July 6, 1943. D. H. DUFFY 2,323,587

CONTOURING MACHINE

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Fig. 1

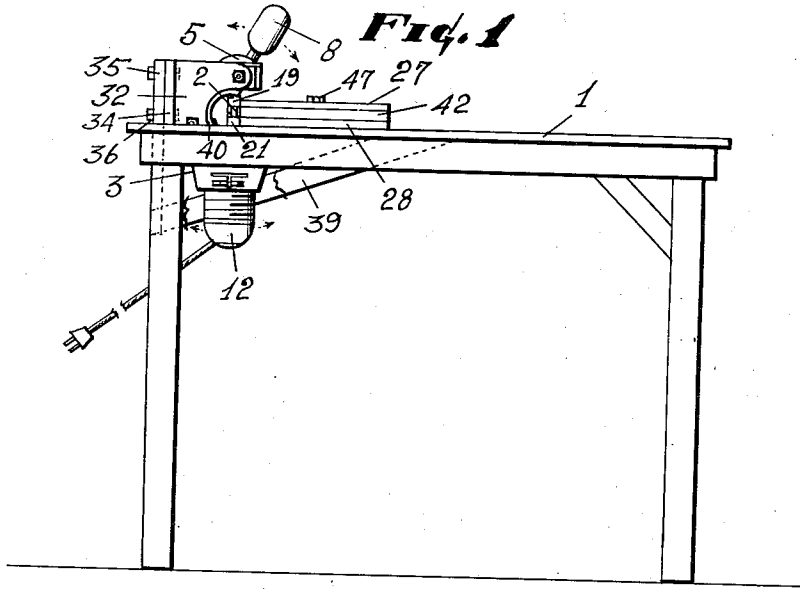
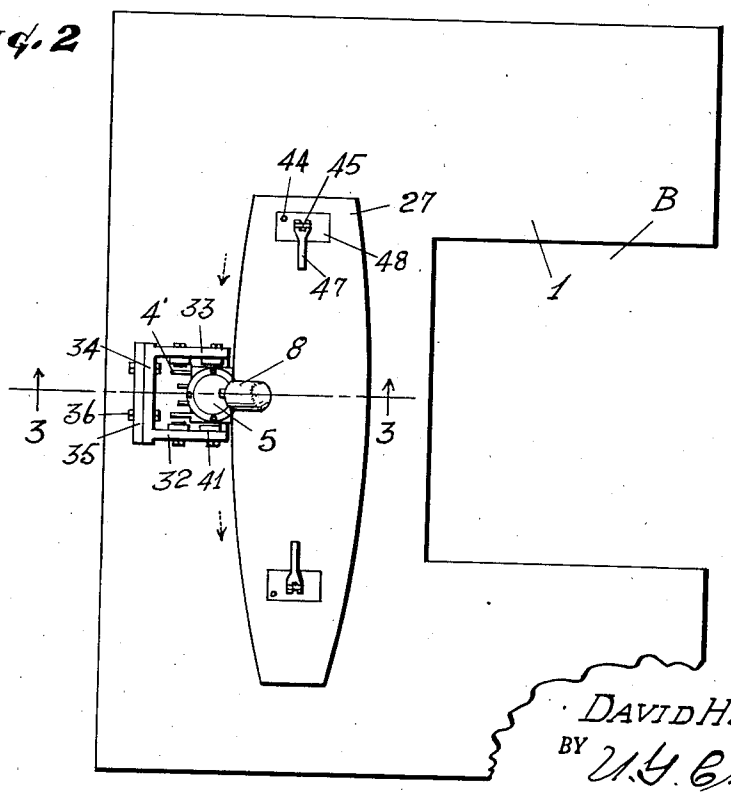


