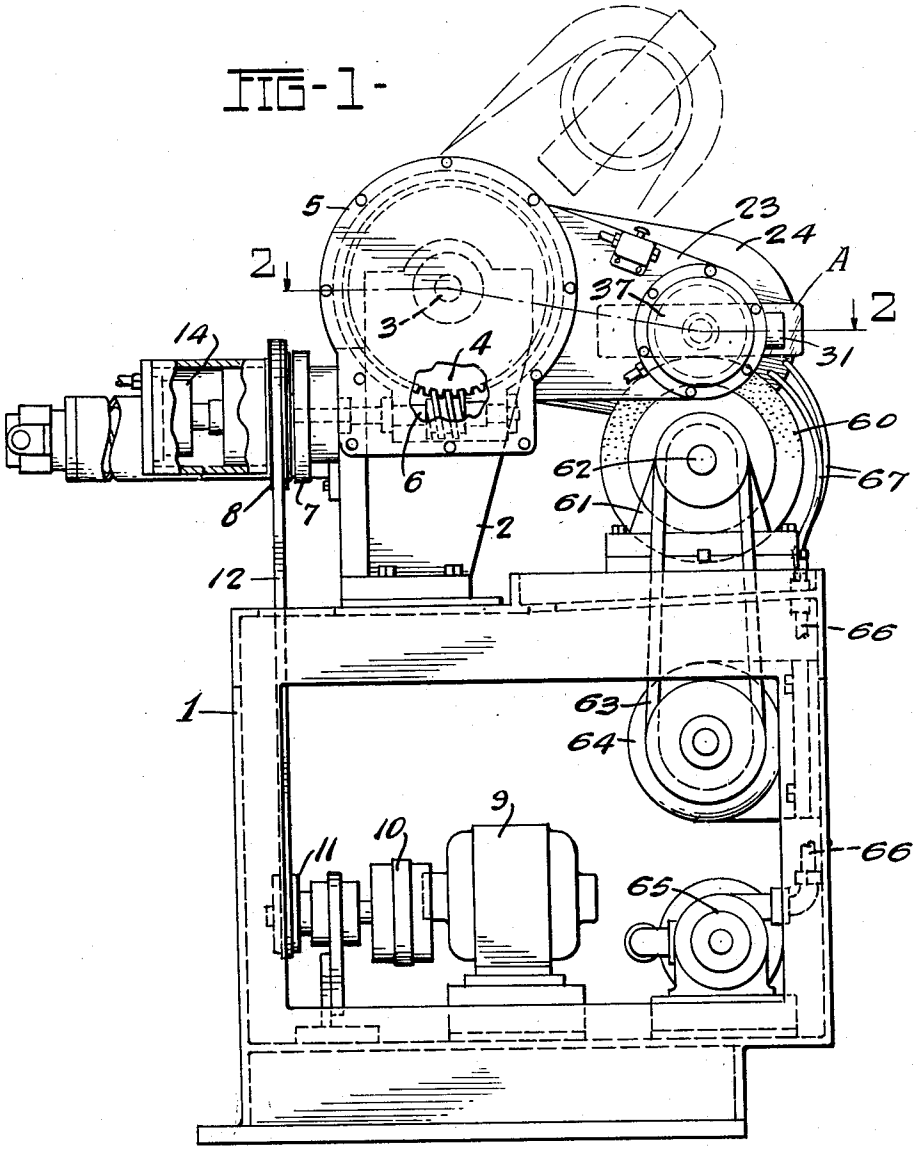
March 2, 1954 W. E. REASER 2,670,575

EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

Filed Sept. 27, 1952 5 Sheets-Sheet 1

FIG-1-



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EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

