March 13, 1928. 1,662,679

H. KESSEL

CUTLERY GRINDING AND POLISHING MACHINE

Filed April 27, 1927 3 Sheets-Sheet 1

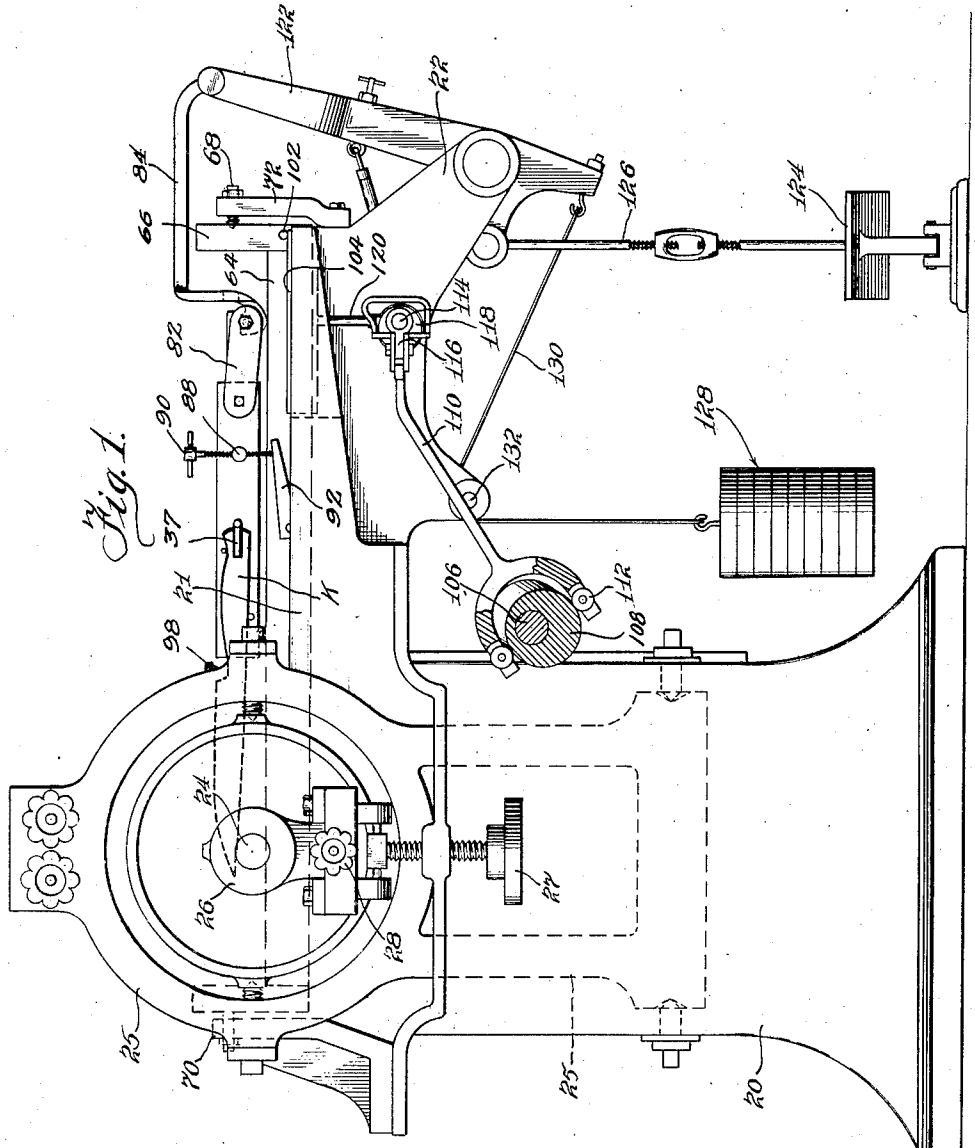


Fig. 1.

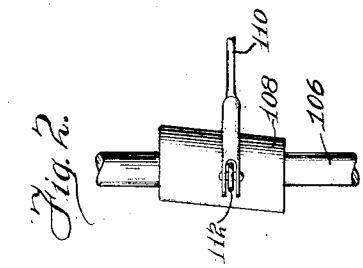


Fig. 2.

