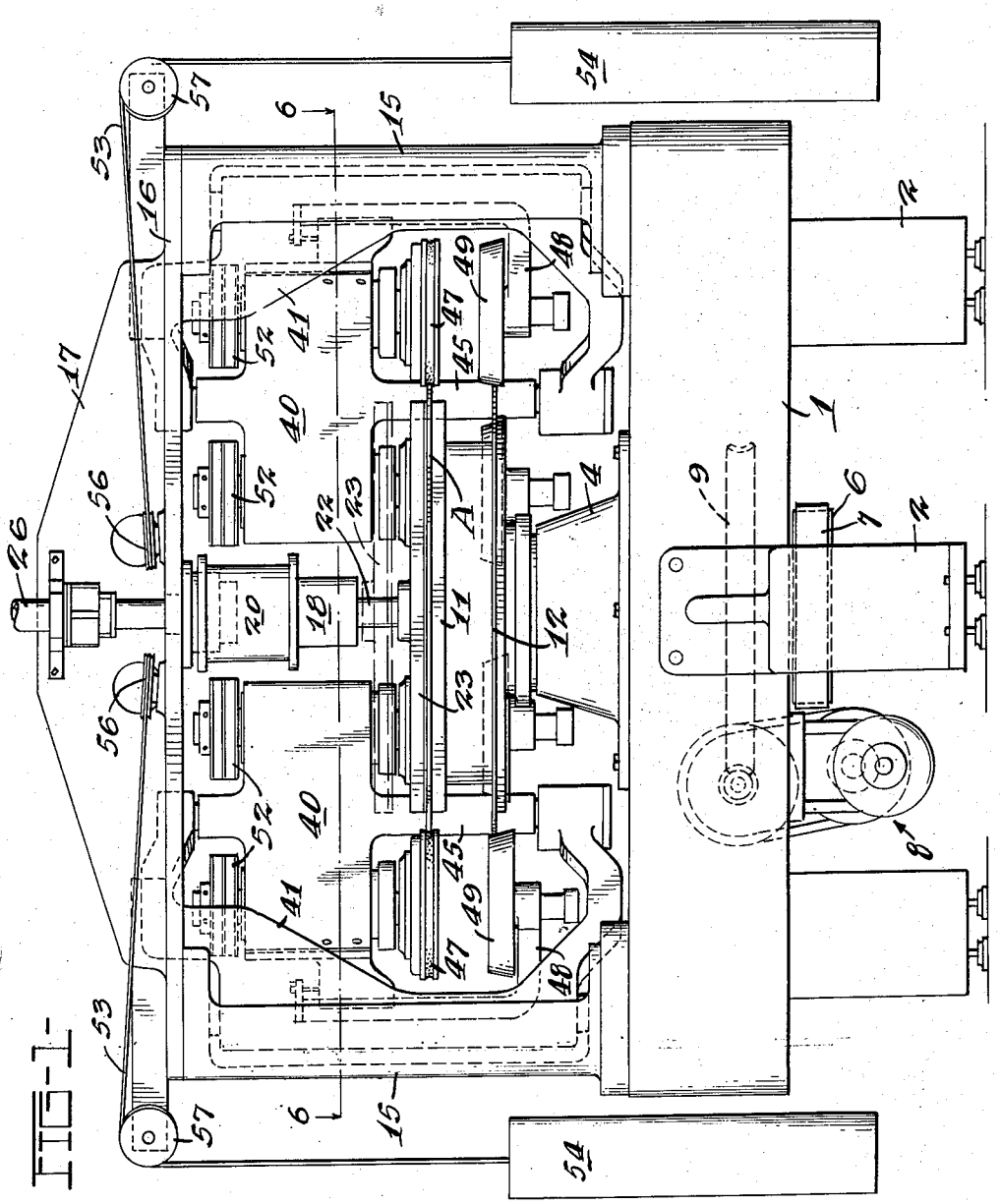
May 20, 1952 W. A. REASER ET AL 2,597,180

ROTARY EDGE GRINDING MACHINE

Filed May 6, 1950 5 Sheets-Sheet 1



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ROTARY EDGE GRINDING MACHINE

