Oct. 16, 1945. O. MIETH 2,386,973

CAM MAKING MACHINE

Filed Nov. 12, 1943 5 Sheets-Sheet 1

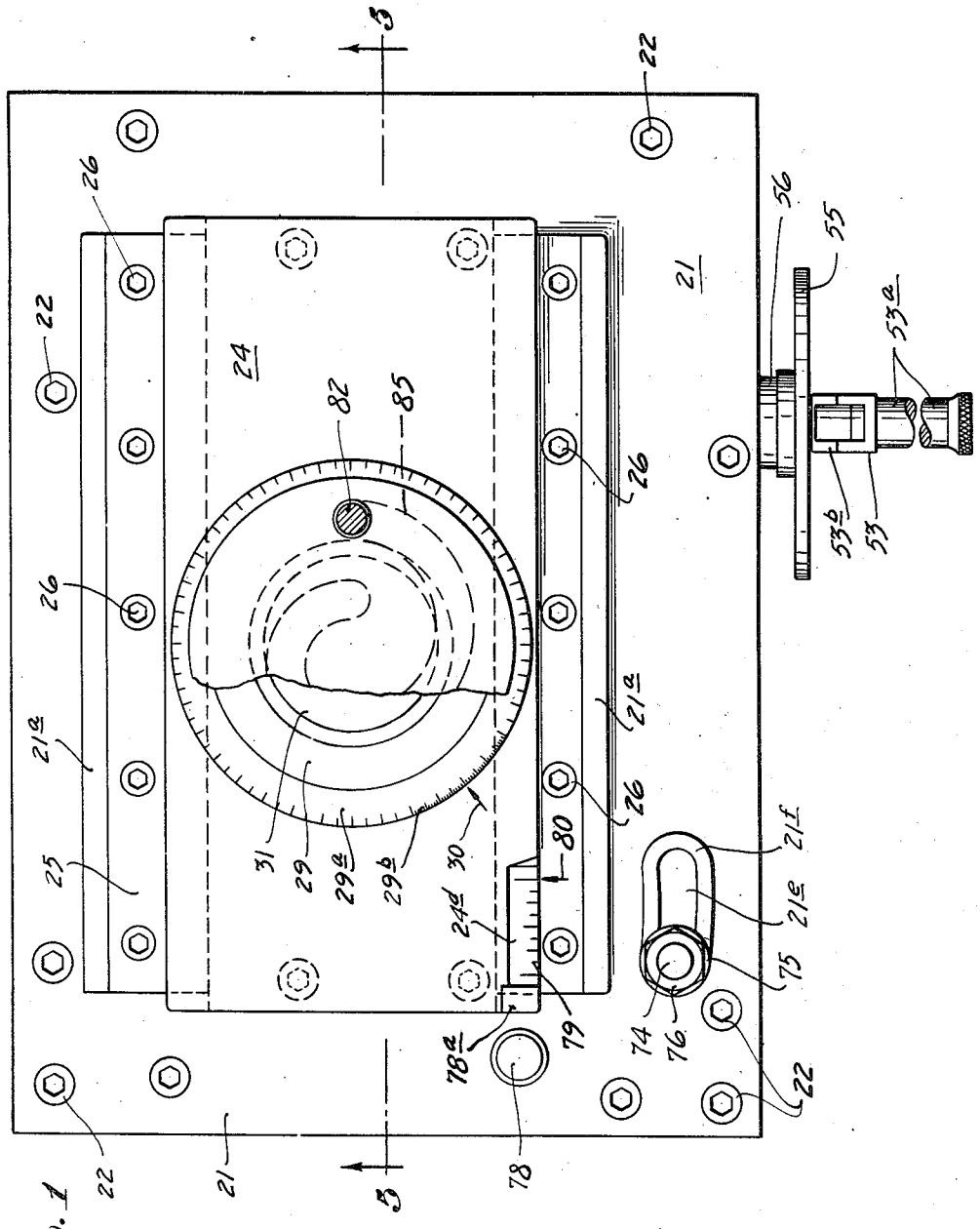

Fig. 1

Inventor
