June 14, 1932. A. J. STRONG 1,862,809

GRINDING MACHINE

Filed Feb. 16, 1929 3 Sheets-Sheet 1

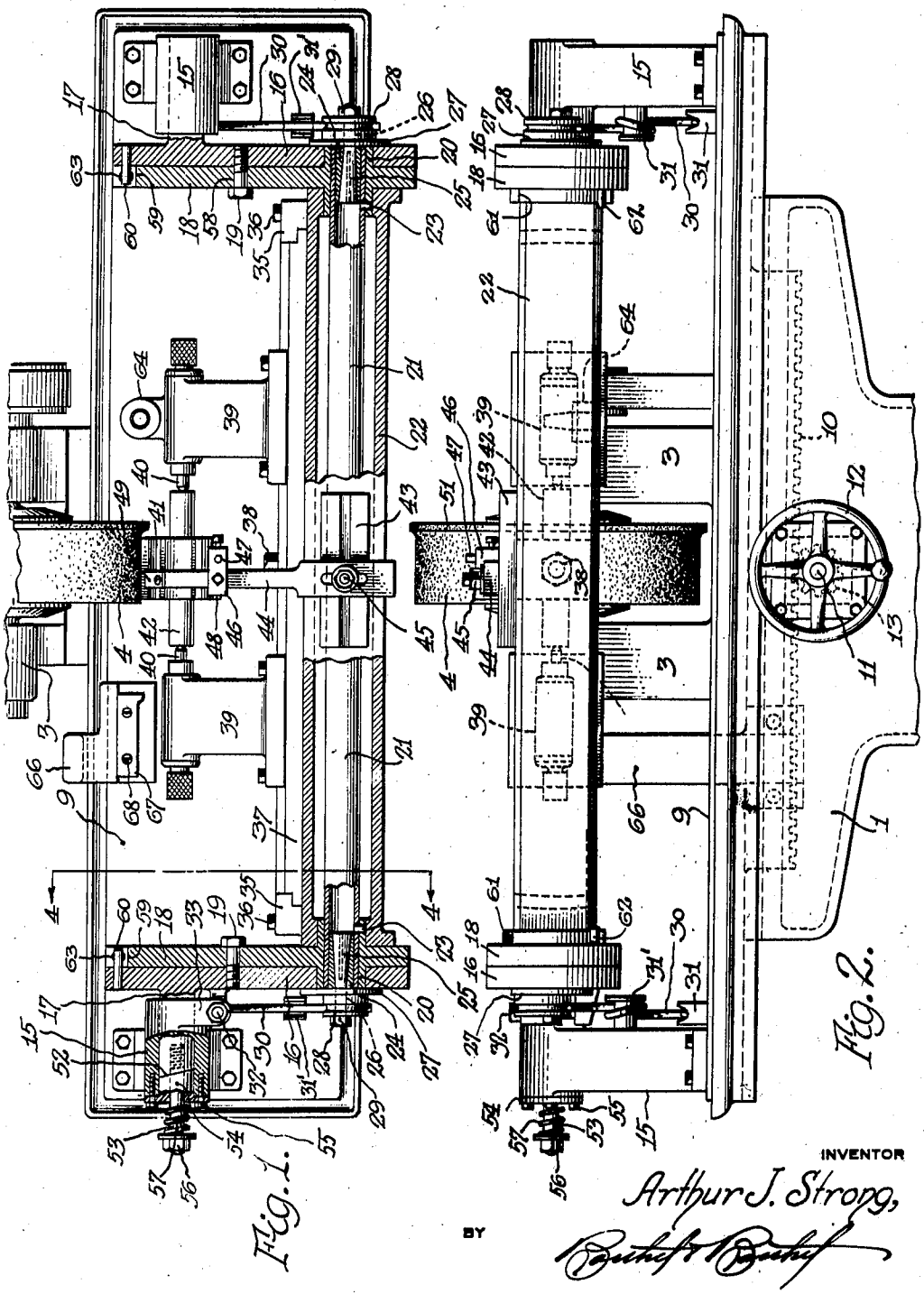


Fig. 1.

Fig. 2.