Filed May 6, 1950 5 Sheets-Sheet 2

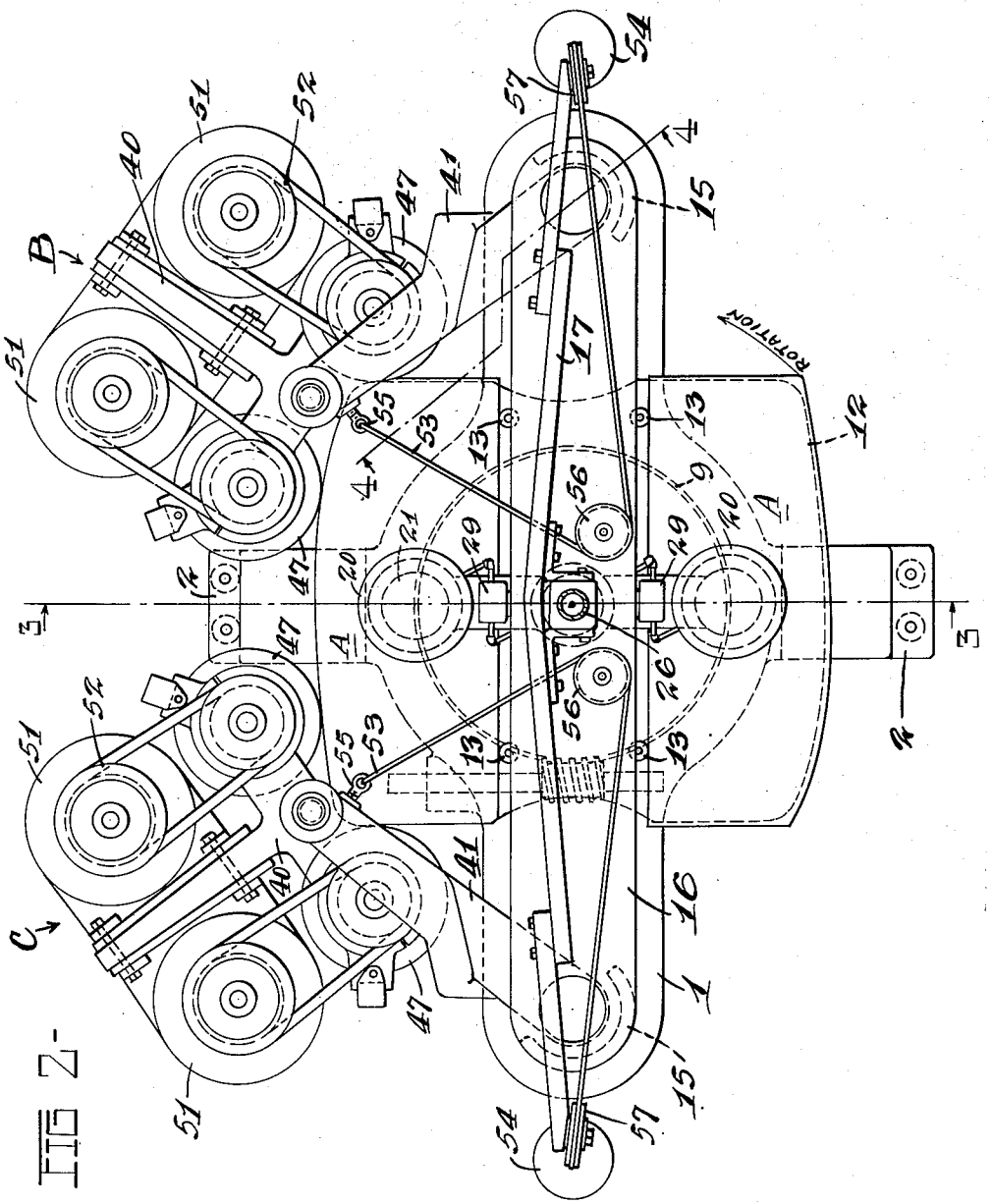


FIG 2.

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ROTARY EDGE GRINDING MACHINE

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FIG-3-

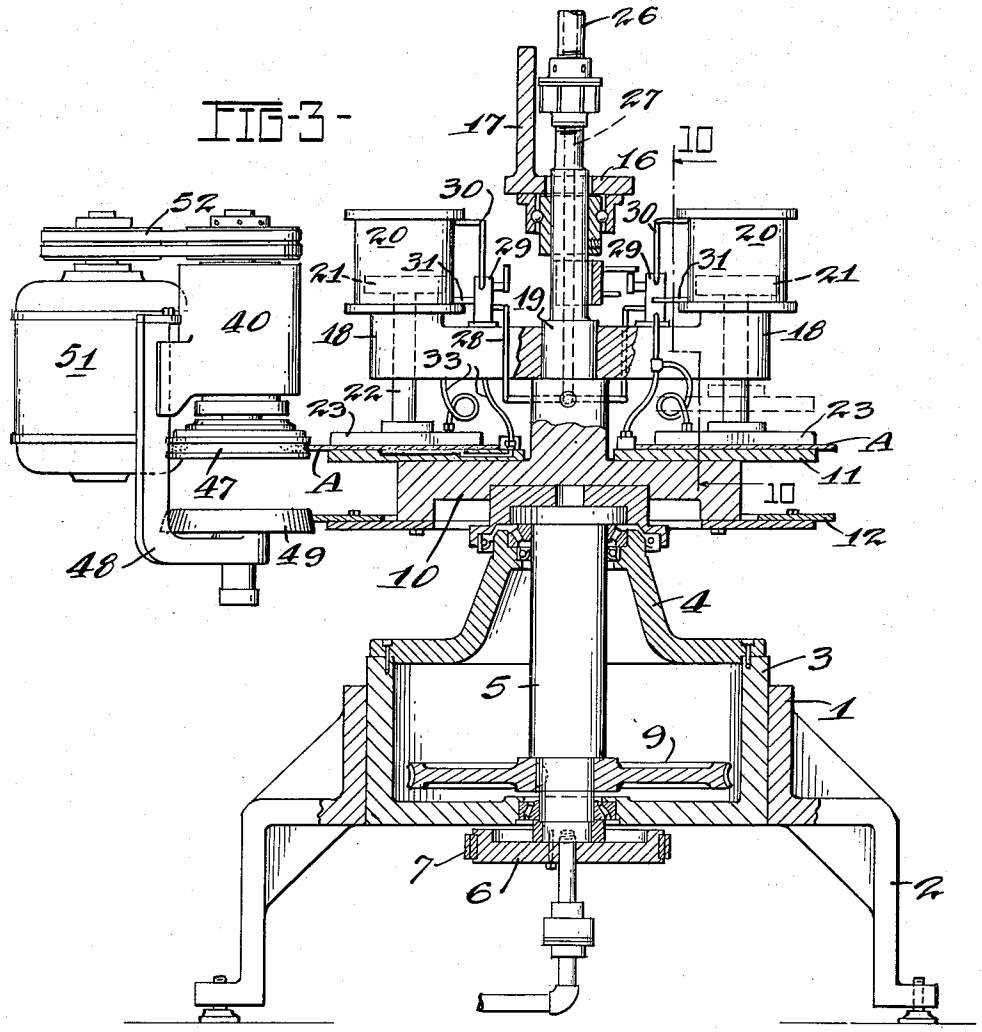
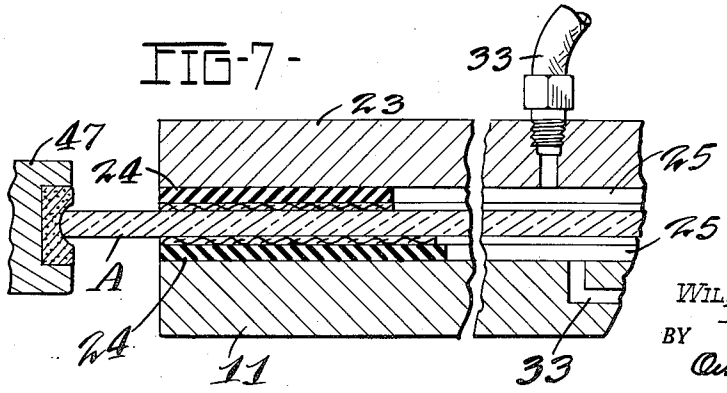