Inventor
Heinrich Kessel
By Williams, Bradbury,
McCaleb & Hinkle
Attorneys.

March 13, 1928. 1,662,679

H. KESSEL

CUTLERY GRINDING AND POLISHING MACHINE

Filed April 27, 1927 3 Sheets-Sheet 2

Fig. 3.

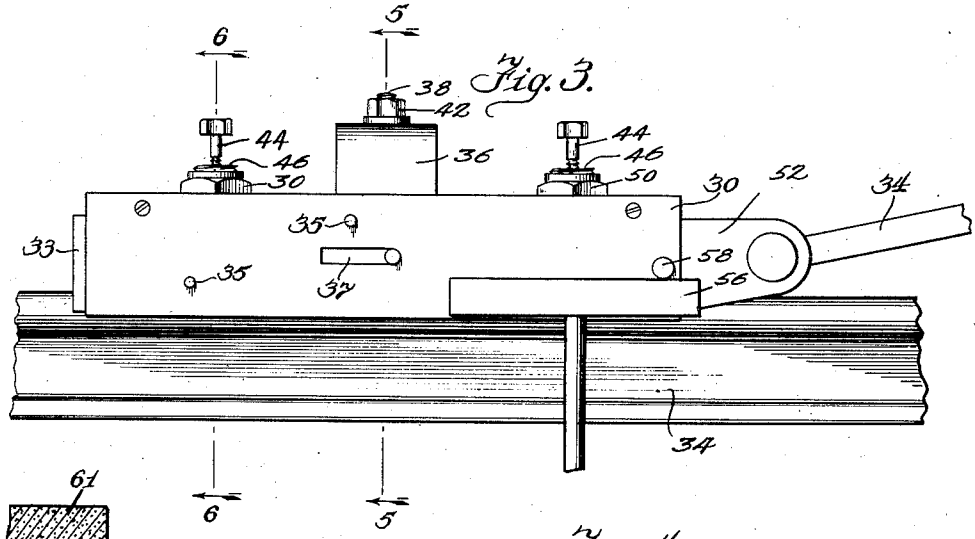


Fig. 4.

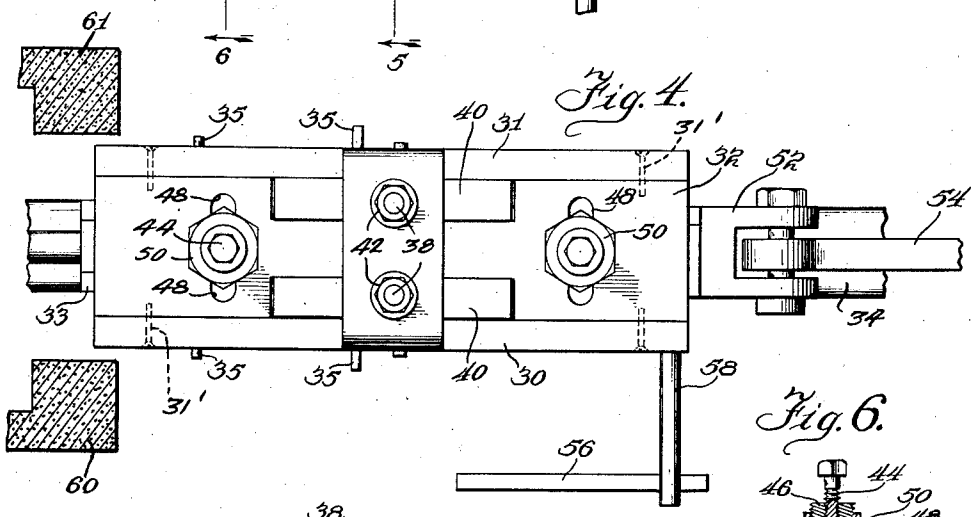


Fig. 5.

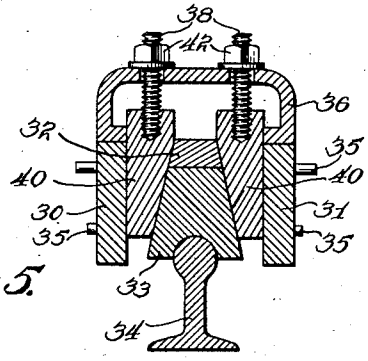
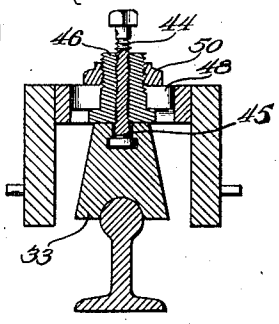


Fig. 6.