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FIG-2-

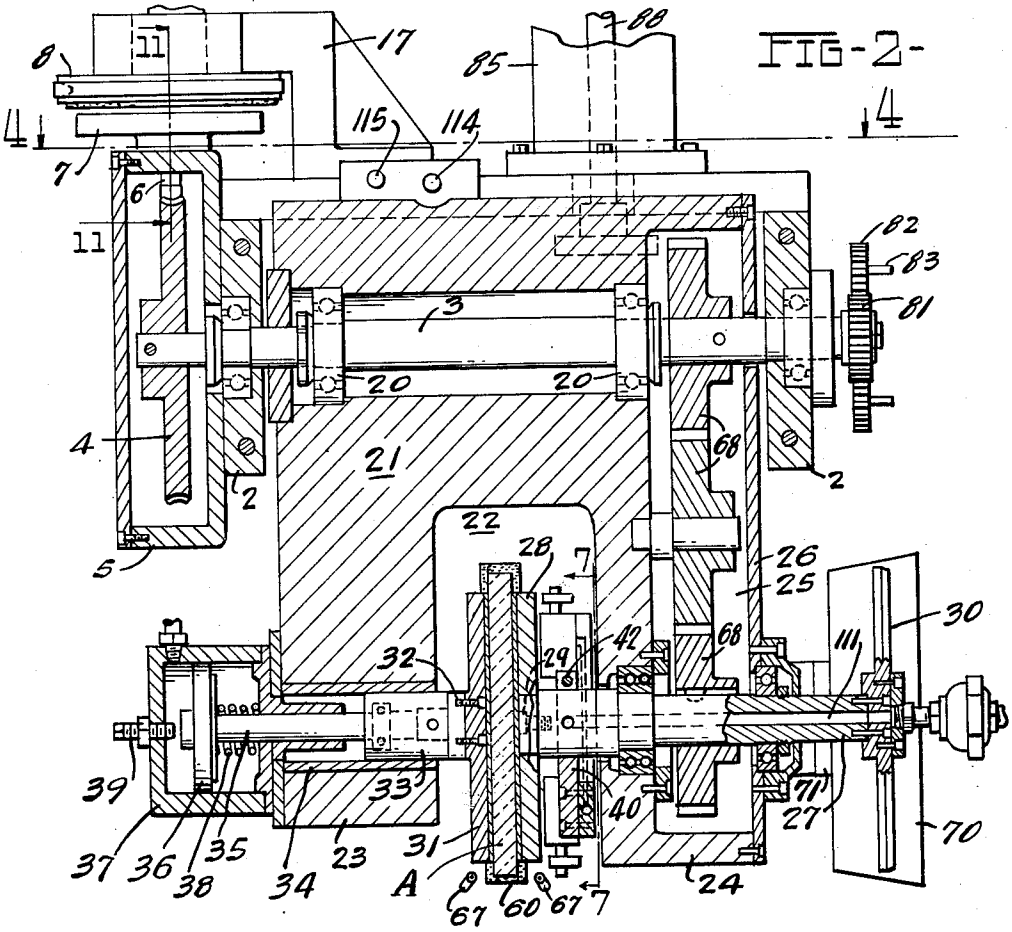
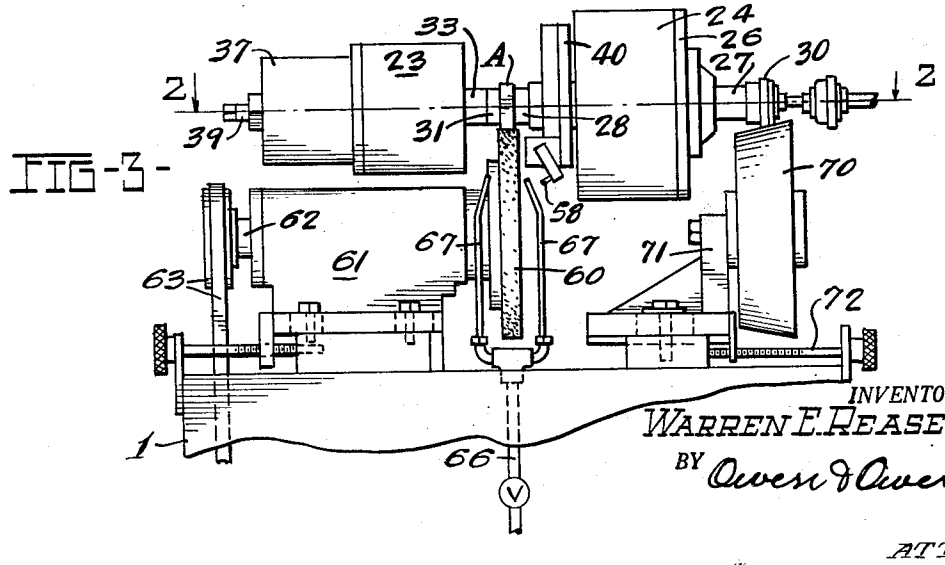