FIG-7-



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ROTARY EDGE GRINDING MACHINE

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FIG-4-

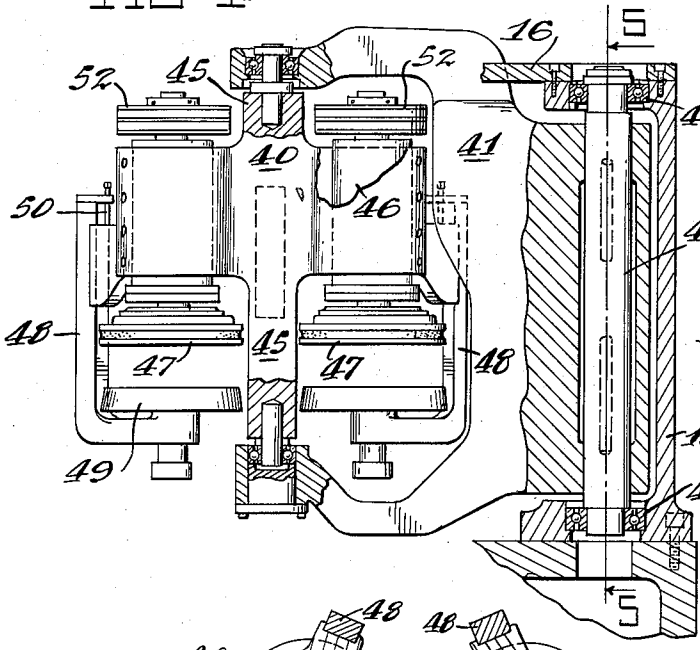


FIG-5-

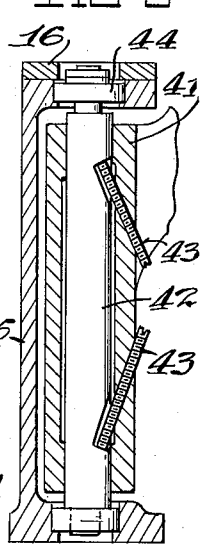
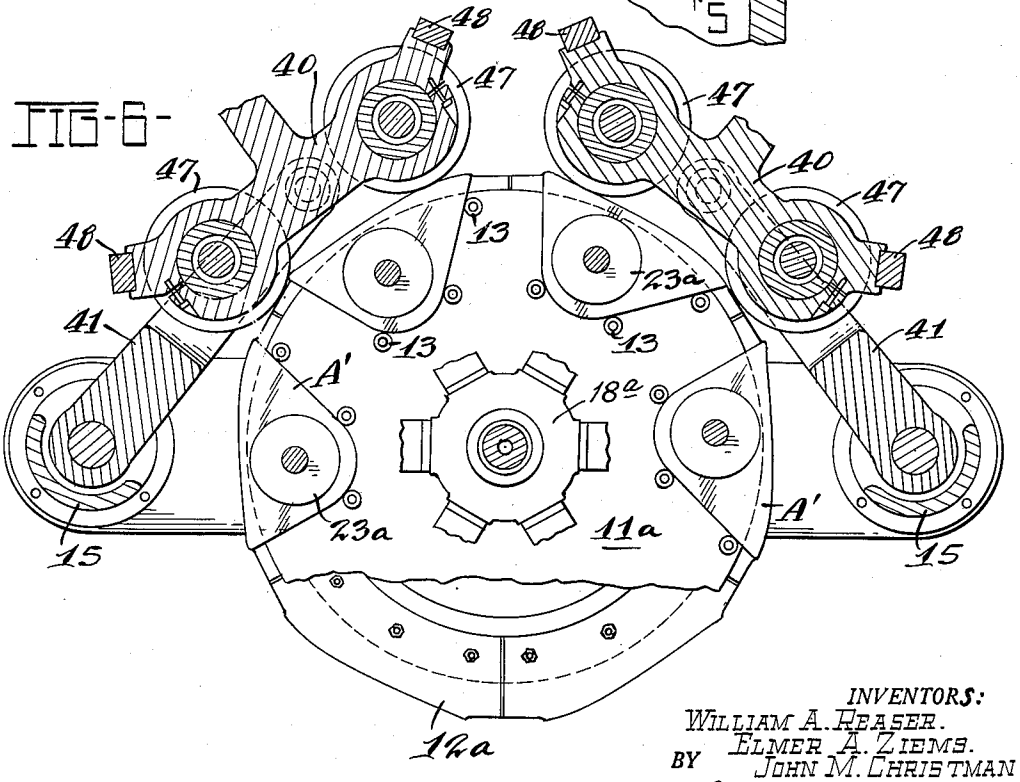


FIG-6-