Inventor:
Heinrich Kessel
By Williams, Bradbury,
McCaleb & Hinkle
Attorneys.

March 13, 1928. 1,662,679

H. KESSEL

CUTLERY GRINDING AND POLISHING MACHINE

Filed April 27, 1927 3 Sheets-Sheet 3

Fig. 7.

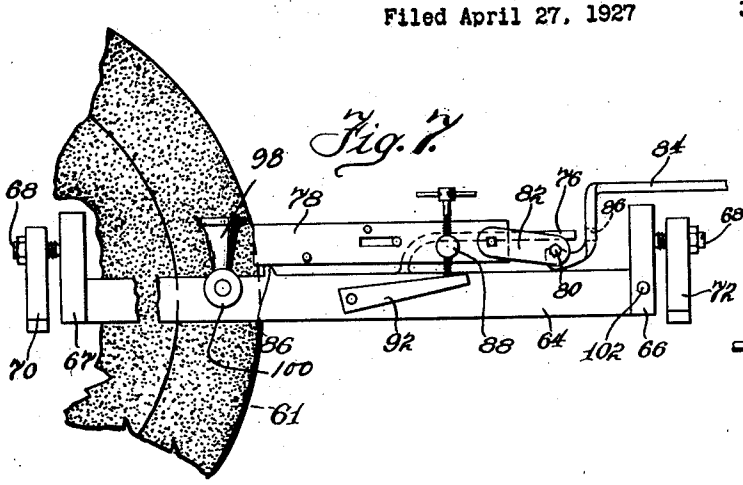


Fig. 9.

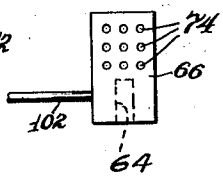


Fig. 8.

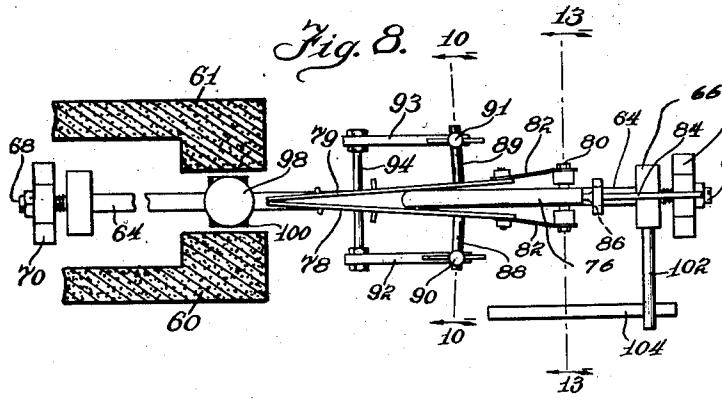


Fig. 10.

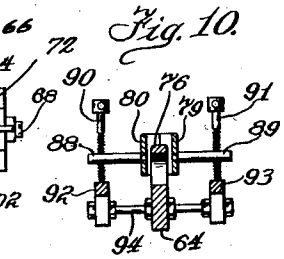


Fig. 12.

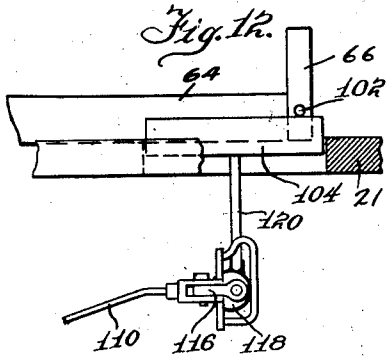


Fig. 13.

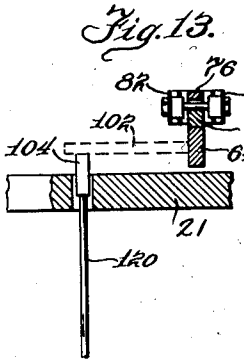
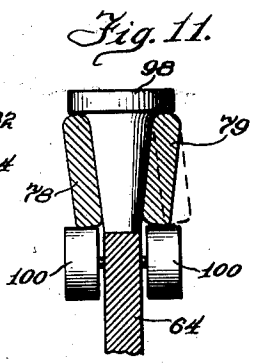


Fig. 11.