Otto Mieth
By his Attorneys
Mecklenburg & Mecklenburg

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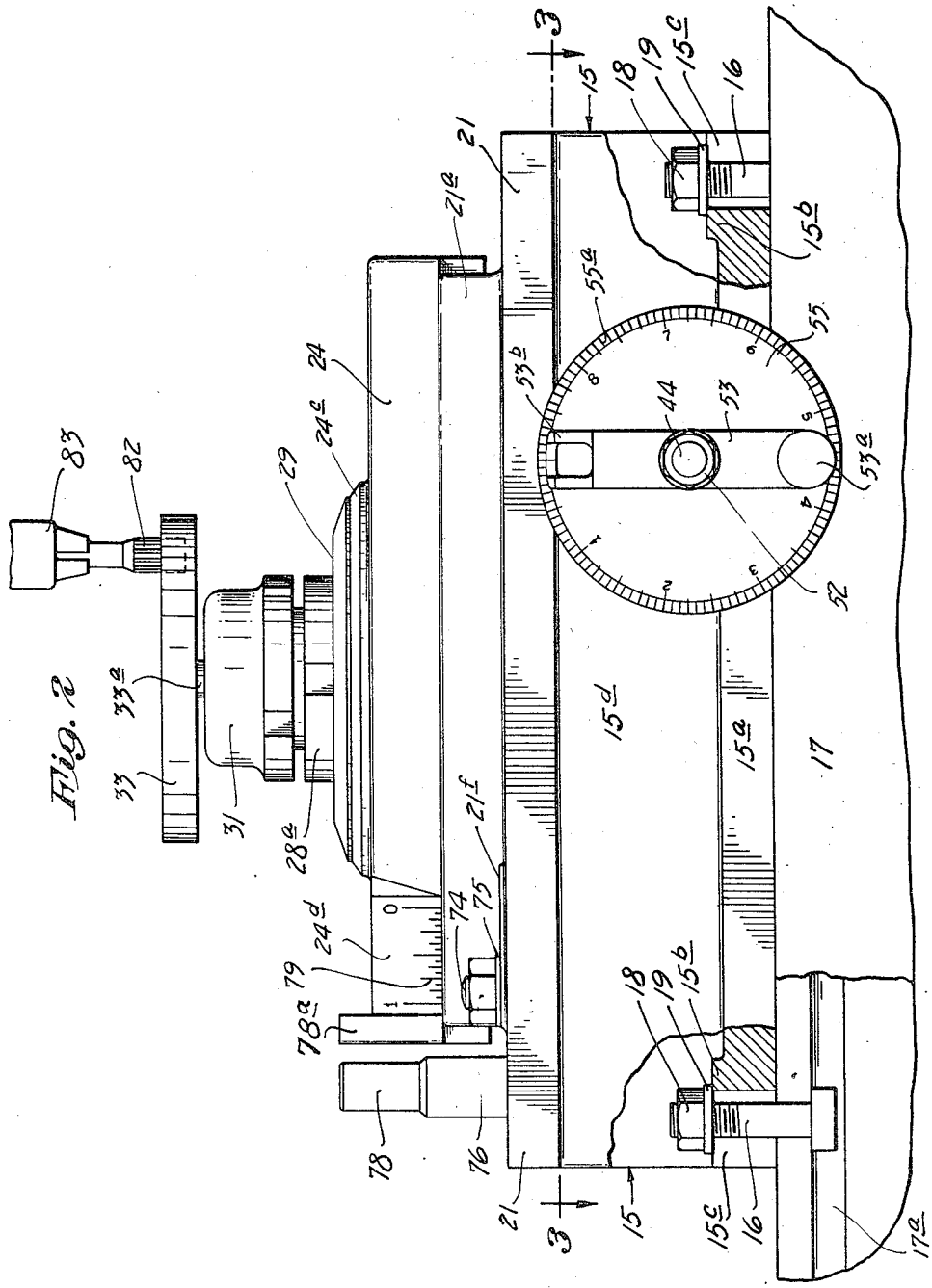