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ROTARY EDGE GRINDING MACHINE

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FIG-8-

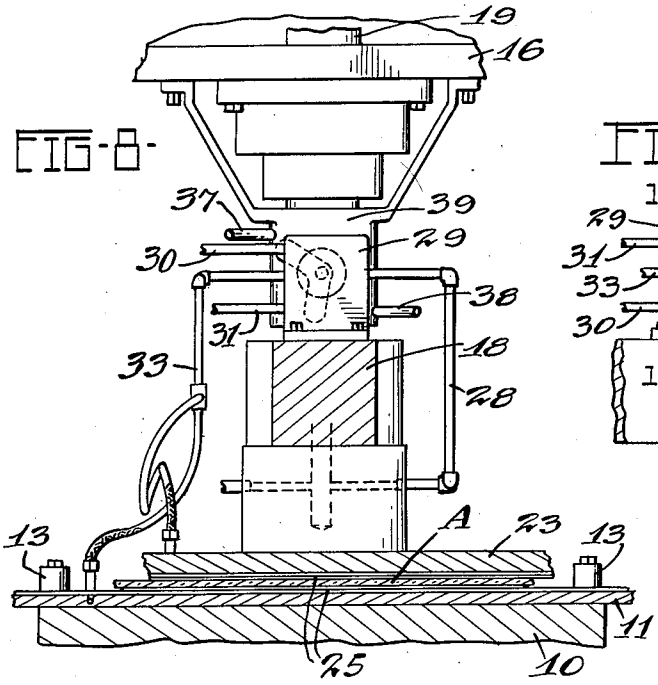


FIG-9-

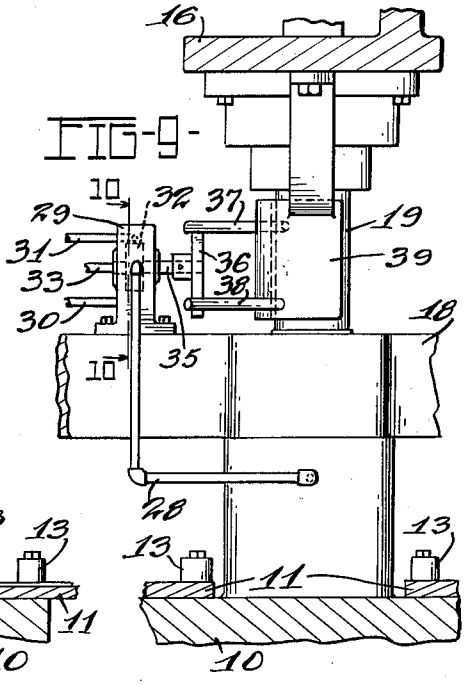


FIG-10-

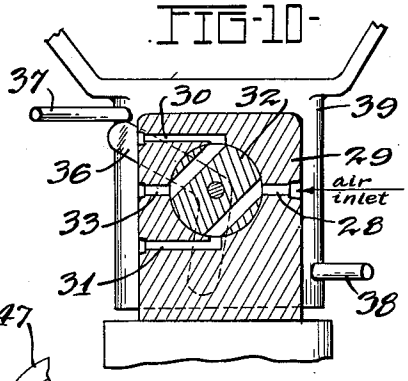
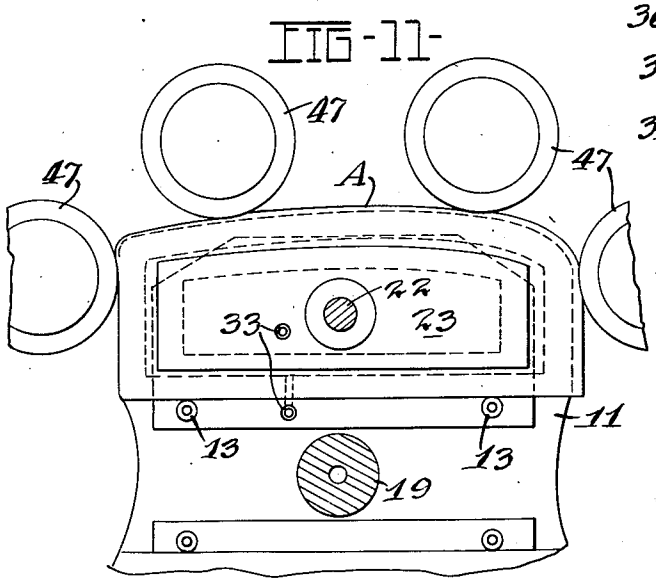