Inventor
Heinrich Kessel
By Williams, Bradbury,
McCaleb & Hinkle
Attorneys.

Patented Mar. 13, 1928. 1,662,679

UNITED STATES PATENT OFFICE.

HEINRICH KESSEL, OF HAAN, GERMANY.

CUTLERY GRINDING AND POLISHING MACHINE.

Application filed April 27, 1927, Serial No. 187,092, and in Germany May 2, 1924.

My invention relates to cutlery grinding and polishing machines and more particularly to means for imparting to the blade holder a motion necessary to obtain the desired profile of the cutting edge. While I will describe my invention as applied to a grinding machine, it will be apparent to those skilled in the art that the basic principles thereof may be employed with equal advantages in polishing and similar machines.

It is an object of my invention to provide means whereby knife blades and similar edged tools may be ground to a predetermined profile of the cutting edge.

It is a further object of my invention to provide means whereby two blades may be simultaneously ground.

A further object of my invention is to provide adjustable means for imparting a rocking or oscillating movement to the blade holder.

A further object is to provide a simplified form of blade holding carriage.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which,

Figure 1 is a side elevation, partly in section, of a grinding machine embodying the novel blade holder actuating mechanism;

Figure 2 is a detailed view showing an eccentric utilized for obtaining the rocking motion of the work holder;

Figure 3 is a side elevation of the blade or work holder according to one embodiment of my invention;

Figure 4 is a plan view thereof;

Figure 5 is a vertical cross sectional view taken on the line 5—5 of Figure 3;

Figure 6 is a vertical cross sectional view taken on the line 6—6 of Figure 3;

Figure 7 is a side elevation of a modification of my invention;

Figure 8 is a plan view thereof;

Figure 9 is an end elevation of the cradle upon which the work holder is guided;

Figure 10 is a vertical cross sectional view taken on the line 10—10 of Figure 8;

Figure 11 is a vertical sectional view illustrating the position taken by the cheek plates;

Figure 12 is a detailed elevation showing the means for swinging the cradle; and

Figure 13 is a vertical sectional view taken on a line 13—13 of Figure 8.

The machine shown in side elevation in Figure 1 is merely illustrative of the type of machine with which the work holding and actuating means of my invention may be readily used. I will briefly describe the general construction and method of operation of this machine so that the nature and use of my invention may be more readily understood.

The machine is built upon a base casting 20 which may have a table 21 and a bracket 22 cast integrally therewith or bolted thereto. A pair of oppositely disposed grinding wheels are mounted upon aligned shafts 24 (only one shown). Each of the shafts 24 is mounted in a pair of bearings 26 which are carried by a swinging frame 25 and which are axially adjustable therein. The shaft may be tilted in a vertical plane by manipulation of the hand wheel 27 and moved axially by the rotation of the hand wheel 28. The grinding wheels may thus be moved toward and away from each other and have their grinding faces at practically any desired angle relative to each other. The blade or work holder is slidable between the grinding faces of the two wheels by suitable mechanism which will be hereinafter described. The machine as above described is well known in the art and forms no part of my present invention.

In the embodiment of my invention shown in Figures 3 to 6 the work holder comprises a pair of cheek plates 30, 31 rigidly secured by countersunk screws 31′ to the cross piece 32. The cross piece rests upon a support 33 which has a semi-cylindrical longitudinal groove adapted to fit over the cylindrical head of a guide rail 34. The cheek plates 30, 31 are provided with any suitable means by which blades K (Fig. 1) may be readily attached, such, for example, as the pins, designated generally as 35, and the flat spring 37. A bridge member 36 is mounted upon the cheek plates 30, 31 and is drilled to receive a pair of studs 38. These studs are tightly screwed into wedges 30 which may thus be raised or lowered by tightening or loosening the nuts 42 on the studs. By raising one wedge and lowering the other the cheek plates may be moved laterally relative to the support 33.