Fig. 2

Inventor
Otto Mieth
By his Attorneys
Mitchell & Mitchell

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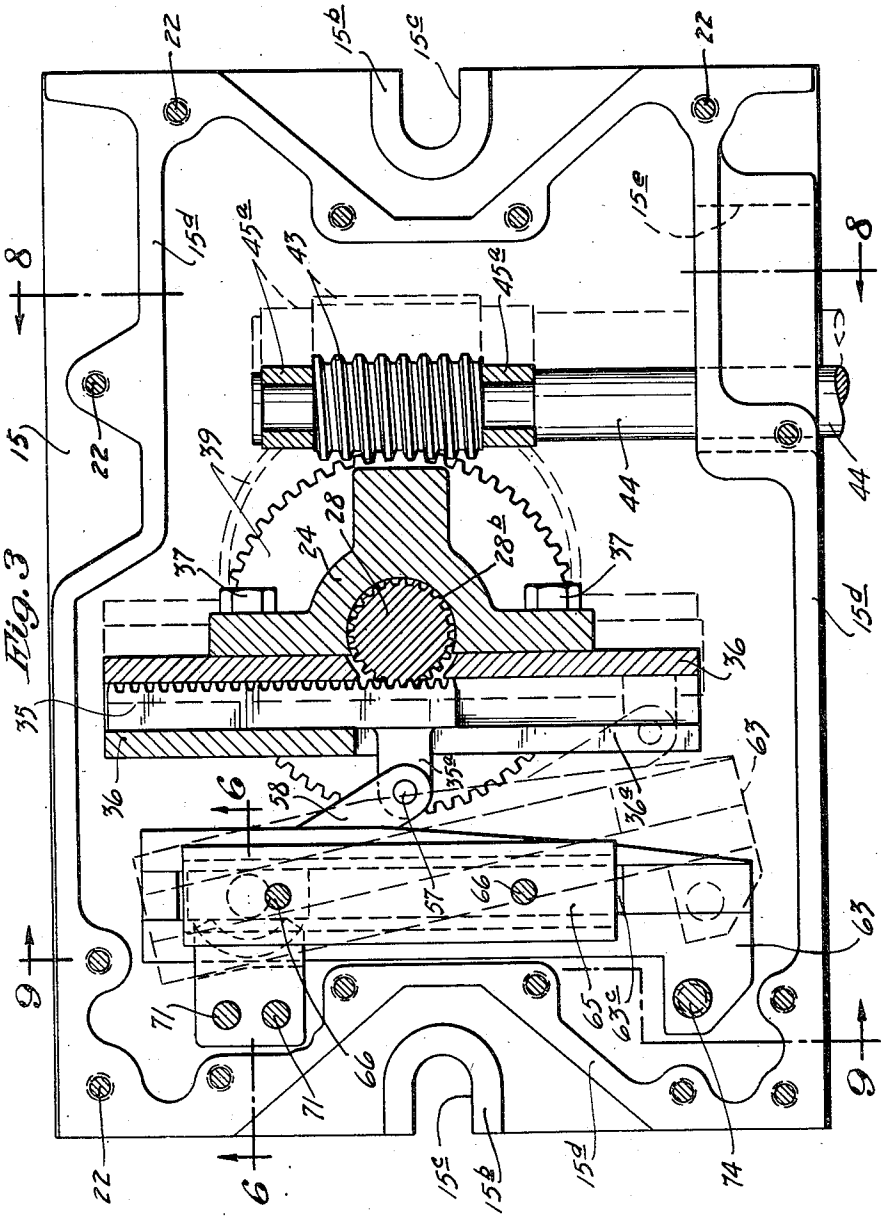