FIG-11-



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Patented May 20, 1952 2,597,180

UNITED STATES PATENT OFFICE

2,597,180

ROTARY EDGE GRINDING MACHINE

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Application May 6, 1950, Serial No. 160,488

12 Claims. (Cl. 51—101)

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This invention relates to machines for edge grinding glass plates or the like, and particularly to such a machine having a rotatable supporting table for the plates to be edge ground.

The primary object of the invention is to improve on the construction and operation of the plate edge grinding machine shown and described in our application for United States Letters Patent filed April 13, 1949, Serial No. 87,242, now Patent No. 2,579,337, dated December 18, 1951.

An object of the invention is the provision of simple and improved means for the rough and finish grinding of an edge of glass plates or the like at one side of the axis of rotation of the supporting table and removing the plate from the table at the opposite side of such axis.

Another object of the invention is the provision of improved means for carrying and controlling the movements of the abrading units.

Further objects and advantages of the invention will be apparent from the following detailed description and from the accompanying drawings, illustrating one embodiment of the invention, in which—

Fig. 1 is a front elevation of a machine embodying the invention; Fig. 2 is a top plan view thereof; Fig. 3 is a vertical section on the line 3—3 in Fig. 2, with parts in full; Fig. 4 is an enlarged section on the line 4—4 in Fig. 2, with parts broken away; Fig. 5 is a section on the line 5—5 in Fig. 4; Fig. 6 is a fragmentary top plan view of the machine, with the abrading wheel-carrying units in horizontal section on substantially the line 6—6 in Fig. 1, and with the machine equipped with different work-supporting table and template, work-pieces and holding means therefor; Fig. 7 (Sheet 3) is an enlarged fragmentary vertical section of the work-clamping means and table of Fig. 2, with an abrading wheel in edge engagement with a clamped work plate; Figs. 8 and 9 are different side elevations with parts in section of the work plate clamping means; Fig. 10 is an enlarged section on the line 10—10 in Fig. 9, and Fig. 11 is a fragmentary plan of the rotary table in Fig. 2, with a plate clamped thereto and diametrically illustrating the progressive action of the several abrading wheels on its edge.

Referring to the drawings, 1 (Figs. 1 and 3) designates the base frame of a machine embodying the invention, such base frame being elongated or of beam-form transversely of the machine and having, in the present instance, supporting legs 2. This frame is provided centrally with a hollow casing 3 and cap 4 therefor in

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which a vertical shaft 5 is journaled. A brake wheel 6 is fixed to the lower end of the shaft below the casing 3 and is engaged by a brake band 7 which may have the desired frictional engagement with the wheel to resist a free turning of the shaft. The shaft is slowly driven by suitable power means indicated at 8 in Fig. 1, and this means includes a worm wheel 9 on the shaft 5 within the casing.

Fixed to the upper end of the shaft 5 to turn therewith is a rotary table part 10 supporting a work plate carrying table 11 on its top and carrying at its lower portion a template 12. The table 11 in Fig. 2 is of a shape to support a work plate A at each of two portions thereof on opposite sides of the table axis with three edges of the plate exposed and projecting slightly beyond the respective table edges in position to be edge ground. In Fig. 6 the table, designated 11^a, is circular and supports a plurality of small work-pieces A' with an edge projecting beyond the table edge in grinding position. The template 12^a in Fig. 6 is of a form suitable for guiding the edge grinding of the work plates 11^a. In each case the table is provided with suitably positioned gauge stops 13 for the plates, and these may be shaped to suit the shape and size of the plates operated on.

A standard 15 rises from each end of the frame base 1 at the respective side of the rotary work-supporting table and these standards are cross-connected at their tops by a cross-piece 16 disposed diametric to the table axis. The cross-piece 16 is provided on its top, in the present instance, with a longitudinally extending vertical web 17 that is offset at its central portion to one side of the table axis, as shown in Fig. 2.

The means for clamping the work plates to the table during grinding is carried by a spider frame 18 that is centrally mounted above the table on a stem part 19 rising centrally from the table part 10 (Fig. 3) to turn therewith. The spider 18 in Figs. 1, 2 and 3 has two oppositely extending arms with each projecting over the respective plate supporting half of the table 11 and supporting a cylinder 20 having a vertically movable plunger 21 therein. A stem 22 extends down from each plunger through the respective spider arm and carries a clamping plate 23 at its lower end for engaging a work plate A and clamping it to the table.