Fig. 2



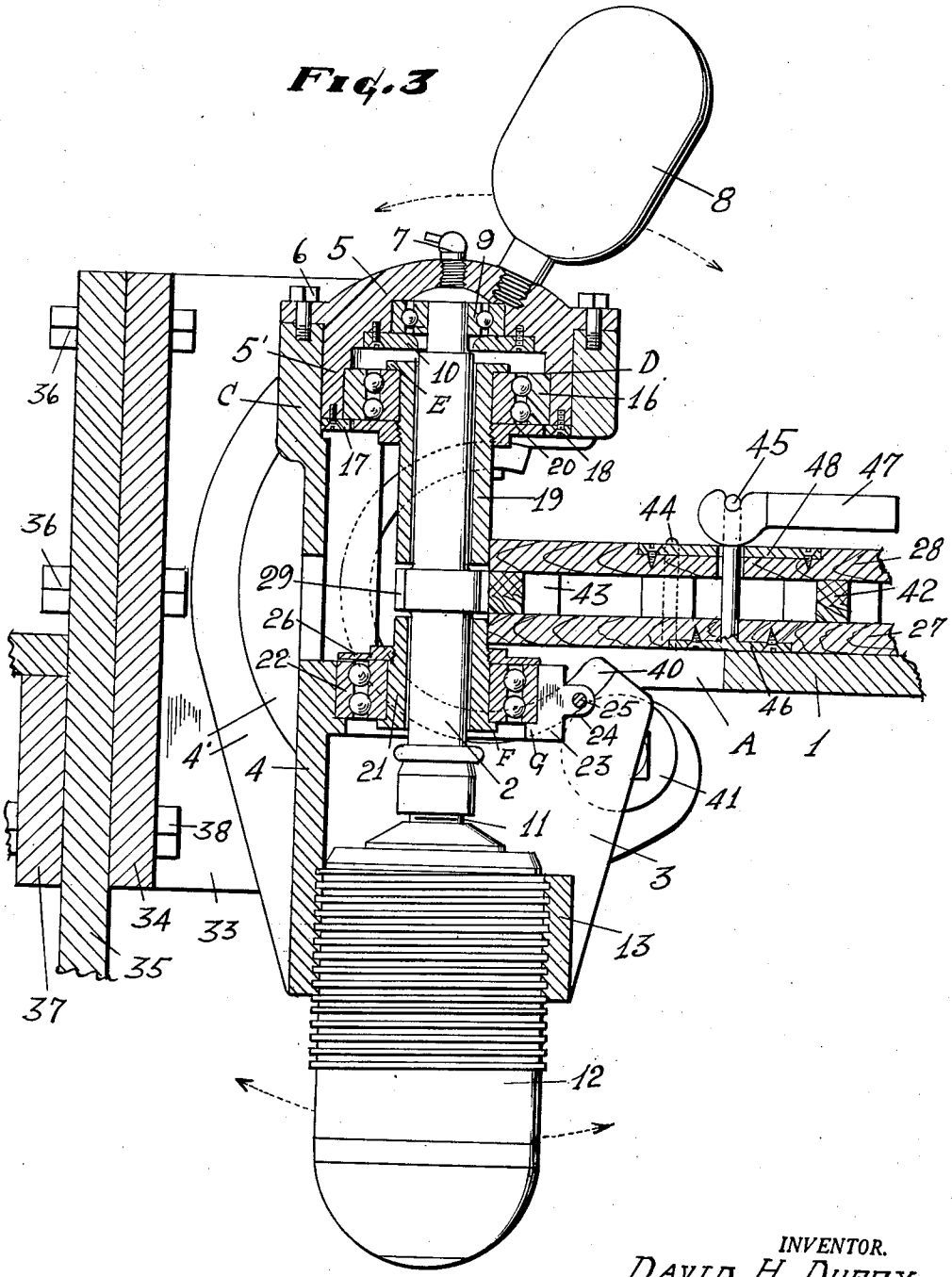
INVENTOR.
DAVID H. DUFFY.
BY U. G. Charles
atty.