FIG-3-



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EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

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FIG-4-

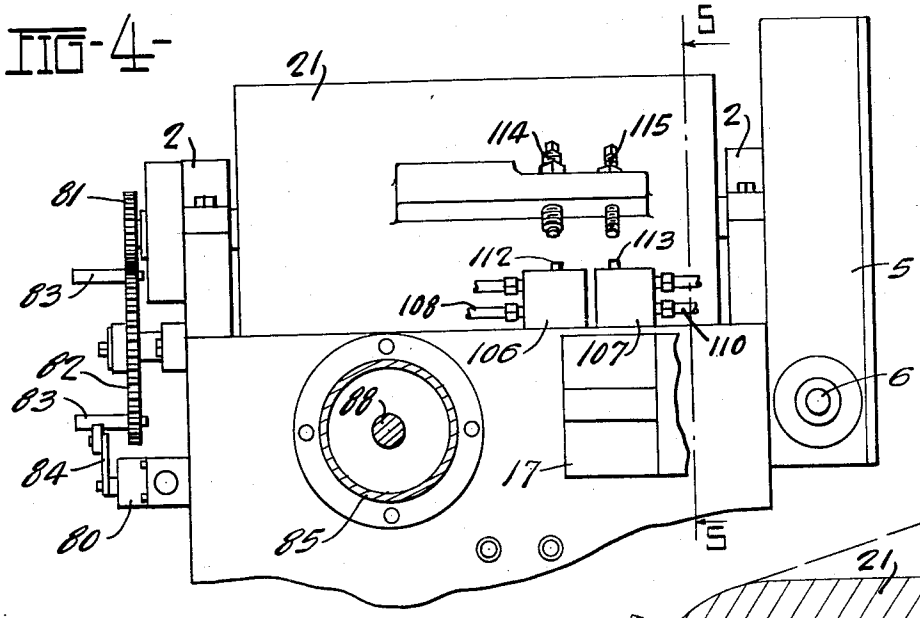


FIG-5-

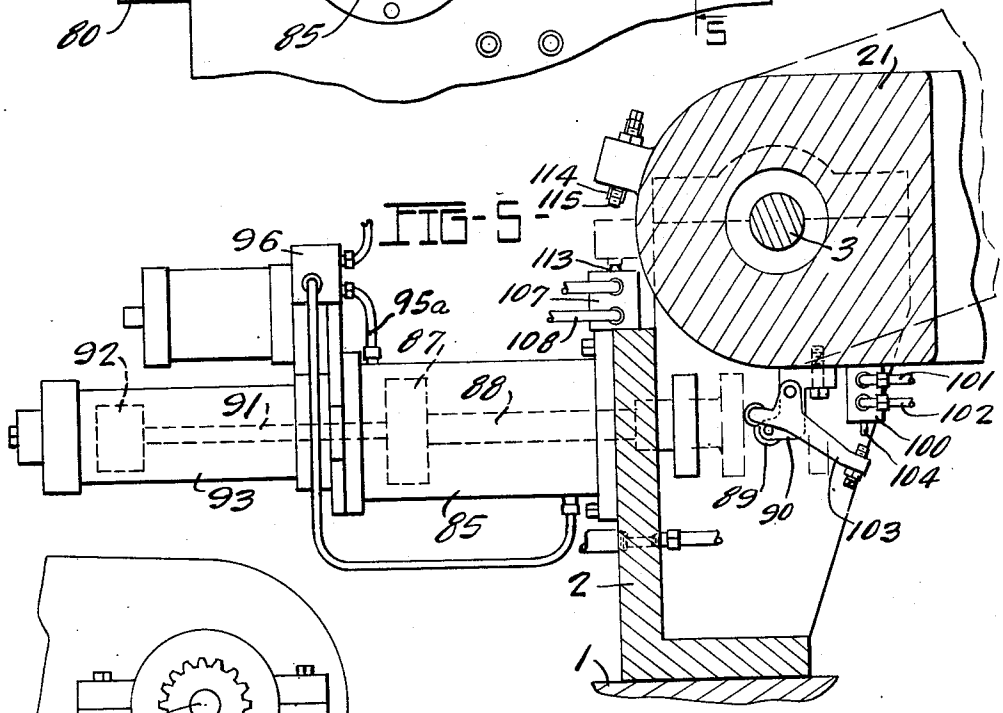
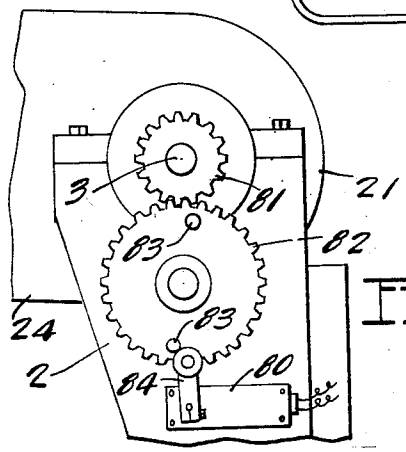


FIG-6-



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EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