In the present instance, the table 11 and clamping plate 23 have their work-clamping faces edged with rubber strips 24 which are faced with fabric, and these provide an air space 25 above

and below the clamped work, as shown in Fig. 7, for the purpose hereinafter described.

Air under pressure is supplied to each cylinder 20 above and below the piston from any suitable supply source through a conduit 26 and connecting passage 27 axially in the table stem 19, thence through lines 28 to a respective four-way valve 29 and lines 30 and 31 to the top and bottom, respectively, of the cylinders 20. Each valve 29 has a rotary plug 32 (Fig. 10) which, when in one position, opens communication between the respective supply line 28 and the cylinder line 31 and at the same time opens the cylinder line 30 to an exhaust line 33. When the valve plug is turned to the other limit of its movement, air pressure is supplied to the upper end of the cylinder and the exhaust is from the lower end through the line 33. The line 33 is divided with one branch in communication with the upper space 25 and the other branch in communication with the lower space 25 (Figs. 7 and 8). The introduction in this manner of the exhaust from the cylinders into said spaces 25 tends to relieve any suction pressure on the respective face of the work plate when the clamping plate 23 is raised to release the holding pressure on the work plate.

A valve 29 is fixedly mounted on each arm of the spider 18 at the inner side of the respective cylinder 20 and a stub shaft 35 projects axially from the valve plug 32 toward the table stem 19 and carries a cross-arm 36 for engagement first at one end and then the other with pins 37 and 38 projecting from a plate 39 that is fixedly attached to the cross-frame part 16, as best shown in Figs. 8 and 9. These pins, in the present instance, are located at the right hand side of the table axis (Fig. 3), which is the plate removal side of the table. The rotation of the table 11 is counter-clockwise and as each end or plate-carrying side of the table approaches the plate-release side of its rotation after a grinding operation, the upper pin 37 engages the upper end of the valve arm 36 and moves the valve plug 32 into position to admit air pressure to the lower end of the adjacent cylinder 20, as indicated in Fig. 10. This effects a raising of the associated clamping plate 23 to permit removal of a ground work-plate and the insertion of a plate to be ground. This movement of the valve plug also places the upper end of the cylinder in connection with the exhaust line 33. Before the table has turned sufficiently for the newly positioned plate A to reach the grinding zone, the lower end of the arm 36 will have engaged the pin 38 and have been moved thereby to admit air pressure to the upper end of the cylinder and to exhaust the pressure from the lower end. This action effects a lowering of the associated clamping plate 23 to clamp and firmly hold the work plate to the table during its passage through the grinding zone. In Fig. 2, the plate replacement zone is indicated at the lower side and the grinding zone at the upper side of the figure.

The edge grinding means, in the present instance, comprises two grinding units B, C, spaced circumferentially of the table 11 and both located within the grinding zone of the table movement. Each unit comprises a frame or head 40 carried for horizontal rocking movements by a respective U-shaped rocker yoke 41 that is journaled at its inner end in the upright 15 at the respective end of the frame beam 1 for horizontal rocking. In the present instance, the inner loop end of the arm 41 is provided with a shaft 42 that is fixed in a respective opening in the arm by screws 43 (Fig. 5) and has its ends forming trunnions that are journaled in bearings 44 in top and bottom portions of the standard 15. The unit frame 40 is provided at its inner or work side with upper and lower central extensions 45 having axially aligned trunnions journaled in bearings in the free ends of the vertically spaced arms of the rocker yoke 41 to have free horizontal rocking movements relative thereto. Mounted in the frame 40 at each of opposite sides of its rocking axis is a vertical shaft 46 carrying at its lower end a grinding wheel 47 in position to have circumferential grinding engagement with the exposed edge of a work plate A clamped to the table 11. An L-arm 48 depends from the frame 40 at the outer side of each wheel 47 and carries a template wheel 49 below and in axial register with the associated grinding wheel 47 and in position to engage and roll around the periphery of the template 12. The rocking of the frame 40 in its carrying yoke permits the grinding and template wheels of a unit to follow an irregular or out-of-round edge of a work plate and associated template, and this action is further facilitated by the permissible rocking of the unit carrying arm 41. The arms 48 are slidably connected to the frame 40 to permit axial adjustment of the associated template wheel to compensate for wear of the wheel, and such adjustment is effected by the turning of an adjusting screw 50 connecting the frame and arm.

The grinding wheels 47 in the unit B, which are the first to have grinding engagement with the edge of a work plate, are for rough grinding, the second plate-engaging wheel preferably having a somewhat finer grind than the other. Likewise, the wheels of unit C are for finish grinding with the last one to engage a work plate effecting a finer finish than the other. It is thus apparent that a plate is first progressively rough ground by unit B and then progressively finish ground by unit C. Each grinding wheel of a unit is individually driven by an associated motor 51 on the frame 40 therewith through a respective belt and pulley connection 52.

The grinding wheels of each unit are held in yielding grinding engagement with a work plate edge by exerting a yielding inwardly moving pressure on each unit carrying yoke 41, in the present instance, by a cable 53 and attached weight 54. Such a cable is attached to the free end of each yoke 41 at its inner side, as at 55, then extends inwardly around a respective sheave 56 on the frame cross-piece 16 near the table axis and then outwardly lengthwise of said frame piece around a sheave 57 at the end thereof and down to the weight 54. It is apparent by reference particularly to Fig. 2 that the edge grinding zone is at one side of the frame structure 1, 15, 16, and that the work plate loading and removal zone is at the other side thereof.