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CONTOURING MACHINE

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Fig. 3



INVENTOR.
DAVID H. DUFFY.
BY U. G. Charles
atty.

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FIG. 4

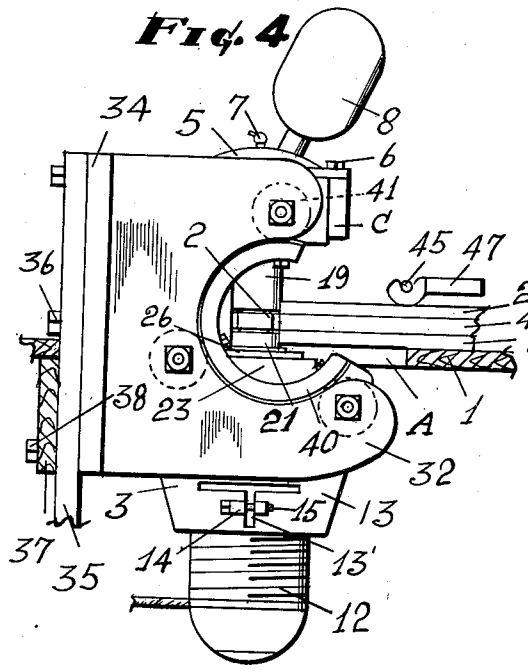


FIG. 5

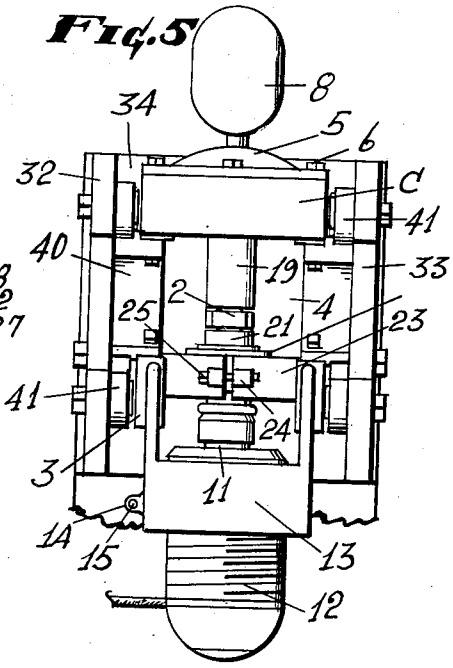


FIG. 6

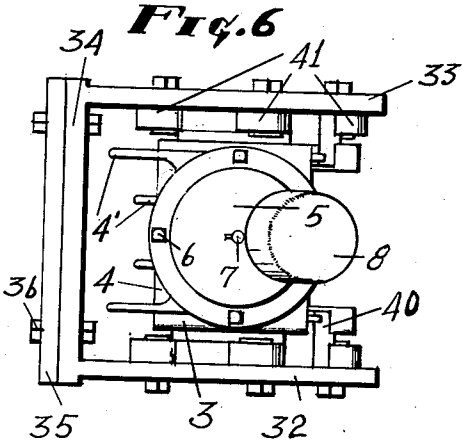
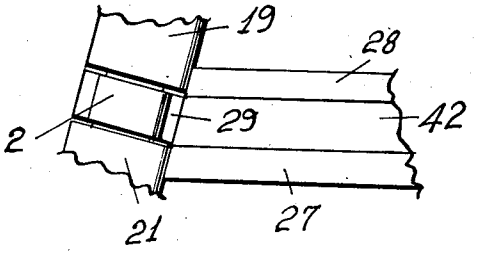