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FIG-7-

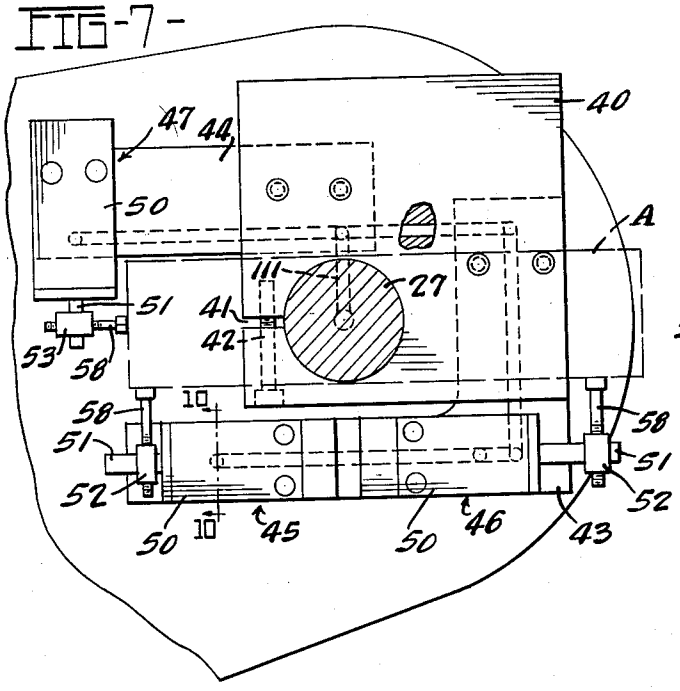


FIG-8-

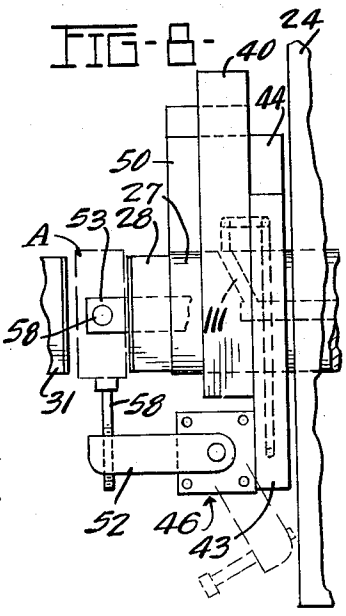


FIG-9-

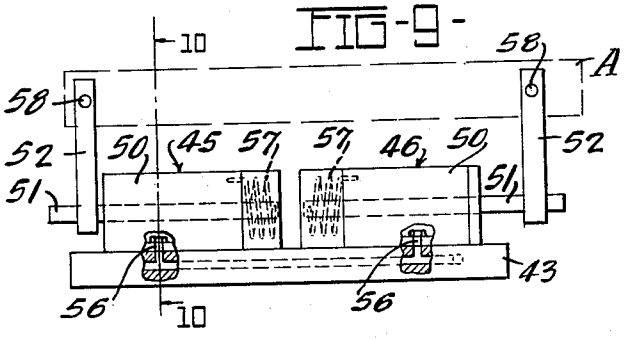


FIG-11-