In the form shown in Fig. 6, the spider frame 18a has six arms so that each arm can carry a cylinder (not shown) like 20 for each work-holding clamp 23a. In an operation of the machine, the table 11 and template 12 are caused to slowly rotate by starting the power means 8. A work plate A is then placed on the exposed portion of the table at the opposite side of the frame structure 1, 15, 16, to the grinding means and beneath the associated clamping plate 23, which is then in raised position. When the table is advanced a predetermined extent from this position and before engagement of the positioned plate by

the grinding wheels, the associated valve arm 36 will have engaged the pin 38 and moved the valve plug 32 into position to admit air pressure to the upper end of the associated cylinder and thus cause a lowering of the clamping plate 23 to engage and hold the work plate to the table. The exposed edge of the plate is then progressively and successively moved into grinding engagement with the several grinding wheels of the units B and C to effect first a rough grinding and then a finished grinding of the plate edge. When the work plate has completely passed from the grinding zone to the replacement zone, the arm 35 of the associated control valve 29 engages the pin 37 and moves the valve plug 32 to admit air pressure to the lower end of the associated cylinder 20 and effect a raising of the clamping plate to release the ground work plate A preparatory to being replaced by another work plate to be ground. At the same time, the exhaust from the upper end of the cylinder is directed to the spaces 25 above and below the work plate to relieve any suction thereon. The same action is present in the operation of the form shown in Fig. 6, except that the work plates being smaller and of greater number successively move with greater frequency into grinding and replacement positions so that the work clamps are accordingly more frequently operated. During rotation of the table the template wheels 49 bear against the periphery of the template 12 and thus cause the respective grinding wheels 47 to have movements in accordance with the guided movements of the template wheels to rough and finish grind the work plate edges to predetermined shape.

It is apparent that the template guided movements of each grinding wheel are of a compound nature in that they comprise both the pivotal movements of the carrying yokes 41 and the pivotal movements in such yoke of the respective wheel-carrying frames 40 about parallel axes. The grinding wheels 47 and template wheels 49 are normally held in yielding engagement with the work and template, respectively, by the weights 54 through the guided cables 53.

We wish it understood that our invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described our invention, what we claim as new, and desire to secure by United States Letters Patent, is:

1. In a plate edge grinding machine having a means for clamping and rotating a work plate with a portion at least of its edge exposed for grinding, the combination of a member pivotally mounted for swinging movements toward and away from the edge of a plate held by said means and about an axis substantially parallel to the axis of rotation of said clamping means, a frame pivotally carried by said member with its pivot axis parallel to that of the member, a plurality of edge grinding wheels carried by said frame for rotation about different parallel axes and in the plane of rotation of a plate carried by said clamping means, means carried by the frame for driving said wheels, means acting on said member and frame to yieldingly hold the wheels in edge grinding engagement with the edge of a work plate during rotation with said clamping means, and cooperating template means on said first means and frame for guiding the grinding wheels.

2. In a plate edge grinding machine having a means for clamping and rotating a work plate, with a portion at least of its edge exposed for grinding, the combination of a member pivotally mounted for swinging movements toward and away from the plate edge about an axis substantially parallel to the axis of rotation of the plate, a frame pivotally carried by said member with its pivotal axis parallel to that of the member, a grinding wheel carried by said frame at each of opposite sides of its pivotal axis in the member, means carried by the frame for driving said wheels, means acting on said member and frame to yieldingly hold the wheels in edge grinding engagement with a work plate edge during rotation, and cooperating template means on said first means and frame for guiding the grinding wheels.

3. A combination as called for in claim 2, together with independent driving means on the frame for each grinding wheel.

4. In a plate edge grinding machine having a means for clamping and rotating a work plate with a portion at least of its edge exposed for grinding, the combination of a yoke pivotally mounted for swinging movements outwardly and inwardly from the edge of a plate carried by said means, a frame pivotally carried by said yoke with its pivotal axis parallel to that of the yoke, an edge grinding wheel carried by the frame at each side of its pivotal axis in the yoke, separate means carried by the frame for driving said wheels, means acting on the yoke and frame to yieldingly hold the wheels in edge grinding engagement with a work plate edge during rotation, and cooperating template means on said first means and frame for guiding the grinding wheels.

5. In a plate edge grinding machine having a means for clamping and rotating a work plate with a portion at least of its edge exposed for grinding, the combination of a yoke pivotally mounted for swinging movements toward and away from the plate edge, a frame pivotally carried by said yoke with its pivot axis parallel to that of the yoke, a plurality of edge grinding wheels carried by said frame with their axes at opposite sides of said frame axis, means carried by the frame for driving said wheels, means acting on the yoke and frame to yieldingly hold the wheels in edge grinding engagement with a work plate edge during rotation of said first means, a template on said first means, and a separate template wheel carried by the frame for each grinding wheel and riding against said template to gauge the plate grinding action of the respective grinding wheel.