INVENTOR

Arthur J. Strong,

BY

ATTORNEYS

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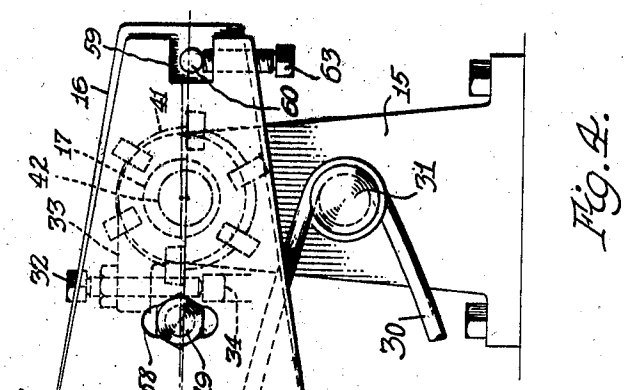


Fig. 4.

Fig. 3.

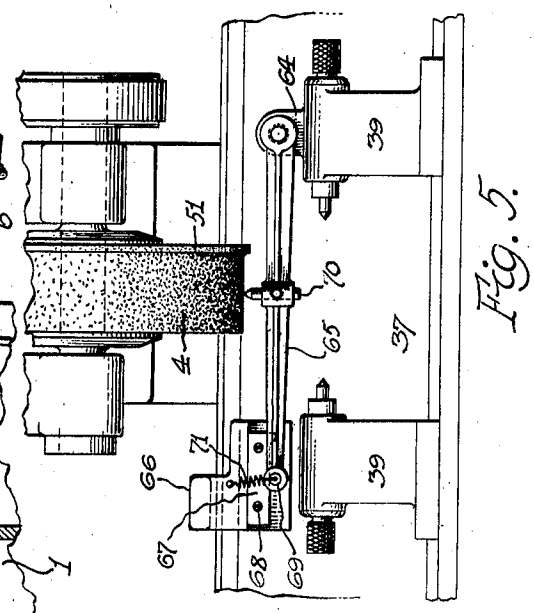


Fig. 5.

INVENTOR

Arthur J. Strong,

BY

ATTORNEYS

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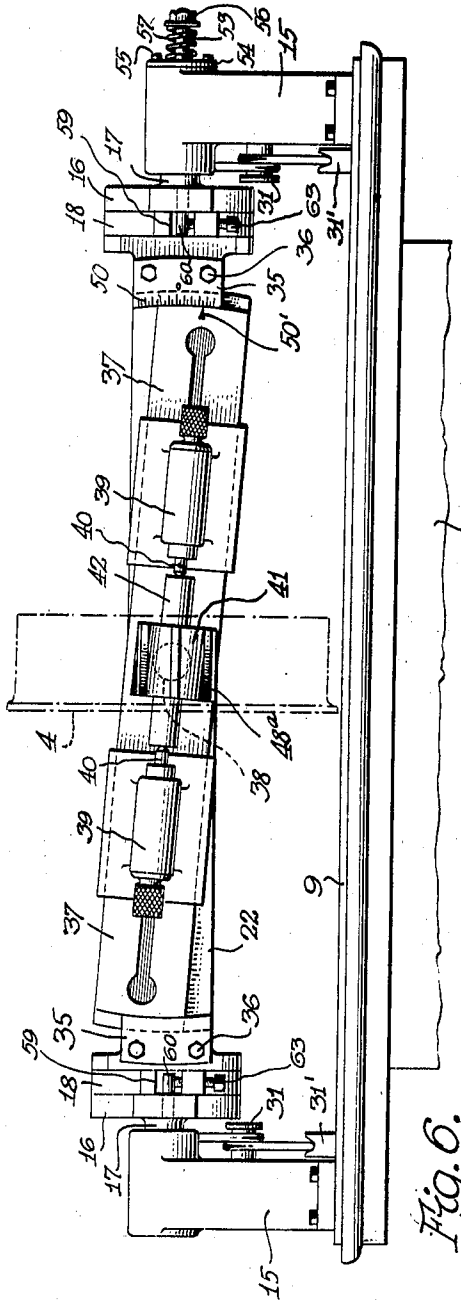


Fig. 6.