Fig. 3

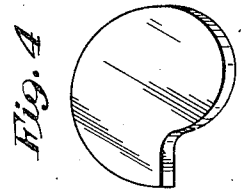

Fig. 4

Inventor
Otto Mieth
By his Attorneys

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Fig. 4

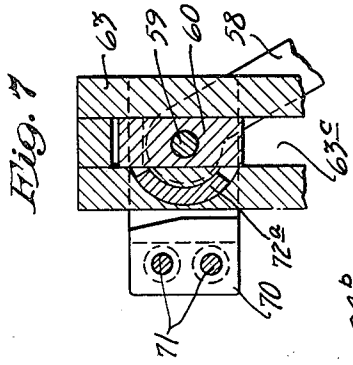


Fig. 5

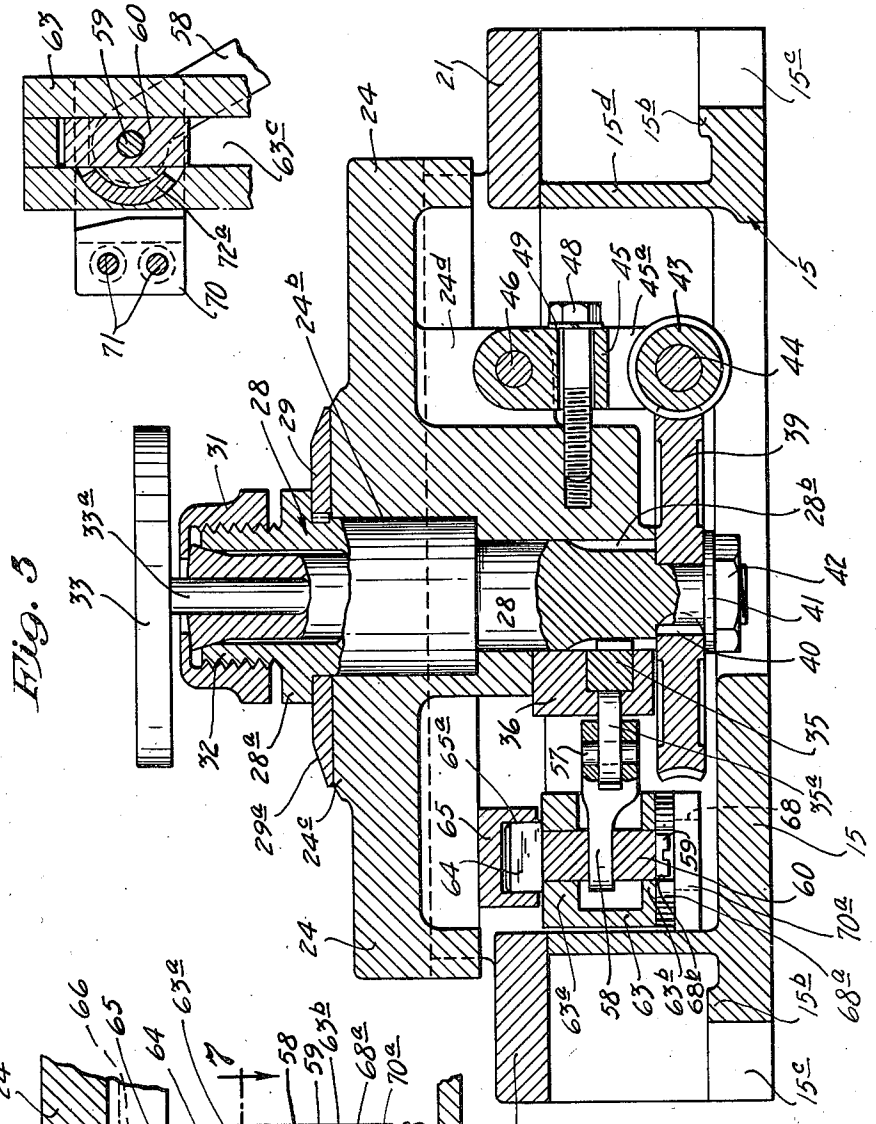
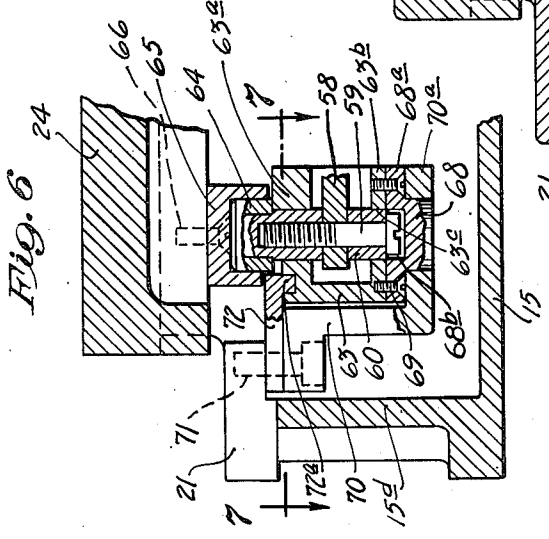