The cheek plates may also be raised and lowered relative to the support 33. The means for accomplishing this, as best shown

in Figure 6, comprise a bolt 44 which has a head freely rotatable in a T-shaped slot 45 in the support 33 and is threaded in a box 46 which is laterally adjustable in a slot 48 in the cross piece 32. The box 46 is externally threaded to receive a nut 50 by which the box may be secured in its laterally adjusted position and thus aids in forming a rigid connection between the cheek plates and the support while permitting lateral adjustment of the cheek plates relative to the support by means of the wedges 40. By rotating the bolt 44 the box 46 may be raised or lowered and as a consequence the cheek plates may be raised or lowered or inclined in either direction relative to the horizontal plane of the top of the support 33. The end of the support 33 is bifurcated at 52 to receive an actuating link 54. As will be hereinafter described, this link 54 imparts a longitudinal movement to the support relative to the guide rail 34. The means for swinging the cheek plates about the center line of the cylindrical portion of the guide rail 34 comprises a bar 56 which is reciprocated vertically by any suitable means, such as the mechanism shown in Fig. 7 and used to reciprocate bar 104, as will be hereinafter described. A rod 58 secured in the cheek plate 30 rests upon the bar 56 and is guided thereby, that is, the vertical movements of the bar 56 are transmitted through the rod 58 and cause rocking or pivotal movement of the entire work holder assembly about the guide rail 34.

The method of operation of this device will now be described. The pieces to be ground, for example, knife blades, are mounted upon the cheek plates 30, 31 by any suitable means, as, for example, the pins 35 as is well known in the art, and the whole is then brought between the two opposed grinding wheels 60 and 61, illustrated in cross section in Figure 4, so that the grinding wheel 60 engages the blade on the cheek plate 30 and the grinding wheel 61 engages the blade on the cheek plate 31. The desired profile of the cutting edge is attained by rocking the blade holder by means of the guide bar 56 and the rod 58. The grinding wheels thus alternately grind more heavily toward and away from the cutting edge, so that by suitably setting up of the blade holder and by suitably raising and lowering of the guide bar 56, the desired profile of the edge of the blade may be obtained.

If the surfaces of the blades to be ground, when at the center of the arc of their swinging movement, lie equidistant from two similarly set grinding wheels, and if the cheek plates are symmetrical with respect to the vertical plane through the axis of pivotal movement, then each of the blades will be ground the same amount.

If the plates 30, 31 are set unsymmetrical with respect to the center of the guide rail 34, then the pieces of work being ground will describe arcs of different lengths and curvatures so that the blade on one plate may be ground convex at the same time that the blade on the other plate is ground with a blunt profile of the cutting edge. By shifting the work holder longitudinally by means of the link 54, the desired profile may be ground to extend the full length of the blade. In using the above described mechanism the profile is necessarily the same throughout the length of the blade.

The hollow ground profile resultant from a stationary work holder is transformed into a convex or blunt profile, dependent upon the degree of swinging movement of the blade relative to the grindstone or grinding wheel. The latter movement may be regulated by changing the length of the stroke of the guide bar 56 which may be accomplished by any well known mechanism, one of which will hereinafter be described.

If it were desired to grind blades with long conical backs, either the grinding wheels would have to be suitably turned during the operation, or some modified structure be provided to swing the cheek plates outwardly during a portion only of their longitudinal stroke. In Figures 7 to 13 I have illustrated such a modified construction which in some respects is similar to that above described but possesses advantages not therein obtained in that the cheek plates may be swung outwardly during a portion of their stroke. As shown in Figures 1 and 7, the work piece holder is supported upon a cradle which comprises a bottom bar 64 which is secured to the end pieces 66 and 67. These end pieces are supported by centers or pointed set screws 68 which are threaded and locked in suitable supporting brackets 70 and 72. The end piece 66 has a plurality of spaced conical recesses 74 adapted to receive the center 68. The end piece 67 may be provided with similar recesses but ordinarily a single central recess is all that is necessary at the rear end of the cradle. By shifting the cradle so that the set screw 68 will engage other than the central recess 74 the axis and degree of pivotal movement imparted to the cradle may be varied as desired. The bar 64 has a guide arm 76 secured thereto. The cradle is the means for supporting a pair of cheek plates 78 and 79 which are secured to a bolt 80 by a pair of flat resilient links 82. The links normally tend to hold the cheek plates 79 in contact with each other and resting upon a suitable guide projection 86 formed upon the bar 64. A link 84, for imparting longitudinal movement to the cheek plates, has a recess to receive the bolt 80 which passes beneath the guide arm 76, and an aperture 86 which registers with the end of

the guide arm 76 so as to maintain these parts in correct relative positions as the link 84 moves toward the left (Figure 7).