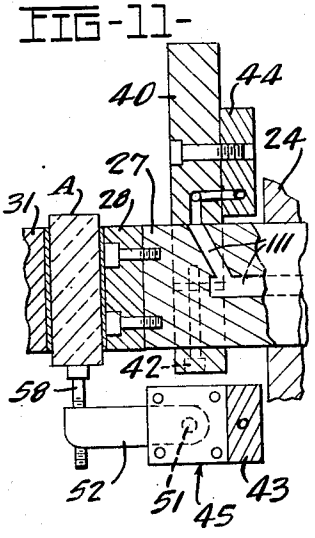
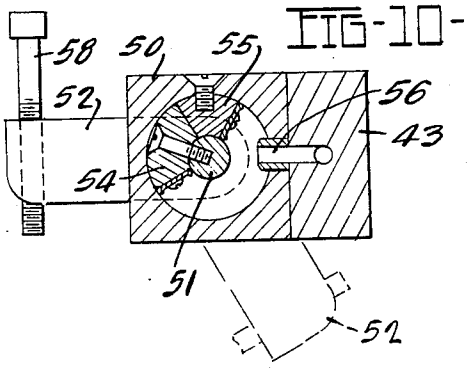


FIG-10-



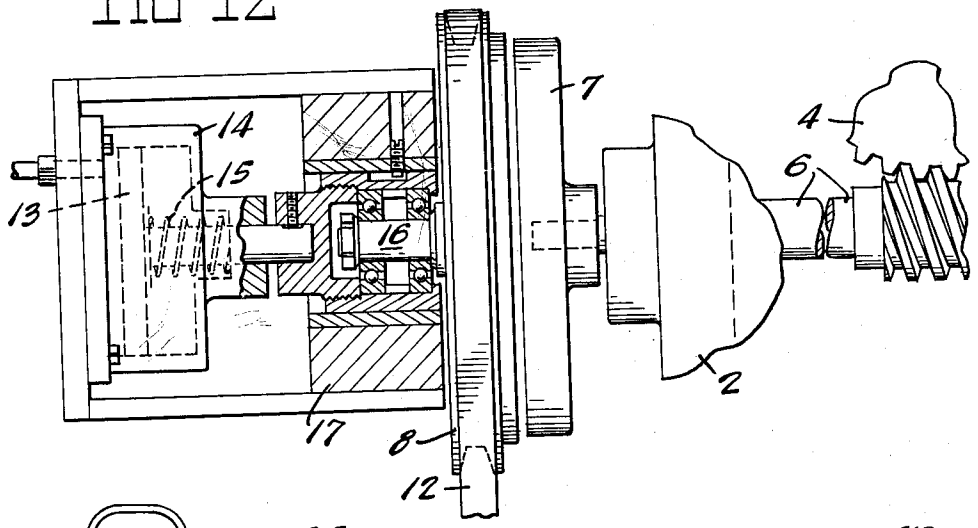
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EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