FIG. 7



INVENTOR.
DAVID H. DUFFY.
BY W. G. Charles
Atty

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Fig. 8

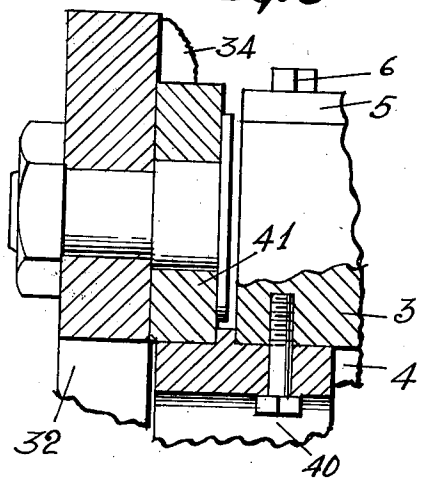


Fig. 9

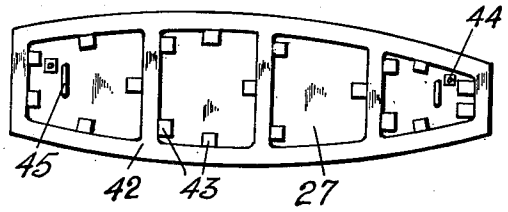


Fig. 10

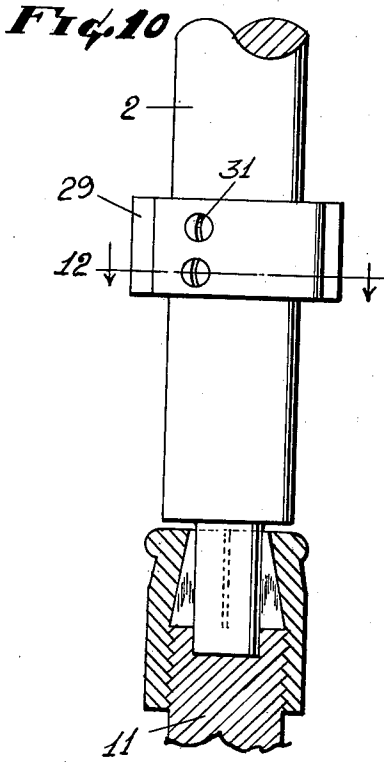


Fig. 11

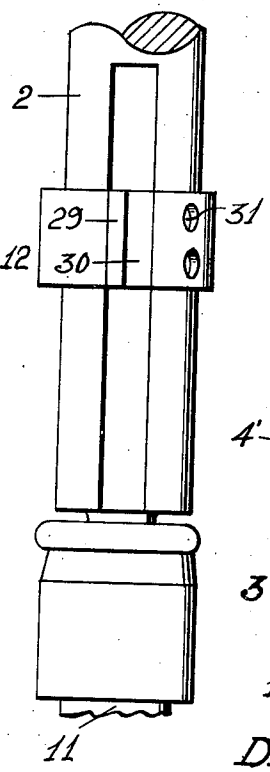


Fig. 12

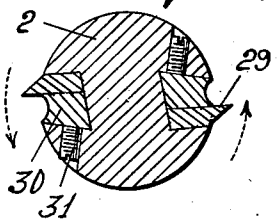
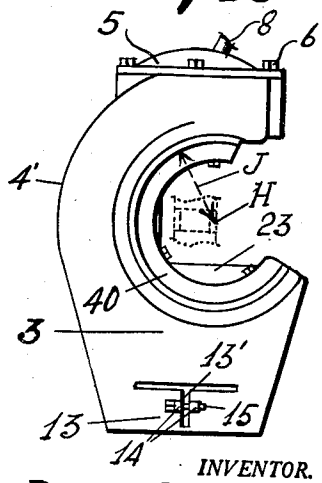


Fig. 13



INVENTOR.
DAVID H. DUFFY.
BY U. G. Charles
atty.