As best shown in Figures 8 and 10, the cheek plates 79 and 80 carry arms 88 and 89 which are rigid with the cheek plates and project perpendicularly therefrom. The arms are vertically tapped near their extremities to receive adjusting screws 90 and 91 which rest upon guiding rails 92 and 93 respectively. These rails are adjustably secured upon a bolt 94 which is fixed in the bar 64. A tapered separating plug 98 (Figure 11) is secured to the bar 64 at a point intermediate the abrading face of the grinding wheels. As the link 84 slides the cheek plates to the left, their ends engage the separator 98 which forces the plates outwardly to bring the blades, which are attached thereto by any suitable means, into position for grinding. The separator 98 has an enlarged head which holds the cheek plates down upon rollers 100 which are suitably mounted on the bar 64. The cradle, as a whole, may be swung upon its pivot 68 through the engagement of a rod 102, which is secured to the end piece 66, with a guide rail 104 which is raised and lowered by any suitable means, such, for example, as that shown in Figures 1, 2 and 12.

Referring to Figure 1, a shaft 106 carries an eccentric cam cylinder 108. A bifurcated arm 110 has a pair of rollers 112 engaging the surface of the cam and adapted to swing the arm 110 on its pivot shaft 114. By shifting the arm 110 laterally, the length of its swinging movement may readily be varied. The arm 110 is pivotally secured to a member 116 which is fixed to the shaft 114. The shaft 114 carries an eccentric 118 which is adapted to impart reciprocatory movement to a rod 120 which depends from the guide rail 104.

As shown in Figure 1, the link 84 is pivoted to a three-armed lever 122 which in turn is pivotally mounted on the bracket 22. A foot pedal 124 is connected to the one arm of the lever 122 by a rod 126, the length of which may be adjusted, and a counter balancing weight 128 is secured to the lower end of the lever 122 by means of a cable or strap 130 which passes around a suitable pulley on a shaft 132. The link 84, and hence the blade holder, may be shifted to the left by depressing the pedal 124 and will be returned by the weight 128.

The embodiment of the work holder shown in Figures 1 and 7 to 13 inclusive has the advantage that the possibility of grinding away, bending over, or burring the front end of the blade is eliminated, since the blades move laterally into contact with the grinding wheels. As above indicated, the latter embodiment also has the added function of being capable of automatically grinding a conical back edge on the blade, and also provides means (the guide rails 92, 93) whereby the curvature may be adjusted to any desired degree. For example, if the guide rails 92, 93 are set so as to incline downwardly to the left (as shown in Figure 7), the cheek plates 78, 79 will be swung outwardly during the return stroke of the work holder, by means of adjustable screws 90, 91 and the arms 88, 89, as shown in dotted lines in Figure 11. This movement of the cheek plates is possible because of the resilient link connection between the cheek plates and the bolt 80.

Upward movement of the cheek plates is prevented since their front ends are held down by the bolt 80 which slides beneath the guide arm 76, and their rear ends are held beneath the head of the separator 98. Of course, the thrust of the grinding wheels may normally be sufficient to hold the cheek plates down, but the above described means insures the proper pushing of the blades and prevents them from chattering and vibrating. The rounded portion, directly beneath the head of the separator, forms a satisfactory bearing surface for the longitudinal and pivotal movement of the plates. With a given setting of the guide rails, raising the screws 90, 91 will bring the point at which the curvature commences closer to the point of the blade, while with a given setting of the screws 90, 91, increasing the angle of inclination of the guide rails 92, 93, increases the curvature of the conical back edge, that is, decreases the radius of curvature.