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FIG-12-



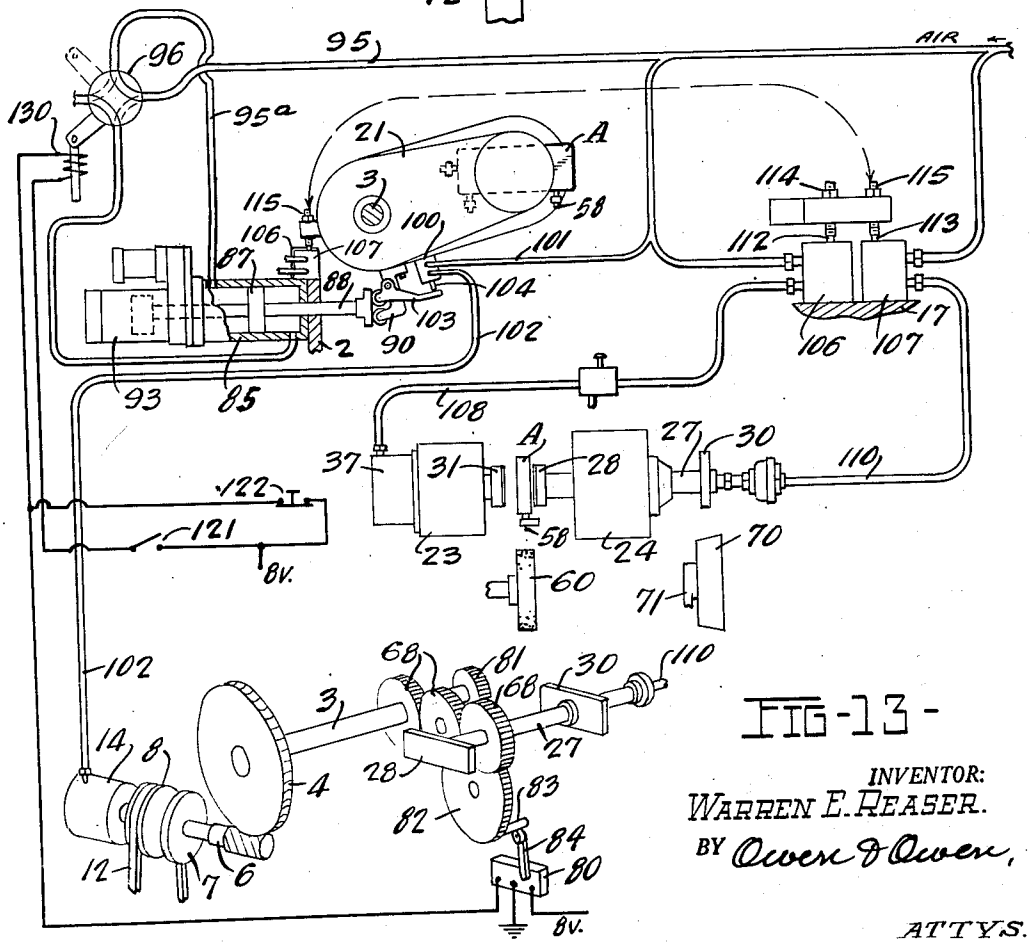


FIG-13-

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UNITED STATES PATENT OFFICE

2,670,575

EDGE GRINDING MACHINE FOR VARIOUS SHAPED GLASS PLATES

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Application September 27, 1952, Serial No. 311,820

16 Claims. (Cl. 51—101)

1

This invention relates to plate edge grinding machines, and particularly to a machine for grinding the edges of glass plates that are other than round.

The object of the invention is the provision of a simple and novel machine of this character that is operable and adaptable to grind the irregular curved or angular edges of glass plates and is template controlled to edge grind plates of any particular shape.