Fig. 6



Inventor
Otto Mieth
By his Attorneys

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Fig. 8

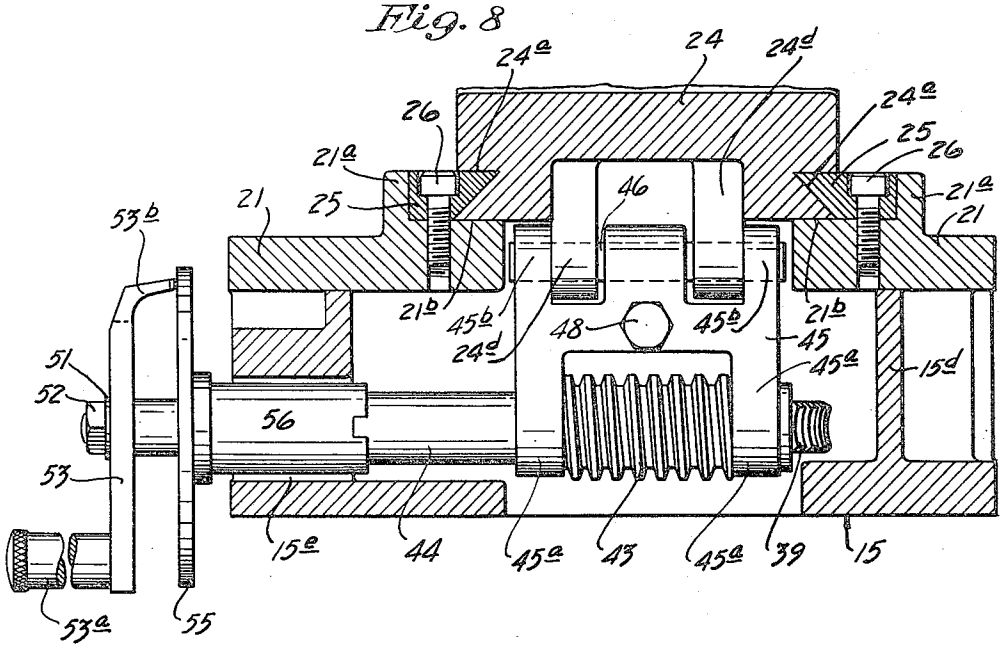
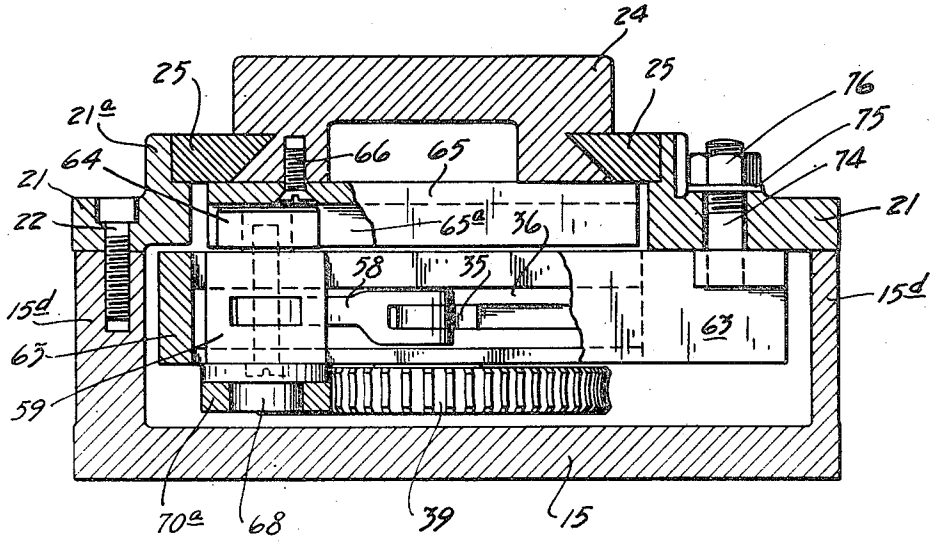


Fig. 9



Inventor
Otto Mieth
By his Attorneys

Patented Oct. 16, 1945

2,386,973

UNITED STATES PATENT OFFICE

2,386,973

CAM MAKING MACHINE

Otto Mieth, Minneapolis, Minn.

Application November 12, 1943, Serial No. 510,045

6 Claims. (Cl. 90—13.9)

This invention relates to a device or mechanism for cutting and finishing cams or similar articles and particularly to such a device for holding a cam in position to be acted upon by a cutter, said cam being rotated and moved so that said cutter finishes said cam to the desired shape. Many cams are now used having a face or periphery which follows a line or surface eccentric to the axis of rotation of said cam. The present device or machine is designed for quickly and efficiently shaping said face or periphery.

It is an object of this invention to provide an apparatus having means for holding and rotating a cam in position to be acted upon by a cutter together with means for rotating said means, an additional means actuated by the rotation of said means for moving said cam during its rotation so that the desired contour is given to said cam.

It is a further object of the invention to provide an apparatus comprising a table which is guided for rectilinear movement, a rotating means carried in said table for holding said cam, means for rotating said means and cam, a member for moving said table actuated by said last mentioned means and means for varying the amount of movement of said table.