Patented July 6, 1943 2,323,587

UNITED STATES PATENT OFFICE

2,323,587

CONTOURING MACHINE

David H. Duffy, Wichita, Kans., assignor to Beech Aircraft Corporation, Wichita, Kans., a corporation of Delaware

Application May 18, 1942, Serial No. 443,380

4 Claims. (Cl. 144—144)

This invention relates to a contouring machine, and the principal object thereof is to construct a machine having a shaft rockable from its vertical plane in one direction reciprocatingly and having cutting blades secured to the shaft, and means to control the rocking movement of the shaft while beveling the contour of structures such as wing ribs, bulkheads, or other frame elements that are peripherally engaged to form the varying contour of wings, fuselages and their control elements.

A further object of this invention is to construct a machine for contouring that is controlled by templates to form the peripheral edges of pieces of work to a predetermined bevel at internals therealong as well as its general contour whereby duplication of pieces of work is accurately maintained in the course of manufacture.

These and other objects will hereinafter be more fully explained, reference being had to the accompanying drawings forming a part of this specification, and in which like characters will apply to like parts in the different views.

Referring to the drawings:

Fig. 1 is a side elevation of the machine, and supporting table therefor.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is an enlarged sectional view through the machine taken on line 3—3 in Fig. 2.

Fig. 4 is a side view of the machine and fragmentary portion of the table top and templates.

Fig. 5 is a front view of Fig. 4 omitting the table top and templates.

Fig. 6 is a top or plan view of Fig. 5.

Fig. 7 is an enlarged fragmentary view of the templates and work piece carried thereby to illustrate a predetermined bevel for the pieces.

Fig. 8 is an enlarged cross sectional view through the roller and frame above the mouth of the structure.

Fig. 9 is a plan view of a wing rib and stationary supporting means on one of the templates, the other template being removed.

Fig. 10 is an enlarged side view of the cutter, shaft, and its connecting means to a motor shaft, the latter being in section.

Fig. 11 is a transverse side view of Fig. 10.

Fig. 12 is a cross section taken on line 12—12 in Fig. 10.

Fig. 13 is an outside elevation of the rockable carrying frame for the shaft.

The invention herein disclosed relates to a contouring machine mounted on a table 1, the table top having an opening A through which the machine extends and being suitably secured in working relation to said top. As a convenient position for an operator there is provided an inwardly extending recess B at the side of the table opposite the machine, the top being a rest on which to slidably move the elements being contoured as worked by the machine.

Said machine consists of a shaft 2, vertically disposed and carried by a frame consisting of two oppositely disposed sides 3, the sides being connected rearwardly by a back 4, said back being reinforced by ribs 4' as shown in Figs. 2, 3, and 6, said carrying frame being closed at its upper extremity by a head 5 removably secured by cap screws 6, said head having attached thereto a Zerk oiling means 7, and a counterbalance weight 8 to offset an eccentric position of the shaft later described. The head of the frame being concavo-convex has in its concave side a ball bearing 9 secured therein through the medium of a disc 10 and on which the bearing seats, by which means the shaft is journalled at its upper extremity, said shaft extending downward to where it detachably connects to a shaft 11 of a motor 12, said motor threadedly engaging with a threaded and transversely split collar 13 at the lower terminal end of the carrying frame, there being ears 14 oppositely disposed at the split and being tensioned together by a bolt 15 to lock the motor against rotation in the collar. There is also provided a slot 13' transversely crossing the split to provide flexibility when the bolt is tightened.

It will be seen that the head 5 has a downward extension 5' engaging inward of the neck portion C of said frame, the extension having a shoulder D to seat on the end of the outside race of a ball bearing 16, while the other end is secured by an annular ring 17 secured to the lower end of said extension by screws 18, the inside race of said bearing tightly engaging around a sleeve 19 extending downward and through which the shaft 2 loosely engages. The sleeve has an annular flange E at its upper end to seat on the upper end of the said inside race as carrying means for the sleeve, the said bearing being closed at its lower extremity by an annular flange 20 extending thereacross while the inner periphery of the flange threadedly engages on the sleeve, said sleeve downward from its threaded portion being reduced to permit removal of the flange from the sleeve, and the said flange serving as an oil tight enclosure for the bearings thereabove.