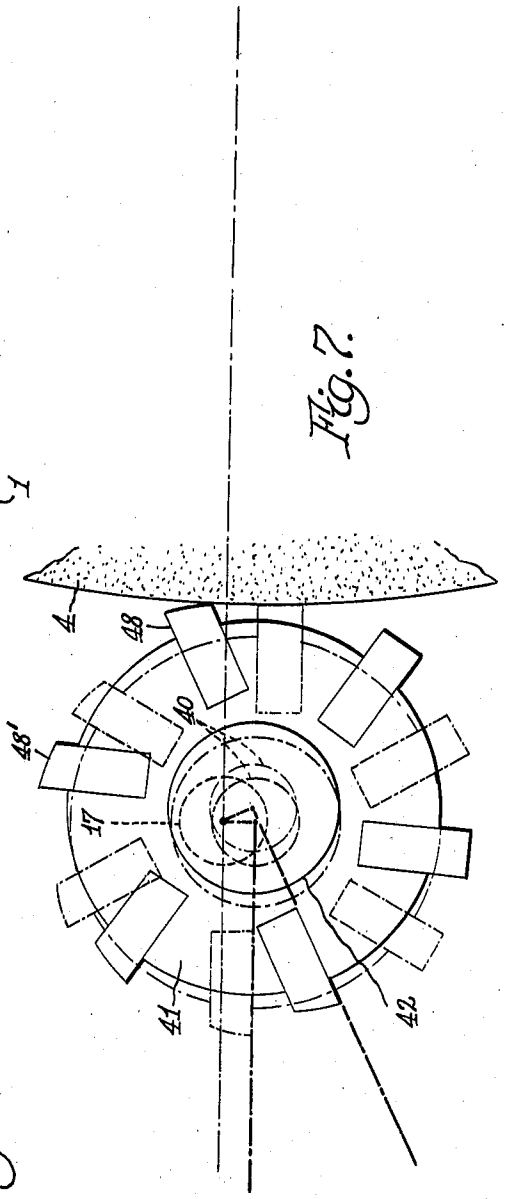


Fig. 7.

INVENTOR

Arthur J. Strong,

BY

ATTORNEYS

Patented June 14, 1932 1,862,809

UNITED STATES PATENT OFFICE

ARTHUR J. STRONG, OF DETROIT, MICHIGAN

GRINDING MACHINE

Application filed February 16, 1929. Serial No. 340,497.

The present invention pertains to a novel grinding machine designed particularly for sharpening rotary cutting tools having elongated cutting edges, such as reamers, counterbores and the like.

The principal object of the invention is to provide a machine of this character which will support the tool in such a manner that the cutting edges thereof will be ground to have clearance. In other words, where the tool is fluted and the flutes are sharpened, the tips of the flutes or blade will not be trimmed to the radius of the tool but will be ground down behind the cutting edge in order to provide clearance behind this edge. This object is accomplished essentially by mounting the tool in a clamp supported on a carrier which in turn is adapted to swing on an axis eccentric of the clamp. The carrier is swung downwardly during the grinding operation, as a result of which a convex tip is formed, bound on one side by the cutting edge and on the other side by a rear edge which is at a less distance from the center of the tool than is the cutting edge.

The invention further embodies various adjustments for the several parts as well as other objects and advantages, all of which are fully disclosed by way of example in the following description and in the accompanying drawings in which

Figure 1 is a fragmentary plan view of the machine, partly in section;

Fig. 2 is an elevation thereof;

Fig. 3 is a detail transverse section, partly in elevation;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a detail plan view showing a dressing instrument applied to the machine;

Fig. 6 is an elevation at the side opposite that shown in Fig. 2; and

Fig. 7 is a diagrammatic view showing the movement of the carrier relative to the grindstone.

Reference to these views will now be had by use of like characters which are employed to designate corresponding parts throughout.

In Fig. 3 it will be seen that the machine is built on a base 1 having at one end a transverse guide 2 in which slides a support 3 carrying the grindstone 4. An adjusting screw 5 turns loosely in a collar 6 depending from the support 3 and threads through a nut 7 supported by the base 1, whereby the grindstone may be adjusted transversely of the base.