It is more specifically an object of the invention to provide an apparatus comprising a frame, a table mounted on said frame and guided for rectilinear movement, a spindle mounted in said table for carrying a cam, means for rotating said spindle and cam, a member having a guideway therein constructed and arranged to be positioned with said guideway at an angle to the movement of said table, means for rotating said spindle, a member moved in said guideway by the rotation of said spindle and a member carried by said last mentioned member for engaging and moving said table, whereby said table and cam are moved as said spindle and cam are rotated.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a plan view of the apparatus, some parts being broken away;

Fig. 2 is a view in side elevation of said apparatus, some parts being broken away and others shown in vertical section;

Fig. 3 is a horizontal section taken substantially on line 3—3 of Fig. 2 as indicated by the arrows;

Fig. 4 is a perspective view of a cam such as formed by the apparatus;

Fig. 5 is a vertical section taken substantially on line 5—5 of Fig. 1;

Fig. 6 is a partial vertical section taken on line 6—6 of Fig. 3 as indicated by the arrows;

Fig. 7 is a partial horizontal section taken on line 7—7 of Fig. 6 as indicated by the arrows;

Fig. 8 is a vertical section taken on line 8—8 of Fig. 3 as indicated by the arrows and Fig. 9 is a vertical section taken on line 9—9 of Fig. 3 as indicated by the arrows.

Referring to the drawings an apparatus is shown comprising a frame member 15 which is provided with a flange 15*a*, having bosses 15*b* at its ends, which bosses are provided with open ended slots 15*c*. Headed and nutted bolts 16 have their heads disposed in a slot 17*a* in a base member 17 and extend through slots 15*c* having nuts 18 thereon engaging washers 19 which overlie slots 15*c* and engage the top of bosses 15*b*. Frame member 15 can thus be firmly secured in different positions to base 17. Frame 15 has vertically extending ribs or flanges 15*d*, having horizontal finished top surfaces and a plate 21 rests upon said horizontal surfaces. Plate 21 is secured to frame 15*d* by a plurality of headed screws or bolts 22 threaded into frame 15 and having their heads countersunk in plate 21. Plate 21 has vertically extending spaced flanges 21*a* and has finished horizontal surfaces 21*b* between said flanges. A table 24 rests upon surfaces 21*b*. Table 24 is provided with V-shaped or dove-tailed guiding slots or recesses 24*a* in its sides extending to its bottom surface and gibs or keys 25 are secured between flanges 21*a* and are shaped to fit in slots 24*a*, said gibs being secured to plate 21 by headed screws 26 having their heads countersunk into the gibs 25. It will be understood that members 25 form a guideway in which table 24 is guided for rectilinear movement.

Table 24 is provided with a cylindrical bore 24*b* and a spindle 28 is fitted in bore 24*b*, the same having a cylindrical flange 28*a* which rests upon a dial member 29, which in turn engages the top of a raised boss 24*c* on table 24. Dial 29 is keyed or otherwise secured to spindle 28. Dial 29 also has a beveled surface 29*a* adjacent its periphery which as shown in Fig. 1 is provided with circumferentially spaced graduations 29*b*. An arrow 30 is formed on the top of table 24 extending radially of dial 29 and adjacent the edge thereof. Spindle 28 is provided with a threaded upper portion which receives a threaded cap 31 having a top flange adapted to engage jaws of a chuck and collet 32 adapted to hold the shaft or shank 33*a* of a cam 33. Spindle 28 extends down-

ward in table 24 and is formed adjacent its lower end with gear teeth 28b, which teeth mesh with the teeth of a rack 35 of rectangular form in cross section and guided in a rectangular slot or guideway formed in a member 36 secured to table 24 by spaced headed bolts 37. Spindle 28 extends below gear teeth 28b and is reduced in diameter to have secured thereto a worm wheel gear 39 secured in any suitable manner as by the key 40, said gear 39 also being held by a washer or collar 41 and a nut 42 threaded onto the lower end of spindle 28. A worm gear 43 meshes with worm wheel gear 39 and is secured to a shaft 44 journalled in the spaced arms 45a of a bracket 45 supported for swinging movement on a pin 46 extending through spaced arms 45b thereof and through spaced lugs 24d depending from the underside of table 24. Bracket 45 is held in the desired position by a headed bolt 48 extending therethrough and threaded into table 24, the same being shown as having a lock washer 49 beneath the head thereof and engaging bracket 45. Shaft 44 extends through an elongated slot 15e in frame 15 and has secured to its outer end by a washer 51 and nut 52 threaded on its end a crank 53 having a handle 53a. Crank 53 extends to the side of shaft 44 opposite handle 53a and has its end formed as a pointer 53b adapted to cooperate with graduations 55a formed on a dial plate or disc 55 carried on a sleeve 56 in turn carried on shaft 44.