There is also provided another sleeve 21 that likewise loosely engages about the shaft, the sleeve having secured thereto the inside race of

a ball bearing 22, while the outer race is secured within an annular band 23 that extends thereabout and being integrally joined to the back of the frame, the forward extension of the band being free and split transversely, there being an ear 24 on each side of the split by which means the band is clamped to the said outer race of the bearing by a bolt 25 engaging through the ears. The lower ends of the ball races are supported by flanges F and G integrally joined to the sleeve and band, respectively, the upper ends having an annular flange 26 to cover the same and threadedly engaging with the sleeve 21, said flange being a guard against flying debris from a contouring cutter carried by the shaft.

Said sleeves at their adjacent ends are adapted to serve as a bearing for the peripheral edges of templates 27 and 28 and revolved thereby to avoid excess friction when the templates are moved, said templates carrying therebetween panels, ribs, or other elements to be contoured by blade cutters 29 secured to the shaft by dovetailed wedges 30, the latter being secured against longitudinal movement by set screws 31, respectively, whereby said blade cutters are removable, said cutters being positioned to engage with a piece of work supported by the templates to contour the work.

It will be seen that the said carrying frame is supported by another frame that is rigidly supported to the table and surrounding said carrying frame with respect to its sides and back, said frame comprising side walls 32 and 33 in parallelism and being connected rearwardly by a wall 34 that is secured to a vertically disposed support 35 by bolts 36, said support extending downward through the table top and lying on the side rail 37 of the table and being secured thereto by bolts 38 as rigid supporting means for the outer frame, said vertical support being braced at its extremities by a member 39 secured thereto and to the underside of the top of the table.

The sides of the carrying frame and sides of the stationary frame each having mouth openings in registry with each other, and through which the templates move, the carrying frame having an arcuate track 40 following the contour of each mouth opening and outwardly extending oppositely from its sides, each track to be engaged by a plurality of rollers 41 that are journalled on the inside of each side wall of the stationary frame, whereby the said carrying frame may be rocked in one direction reciprocatingly, the rocking movement being actuated by the templates forced to engagement with the sleeves of the shaft heretofore described, the force actuated by an operator positioned in the recess of the table top as a manipulator for said templates that are positioned as shown in Fig. 2.

To contour and bevel the edge of a wing rib 42, the same is positioned on one side of the lower template as shown in Fig. 9, and being secured thereto against transverse and longitudinal movement by blocks 43 that are secured to said template, and adapted to engage snugly with the inner edges of the wing frame, while the other template is centered by a pair of pins 44 secured to the lower template and extending upward to engage in apertures through the upper template, whereby said templates are brought to an accurate registry with respect to a predetermined bevel that is formed on the contour of each template shown in Fig. 7 as an example. It will also be seen that a pair of T bolts 45 having corresponding ends connected to the lower template through the medium of a plate 46, the T-ends of the bolts passing through a slot arranged therefor through the upper template, the T-end to be engaged by a rockable cam 47 arranged on a plate 48 that is secured to the upper template to serve as a track on which the cam will slidably engage, whereby when the handle of the cam is rocked downward, the templates are brought to snug engagement with the wing frame, it being understood that a marginal edge portion of the wing frame extends outward from the edge of the templates to be acted upon by the shaft cutter. Forcing the edges of templates in contact with the sleeves of the shaft will rock the same from a vertical plane sufficiently for each sleeve to engage with the edge of its respective template to establish the predetermined bevel coinciding with that of the templates, it being understood that the rocking axis of the carrying frame is established at the vertical center of the blades at their cutting contact, as at H, the radius of which is indicated by a line J, in Fig. 13. Therefore, when the sleeves are in contact with each template, the vertical rocking movement is at its limit regardless the force of pressure applied; furthermore a predetermined contour of the wing frame is formed as the templates are moved in the direction of the arrows as shown in Fig. 2. It will now be seen that the wing rib or other frame structure of an aircraft each may be accurately reproduced in quantities.