6. In a machine of the class described having a rotatable work plate supporting table, means for clamping a plate to the table, and a guide template turnable with the table and coaxial therewith, the combination of a yoke mounted for swinging movements at an edge of and in the plane of rotation of the table, a frame carried by said yoke for free swinging movements relative thereto in a plane substantially parallel to the swinging movements of the yoke, a grinding wheel rotatably carried by said frame at each of opposite sides of the frame axis and in the plane of a held plate, means for driving each wheel and mounted on the frame therewith, a template wheel carried by the frame for each grinding wheel, and means acting on said frame and yoke to yieldingly hold the grinding and template wheels in edge engagement with a work plate to be ground and with said template, respectively, as the table rotates.

7. In a machine of the class described having a rotatable work plate supporting table, means

for clamping a plate to the table coaxial therewith, and a guide template turnable with the table, the combination of a U-shaped yoke having its arms vertically spaced and having its loop end pivotally mounted for horizontal swinging movements, a frame pivotally mounted between the yoke arms for horizontal swinging movements at an edge of the table, at least two grinding wheels carried by frame for horizontal rotation about different axes and in position to both engage and travel on the edge of a clamped work plate when the table is rotated, one at least of said wheels having an edge grinding action on the plate, driving means for each grinding wheel carried by the frame, a template engaging wheel carried by the frame in coaxial relation to each grinding wheel, and means acting on said frame and yoke to yieldingly hold the grinding and template wheels in edge engagement with the work plate and template, respectively, as the table is rotated.

8. In a machine of the class described having a rotatable work plate supporting table, means for clamping a plate to the table, and a guide template turnable with the table and coaxial therewith, the combination of means operable to hold a work plate to the table during a grinding zone of movement and releasing it in a work replacement zone of movement of the table, a frame, a swinging member carrying said frame for swinging movements relative thereto and toward and away from the table axis at the grinding zone of movement of the table, a pair of grinding wheels carried by the frame one at each side of the swinging axis of the frame, separate means carried by the frame for driving each wheel, separate means on the frame coaxial with each grinding wheel for coacting with said template to guide the swinging movements of the respective wheels, and means acting on the wheel-carrying frame to impart yielding inward movements to the wheels relative to the table.

9. In a machine of the class described having a rotatable table for holding a work plate with a portion of its edge projecting beyond the table edge, and a guide template turnable with the table coaxial therewith, the combination of a cross-frame over the table, a member attached to each end of said frame for horizontal swinging movements, a frame unit mounted in the free end of each of said members for horizontal swinging movements relative thereto and therewith inward and outward at an edge of the table, at least two grinding wheels carried by each frame unit, one at each side of the frame unit pivot, and with their axes parallel to said pivot, means for yieldingly swinging said member inward to hold said wheels in edge grinding engagement with a plate on the table, the several wheels of the two frame units having tandem engagement with the work edge to progressively grind it as the table rotates, driving means for each wheel carried by its frame unit, and means associated with each wheel for coaction with said template to guide the wheel movement in engagement with the plate.

10. A combination as called for in claim 9

wherein said swinging members project from the same side of said cross-frame so that the grinding wheels have coaction with a work plate on the table at one side only of the cross-frame.

11. In a plate edge grinding machine having a means for clamping and rotating a work plate with a portion at least of its edge exposed for grinding, the combination of a yoke pivotally mounted for swinging movements toward and away from the edge of a plate clamped by said means, a frame pivotally carried by said yoke with its pivotal axis parallel to that of the yoke, a plate edge grinding wheel carried by the frame at each side of the pivotal axis of the frame, separate means carried by the frame for driving said wheels, means acting on the yoke and frame to yieldingly hold the wheels in edge grinding engagement with a work plate edge during rotation of said first means, and template means for guiding the grinding action of the wheels, said template means comprising a template plate on and turnable with said work-clamping means, a bracket carried by said frame in association with each grinding wheel thereof and mounted on the frame for adjustment in parallel axial relation to the associated grinding wheel, and a template wheel mounted on each bracket in spaced axial relation to the associated grinding wheel and having edge coaction with said template plate.

12. In a machine of the class described, a work plate supporting table, means for mounting and rotating said table, means rotatable with the table and pneumatically operable to clamp work to the table during one zone of movement thereof and to release it during another zone of movement said clamping means having provision for the exhaust of air therefrom, means for directing the air exhaust from said clamping means to a point between the table and a work-piece which may be clamped thereto to relieve any plate-holding suction when the clamping means is released from holding engagement with the work, and means for edge grinding work during the zone of movement while it is clamped to the table.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
236,824	Morris	Jan. 18, 1881
384,995	Moore	June 26, 1888
531,368	Fifield	Dec. 25, 1894
1,049,412	Sheehan	Jan. 7, 1913
1,444,225	Walker	Feb. 6, 1923
1,597,748	Whitney	Aug. 31, 1926
1,617,562	Bailey	Feb. 15, 1927
1,685,613	Onsrud	Sept. 25, 1928
1,921,715	Whitney et al.	Aug. 8, 1933
2,010,922	Leonard	Aug. 13, 1935
2,015,495	Philippi	Sept. 24, 1935
2,209,538	Rabe	July 30, 1940