Rack 35 has a lug 35a projecting therefrom and movable through a slot 36a in member 36, which lug has pivotally secured thereto by a pivot pin 57 a link 58. Link 58 at its other end is pivotally secured to a bolt 59 extending through block 60 having flanges disposed above and below link 58. Bolt 59 is threaded into the upper flange of block 60. Block 60 is slidable in a slot 63c formed in a swinging member 63 having upper and lower flanges 63a and 63b. Block 60 projects above flange 63a and is reduced in diameter to fit within a bore in a block 64 which fits in and is slidable in a slot 65a formed in a channel member 65 secured to the bottom of table 24 by screws 66, said channel 64 extending transversely of table 24. Block 60 as stated is slidable in a slot 63c which is formed in the upper and lower flanges 63a and 63b of member 63. A member 68 has a flange 68a secured by circumferentially spaced screws 69 to the bottom of flange 63b and has a lower cylindrical portion journalled in a bore in the flange 70a of a bracket 70, having an attaching flange secured by the bolts 71 to plate 21. A plate 72 is secured between the top of bracket 70 and plate 21 and the same extends under one end of channel member 65 and has a depending arcuate flange 72a which is disposed in an arcuate slot formed in the top of flange 63a. Member 68 is provided with a recess in the nature of an upwardly opening channel 68b that extends transversely of the flange 68a and receives the head of the bolt 59. With the described construction it will be seen that member 63 is swingable about the axis of member 68 and the axis of flange 72a, which axes of course are in vertical alignment. Also with the described construction block 60 which is slidable in slot 63c can be moved so that the axis of bolt 59 can be positioned coaxial with the axis of member 68 as shown in Fig. 7. Member 63 has a stud 74 secured in a lateral projection at one end thereof which stud extends vertically through an arcuate slot 21e in plate 21, said slot being formed in a raised boss 21f. Bolt 74 has thereon a washer 75 engaging boss 21f and in turn engaged by a nut 76 threaded on the upper end of stud 74. By tightening nut 76 arm or member 63 can be held in different positions to which it can be swung about the axes of member 68 and flange 72a. Table 24 has a beveled portion 24d which is provided with graduations 79. An arrow 80 on one of the gibs 25 cooperates with graduations 79. For use with a micrometer for reading the cam rise (the difference between the lowest and highest points of the cam) I preferably provide the plate 21 with an upstanding post 78 that extends in parallel spaced relation to an upstanding lug 78a on the table 24. With this arrangement, approximate settings of the machine can be read on the cooperating scales and exact settings can be determined by measuring the spaces between the outsides of the post 78 and cooperating lug 78a with a common machinist's micrometer.

In operation the cam to be shaped will be held in the chuck of spindle 28 by its shaft or shank 33a and said cam will be held in position to be acted upon by a cutter 82 carried in the arbor or chuck 83 of a milling machine or other suitable machine. The apparatus is designed to move the table 24 so that the desired eccentric surface is cut on the cam. A cam such as operated upon is shown in Fig. 4. The cam will be positioned with cutter 82 disposed at the beginning of the surface to be formed. Cams vary in circumferential extent, some having a cam surface for only a portion of the periphery. The amount of throw or eccentricity of the cam will be known as will also the circumferential extent of the cam surface. The member 63 will accordingly be swung about its pivot members 68 and 72 to the angle which will give the amount of travel desired for the circumferential extent of the cam. The cutter will now be operated and the operator will turn crank 53 thus rotating shaft 43, worm gear 43 and worm wheel gear 39. Spindle 28 will thus be rotated and cam 33 will be rotated so that the cutter will move along its periphery or the periphery will be moved past the cutter. As spindle 28 revolves its gear portion 28b acts on rack 35 moving the same downward as shown in Fig. 3 and block 60 will be moved in guideway 63b. Since said guideway is at an angle to the movement of table 24 or to the guides of table 24, said table will be moved in its guideways by block acting on channel member 65 as block 64 moves with block 60. The table is thus also moved as cam is rotated and an eccentric surface is thus formed on the cam as desired. The path traced on the cam by the cutter is shown in dotted lines 85 in Fig. 1. The amount of turning of the cam can be observed as the same will be indicated by the graduations 29b. The amount of rotation can also be determined by the graduations 55a as the pointer end 53b of crank 53 moves past these graduations. As the table 24 moves it carries with it the bracket 45 as well as shaft 43, spindle 28 and rack 35. Bar 63 can as stated be moved to different positions by loosening nut 76 and moving stud 74 in the slot 21e. Said bar will be held in the desired position by again tightening nut 76. The channel or guide member 65 is connected to table 24 so that table 24 may always start from and come back to the starting or zero point on index plate 29. As before stated, the amount of cam rise is determined by the position of the swinging member 63. When said swinging member 63 is to be set and locked in a predeter-