Modifications may be made as lie within the scope of the claims.

Having fully described this invention what is claimed as new and desired to secure by Letters Patent is:

1. In a contouring machine, a vertically disposed shaft having cutter blades secured thereto with their cutting edges lying parallel to the shaft, power means to turn the shaft, rockable carrying means in which the shaft is journalled, a table and stationary supporting means positioned on the table as carrying means for the rockable carrying means, said shaft adapted to rock about a horizontal axis lying in a plane parallel to the plane of the table and bisecting the effective cutting edge of the blade, and a counterbalance to normally keep the shaft in vertical position, there being a pair of templates having aligned bevel edges and carrying a work element therebetween to space the templates apart so that the templates will engage the shaft above and below its rocking axis respectively whereby when the templates are forced into engagement with the shaft they will rock the same, and the cutter blades will trim the edge of the element to correspond with the contour of the templates as predetermined.

2. In a contouring machine, a table having a top and legs to carry the top, said top having an opening therethrough adjacent one side thereof and a recess inwardly extending from the side opposite the opening, a frame means stationarily secured to the top and engaging in the opening, said frame means comprising two sides and a back connecting the sides at their back edges, the front being open, said sides having arcuate mouth openings at their front edges, a plurality of rollers journalled on each side wall inward thereof in spaced relation, the turning axis of the rollers spaced from the peripheral edge of their respective mouth openings to conceal the rollers from view through the mouth openings, a rockable frame means comprised of two op-

positely disposed side walls and a back wall connecting the side walls, the front of said frame being partly open, a head to close the upper end of said frame, a motor to close the lower end of said frame and being carried thereby, each side wall of said frame having a similar mouth opening to that in the side walls of said stationary frame, an arcuate track secured to and extending outward from each side wall of the said rockable frame, said tracks adapted to engage on their respective rollers of the said stationary frame as rockable carrying means for the said rockable frame, a shaft vertically journalled in the rockable frame and being connected to the motor, said shaft having cutters secured thereto at the rocking center of the shaft and in registry with the said mouth openings, a sleeve extending each way from the cutters and through which the said shaft extends, each sleeve being journalled in the rockable frame, and adapted to rotate independently of the shaft, said sleeves being rotated by templates having predetermined beveled edges each frictionally engaging its respective sleeve as the templates are moved while being pressed against the sleeves and whereby the shaft and frame is rocked into alignment with the beveled edges of the templates, the cutter thereby shaping the edges of the element secured between the templates to a predetermined contour.

3. In a contouring machine as recited in claim 2, a weight obliquely extending from the vertical axis of the upper head of the frame and being carried thereby to counterbalance the shaft and its carrying frame as eccentrically carried by the said track and rollers substantially as shown and described.

4. In a contouring machine of the class described, comprising a table, a stationary frame mounted thereon, said frame having end and side walls and rollers journalled on the inner side of the side walls, another frame positioned within the stationary frame, said last frame having arcuate tracks to engage the rollers whereby said last frame is rockably mounted in said first frame, a vertically disposed rotatable shaft journalled in said second frame, blades secured to the shaft and extending outwardly therefrom for forming a predetermined edge on a piece of work engaged thereby at one side of the shaft, the axis on which the said second frame rocks being at said one side and centrally of the ends of the blades, a sleeve carried by the rockable frame and positioned on the shaft adjacent each end of the blades, said sleeves adapted to turn on the shaft and being rotated by templates engaging therewith, the templates having similar predetermined bevels and alignment with each other for offsetting the side of one template from that of the other whereby the larger template when brought into engagement with its respective sleeve will rock the shaft from a vertical plane to engage the other template for slanting engagement of the blades with the peripheral edge of the work as clamped between the templates.

DAVID H. DUFFY.