In operation two sets of cheek plates, together with the parts secured thereto, may be provided with each machine so that the operator may attach the blades to one set while the other set is in operation. It will be understood that it is necessary for the operator to insert the blade in the machine twice, once upon each cheek plate, in order to grind both sides of the blade. By sliding the cheek plates to the right (Figure 7) until the bolt 80 passes beyond the end of the guide arm 76, they may be easily removed from the machine and another set substituted.

If desired, one side of the blade may be ground convex and the other side relatively blunt by mounting the cradle unsymmetrically upon its pivot centers, as by using recesses 74 other than those in the center vertical column.

From the above description it will appear that I have provided a work piece holder which is very simple in construction, efficient in operation, and by means of which blades may be ground so as to have practically any desired profile of the cutting edge.

While I have shown and described but two embodiments of my invention it will be obvious to those skilled in the art that vari-

ations thereof may be made without departing from the principles of my invention. I therefore do not wish my invention to be limited except by the claims which follow.

I claim:

1. In a machine of the class described, a work holder comprising two vertical, rigidly joined, cheek plates, a support for said plates, means for vertically adjusting said plates relative to said support, and means for laterally adjusting said plates relative to said support.

2. In a machine of the class described, a work holder comprising a reciprocable support, a cross piece vertically and laterally adjustable relative to said support, screw means for securing said cross piece in adjusted position, and a pair of plates adapted to support the piece to be ground, fixed to said cross piece.

3. In a machine of the class described, the combination of a guide rail, a support slidably and pivotally mounted thereon, work holding means vertically adjustable relative to said support, and screw means for effecting adjustment of said work holding means.

4. In a machine of the class described, the combination of a guide rail, a support slidably and pivotally mounted thereon, work holding means vertically and laterally adjustable relative to said support, and screw means for effecting adjustment of said work holding means.

5. In a machine of the class described, the combination of a member having a guide rail therealong, a work holder longitudinally slidable on said rail, and means for imparting a pivotal movement to said work holder irrespective of the position of said work holder on said rail.

6. In a machine of the class described, a guide rail, work holding means reciprocable relative thereto, means for imparting a swinging movement to said work holding means, and means, including a cylinder rotating about a diagonal axis, for varying the extent of swinging movement of said work holder.

7. In a machine of the class described, the combination of a guide bar, a pair of cheek plates reciprocably mounted upon said bar, means for sliding said cheek plates longitudinally, resilient connections between said last-named means and said cheek plates, said resilient means tending normally to press said cheek plates together, and wedging means adapted to separate said cheek plates at one portion of their reciprocatory stroke.

8. In a machine of the class described, the combination of a pivotally mounted cradle, said cradle being carried on a pair of adjustable centers so that the pivotal axis of the cradle may be shifted, work-holding means reciprocable upon said cradle, said means comprising a pair of plates adapted to hold the pieces of work on their outer faces, a rigid cross-piece and resilient means normally tending to move said plates toward each other; means to reciprocate said work-holding means, means to spread said plates apart during a portion of their stroke, adjustable means to rock said cradle, and adjustable means to swing said plates outwardly during a portion of their reciprocatory stroke.

9. In a machine of the class described, the combination of a swinging guide rail, means for permitting the shifting of the axis of the swinging movement of said guide rail, a work-holder reciprocable on said rail, means to move said work-holder longitudinally, and means to move said work-holder laterally during a predetermined portion of its reciprocatory stroke.

10. In a machine of the class described, the combination of a pair of juxtaposed plates adapted to receive the work on their outer faces, means to longitudinally reciprocate said plates, means to force said plates laterally to bring the work in operative position, and adjustable means for swinging said plates outwardly about axes adjacent the upper lateral edge of said plates.

11. Work-holding means comprising a pivotally mounted cradle, work supporting means reciprocably mounted on said cradle, and means for periodically swinging said cradle a pre-determined extent by reciprocation of said work supporting means.

12. In a machine of the class described, the combination of a cradle pivotally mounted, means to impart a pre-determined pivotal movement to said cradle, a pair of plates resiliently held on said cradle and guided thereby, means to reciprocate said plates, and means for swinging each of said plates outwardly along a longitudinal axis, the degree of swinging movement being a variable function of the reciprocatory movement of said plates.

In witness whereof, I hereunto subscribe my name this 6th day of April, 1927.

HEINRICH KESSEL.