The base is formed with still another guide or way 8 in front of the stone for supporting a carriage 9 which slides longitudinally of the base. The lower portion of the carriage carries a rack 10, and in the base 1 is journaled a shaft 11 carrying at one end a hand wheel 12 and at the other end a pinion 13 meshing with the rack 10. By this means, the carriage may readily be adjusted longitudinally of the base.

The base supports a pair of upright bearings 15 at its ends to provide a swivel mounting for a pair of arms 16 having journals 17 extending into these bearings. To the inner faces of the arms 16 are attached plates 18 by means of bolts 19, for a purpose which will presently appear. The plates are formed with double or oppositely extending hubs 20 which receive a rod or shaft 21 lying longitudinally of the carriage at the forward edge thereof. The outer end of each hub extends into the adjacent arm 16, and the two inner ends serve to support a carrier body 22 which encloses the rod 21. The inner ends of the hub are further secured to the rod 21 by means of pins 23 as clearly shown in Fig. 1. Each end of the hollow rod 21 contains a plug 24 with a hole or socket in which is received a split conical member 25 having a stem 26 extending outwardly beyond the adjacent arm 16. The stem is surrounded by a disk 27 and a grooved cam 28 against which

the socket member 24 is drawn by a nut 29 threaded on the extremity of the stem 26.

It will now be evident that the carrier assembly is adapted to swing in the bearings 15. However, it is normally held in a raised position by bow springs 30 wound around studs 31′ on the bearings 15 and having one end in engagement with the corresponding grooved cam 28 and the other end resting in a seat 31 on the carriage 9 (Fig. 3). The upward movement of the carrier is limited by a set screw 32 adjustable in a lug 33 extending from one of the bearings and engageable by a lug 34 extending from the adjacent arm 16 as shown in Figs. 1 and 4. The tension of the springs is regulated by adjusting the cams on the stems 26, inasmuch as the cams may be locked in any desired position by means of the nuts 29.

To the side of the body 22 facing the stone 4, are secured a pair of arcuate guides 35 by means of bolts 36. These guides form an arcuate way for a carrier plate 37 therebetween and pivoted at its midpoint to the carrier body by a stud 38. The plate 37 in turn carries a pair of bearing brackets 39 adjustable thereon and supporting longitudinally adjustable centers 40 which are arranged eccentrically of the journals 17. The tool 41 to be sharpened is mounted on a mandrel 42, the ends of which are held by the centers as shown in Fig. 1.

Upon the carrier body 22 is mounted a short track member 43 in which one end of an arm 44 is adjustably held by a clamping bolt and nut 45. The arm extends over the tool 41 and carries a slidable block 46 in which is adjustably mounted a stop finger 47 adapted to engage the upper surface of the finger of the blade 48 which is diametrically opposite the blade in contact with the stone, as shown in Fig. 3. The inner extremity of the arm 44 carries a swingable gauge 49 which determines the position of the blade engaging the stone.

In the operation of the device as thus far described, it will be seen that one of the flutes or blades to be ground is brought into contact with the stone 4. In the normal position of the carrier and tool, as indicated by dot and dash lines in Fig. 7, the stone 4 forms a convex edge on the blade or finger 48 in contact therewith. As the carrier is depressed against the action of the springs 30, the tool moves in an arc eccentric of its centers 40, whereupon the trailing edge of the blade is brought closer to the stone and ground down, while the leading or cutting edge is retracted from the stone, as shown in full lines in Fig. 7, with the result that the blade is formed with a convex tip 48′ having its trailing edge at a less distance from the center than the leading edge, thereby providing clearance behind the leading or cutting edge.

After a blade 48 has been thus ground, the carrier body is swung upwardly around the hub members 20, bringing the tool well away from the grindstone so that it may safely be adjusted for grinding another blade. The stop 47 is withdrawn, and the gauge 49 swung away from the tool, so that the latter may be turned to present another blade or to bring another blade in a position to be worked upon by the stone. This position is determined by the gauge 49, which is immediately returned to its operative position. The stop 47 is then brought into engagement with the blade opposite that engaged by the gauge, and this stop prevents rotation of the tool while the blade is being ground.

Where the blades 48*a* of the tool are at an angle to the tool head 41′, as in Fig. 6, the plate 37 is swung in its guides 35 to a position which brings the blades parallel to the axis of the grindstone. The adjustment of the plate is permitted by loosening the bolts 36 which are tightened again after the proper angle of compensation has been determined by means of graduations 50 on one of the guides and an index 50′ on the end of the carrier plate adjacent thereto.