mined position, the bolt 59 should be in vertical or axial alignment with the member 68 and the arcuate flange 72*a* so that the position of the cam will not be disturbed. It will be noted that, if the bolt 59 and the parts carried thereby are not axially aligned with the member 68 and the arcuate flange 72*a*, movement of the swinging member 63 is possible only by turning the crank 53. This will, in some instances, necessitate resetting the cam in the chuck, and the movement of the whole device in relation to the cam cutting tool.

From the above description it will be seen that I have provided a comparatively simple and very efficient machine for shaping cams. As stated the movement of table 24 to give the eccentricity can be varied and this movement can be seen or preliminarily tried by using the graduations 79. The amount of the periphery of cam surface can be noted with the graduations 29*b*. The amount of rotation of crank 53 which is necessary may also be tried and gauged by use of dial plate 55. The device can be easily applied to the bed of the milling machine or other machine having the desired cutter. The device has been amply demonstrated in actual practice and found to be very successful and efficient.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combination of parts disclosed and defined in the appended claims.

What is claimed is:

1. A device for shaping cams or similar articles having in combination, a supporting frame, a rotatable means for holding the cam, a movable member carrying said means and guided for rectilinear movement on the frame, means carried by said member for rotating said means, a fixed member having an adjustable guideway therein, a link movable in said guideway and pivotally connected to said movable member to move the same, and means for rotating said first mentioned means and moving said link to move said movable member as said cam is rotated.

2. A device for shaping cams or similar articles having in combination, a rotating means in which the cam is held in position to be acted upon by a cutter, a movable table in which said means is mounted, a frame having a guideway for guiding said table in a rectilinear path, a second guideway carried by said frame and constructed and arranged to be disposed at an angle to said first mentioned guideway, means for rotating said first mentioned means, a third guideway carried by said table, and means connected to and moved by said last mentioned means and connected to said second and third guideways to move said table and first mentioned means as the latter and said cam are rotated.

3. A device for shaping cams or similar articles having in combination, a spindle having means at one end for holding the cam in position to be operated upon by a cutter, a table carrying said spindle and guided for rectilinear movement, a pair of associated guideways constructed and arranged to be positioned at angles to each other and to the movement of said table, a member movable in said guideways for slidably engaging said table to move the latter, means for rotating said spindle, and means actuated by the rotation of said spindle for moving said last mentioned member to move said table as said spindle and cam are rotated.

4. The structure set forth in claim 3 said last mentioned means comprising a gear on said spindle, a rack engaged and moved by said gear and a link pivotally connecting said rack and said last mentioned member.

5. A device for shaping cams or similar articles having in combination, a spindle having means at one end for holding the cam in position to be operated upon by a cutter, a table carrying said spindle and guided for rectilinear movement, a member pivoted for a swinging movement and having a guideway therein, means for holding said member in different positions so that said guideway may extend at an angle to the movement of said table, a second member movable in said guideway relative to the table, a gear carried by said spindle, a rack engaged by and moved by said gear guided for rectilinear movement, a link pivotally connected to said rack and to said second member, and means carried by said second member and slidably engaging said table for moving the latter.

6. A device for shaping cams or similar articles having in combination, means for holding and rotating a cam for operation of a cutter thereon, and means for variably moving said cam including a pivoted member having a guideway therein a link movable on the guideway over said pivot, a bracket having a semi-annular flange therein at one side of said guideway opposite said pivot, and said member having a slot concentric with said pivot in which said flange fits so that said member may swing about said flange and the axis thereof when the link is over said pivot.

OTTO MIETH.