The grindstone 4 is here illustrated as having a fillet 51 at one edge for rounding off one of the ends of the cutting edge of each blade. The blade first lies entirely along the cylindrical surface of the grindstone but is subsequently carried to the fillet 51 by the means which will now be described.

One of the journals 17 (Fig. 1) has its outer end cut at an angle to form a cam 52. A stem 53 extends from this journal through a cam member 54 held in the corresponding bearing 15 by bolts 55 and adapted to cooperate with the cam face 52. The outer extremity of the stem 53 carries a nut 56 and is surrounded by a compressed spring 57 bearing against the member 54 and the nut 56 to draw the cam face 52 against the cam 54. Consequently, on depression of the carrier and rotation of the journals in the manner already described, the contacting cam faces shift the carrier and hence the tool 41 toward the fillet 51, so that one end of the cutting edge is rounded off.

The curvature of the tip 48′ of the blade depends on the distance between the axes of the journals 17 and the clamping centers 40. In order to vary the curvature of the tip for various requirements, the axes of the centers 40 may be adjusted with reference to the axes of the journals 17. To this end, each of the bolts 19 works in a slot 58 in the adjacent plate 18. Each plate is also formed at its inner end with a notch 59 receiving a stud 60 extending from the adjacent arm. By loosening the nuts 19, the plates 18 may be adjusted relatively to the arms 16. The carrier body 22 which is rotatable on the hubs 20 tends to swing because of the weight of the bearings 39 and follows the adjustment of the plates

18 by reason of notches 61 in the ends thereof cooperating with stop pins 62 extending from the plates. The desired adjustment may be determined by inserting correspondingly dimensioned shims in each notch 59 over the stud 60 and bringing the studs, shims and upper walls of the notches into mutual contact by set screws 63 threaded through the bottom walls of the notches and engaging the studs.

In Fig. 5 is illustrated a device for dressing the face of the grindstone 4. One of the bearings 39 carries an ear 64 to which is pivotally attached an arm 65 extending to a point adjacent the other bearing 39. To the base 1 of the machine is secured a bracket 66 extending to a point adjacent the last named bearing 39 and there equipped with a guide 67 conforming to the profile of the stone. The guide is detachable by means of screws 68 so that it may readily be replaced by other guides for various styles of stones. The free end of the arm 65 carries a pin or roller 69 adapted to ride along the guide, and to an intermediate point of the arm is secured a dressing instrument 70, such as a sharp pointed member or a diamond point, adapted to run across the face of the stone. This instrument is normally urged into contact with the stone by means of a spring 71 connecting the arm 65 to the bracket 66. The transverse movement of the instrument with respect to the stone is obtained by operating the hand wheel 12 which results in the movement of the carriage 9 and bearings 39 axially of the stone.

Although a specific embodiment of the invention has been illustrated and described, it will be apparent that various alterations in the details of construction may be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:—

1. In a grinder for use in conjunction with a grindstone having a fillet, a base, a carrier pivotally and slidably supported by said base, clamping means on said carrier for holding a work piece to be ground, means for adjusting said clamping means in an eccentric relation to the pivotal center of said carrier, co-operating cam members, one of said members being fixed and the other being movable with said carrier to move the carrier towards said fillet as the carrier is swung on its pivotal axis.

2. In a grinder for use in conjunction with a grindstone having a fillet, a base, a carrier pivotally and slidably supported by said base, clamping means on said carrier for holding a work piece to be ground, means for adjusting said clamping means in an eccentric relation to the pivotal center of said carrier, and means operable on pivotal movement of said carrier for sliding the carrier towards said fillet.

3. In a grinder for use in conjunction with a grindstone having a fillet, a base, bearings on said base, a carrier having journals in said bearings, clamping means on said carrier for holding a workpiece to be ground, said carrier being mounted to swing on an axis eccentric on said clamping means, and a cam in one of said bearings and adapted to act on the journal therein to move the carrier towards said fillet as the carrier is swung on its journals.

In testimony whereof I affix my signature.

ARTHUR J. STRONG.