Other objects and advantages of the invention will be apparent from the following detailed description and from the accompanying drawings, in which—

Fig. 1 is a side elevation of a machine embodying the invention, with parts broken away;

Fig. 2 is an enlarged section on the line 2—2 in Fig. 1;

Fig. 3 is a front end view of the machine with the work-plate carrying yoke in lowered grinding position and with parts broken away;

Fig. 4 is a fragmentary rear elevation of the machine, with parts in section, on the line 4—4 in Fig. 2;

Fig. 5 is an enlarged fragmentary section on the line 5—5 in Fig. 4;

Fig. 6 is a fragmentary side elevation of the rear end portion of the machine looking toward the right hand end showing the cycle timing means;

Fig. 7 is an enlarged section on the line 7—7 in Fig. 2, with the gauge arms in work-plate supporting position;

Fig. 8 is a front elevation of the work gauging means shown in Fig. 7;

Fig. 9 is an enlarged bottom view of the work-plate gauging means;

Fig. 10 is an enlarged section on the line 10—10 in Fig. 9;

Fig. 11 is a central longitudinal section through the parts shown in Fig. 8;

Fig. 12 is an enlarged detail, partly in section, of the clutch control means for the main drive shaft, and

Fig. 13 is a diagram of the various operating parts and controls, with two arbor control valves shown in duplicate for clarity.

Referring to the drawings, 1 designates the base frame of the machine that is preferably hollow to permit the locating of different operating parts therein. On the top of this frame, at opposite sides of its rear end portion, are standards 2, 2, in which are journaled the respective end portions of a main drive shaft 3. On one end of this shaft, the left in Fig. 2, is fixed a worm

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wheel 4 that is mounted within a casing or housing 5 attached to the adjacent standard 2 and this wheel is in mesh with a drive worm the shaft 6 of which is suitably mounted in the case (Fig. 1).

A clutch plate 7 on the outer end of the worm shaft has controlled frictional clutch engagement with the companion clutch side of a drive pulley 8. This pulley is normally free with respect to the clutch plate 7 and is driven, in the present instance, from an electric motor 9 through a suitable reduction gearing in the case 10 and through a pulley 11 and belt 12 (Fig. 1). The pulley 8 is mounted for slight axial movement and is moved into clutch engagement with the plate 7 by fluid pressure on an attached plunger 13 operating in a cylinder 14 (Fig. 12). The admission of fluid pressure to the outer end of the cylinder 14 forces the pulley into engagement with the plate 7 while a spring 15 acts to relieve the pressure of the pulley against the plate. The spindle 16 for the clutch pulley 8 is suitably journaled for rotary and limited axial movements in a bracket arm 17 attached to the base frame. This bracket also serves as a mounting means for the cylinder 14.

Mounted on the shaft 3, intermediate the bearing standards 2, 2, for free vertical rocking movements on bearings 20, is a yoke 21 in which the work-carrying parts are mounted. This yoke projects forwardly from the shaft 3, substantially in reclining position, and its forward or free rocking end is forked to provide the space or recess 22 and the fork arms 23 and 24. One side of the yoke 21, the right hand side in Fig. 2, is also provided with a recess 25 that is closed by a plate 26.

Journaled in the fork arm 24 of the yoke 21 and in an opening in the plate 26 is a rotatable shaft 27 that is anchored against axial movements and has one end projecting into the recess 22 and its other end projecting beyond the plate 26. This shaft has a work-clamping bar or plate 28 removably attached to its inner end by a holding screw 29 threaded into the shaft end and removably carries a template plate 30 at its outer end (Figs. 2 and 3) to rotate therewith.

A work-plate A to be edge ground is clamped to the bar or plate 28 within the recess 22 by an opposed axially movable plate 31 which is removably secured by screws 32, in the present instance, to the adjacent end of a stub-shaft 33 that is both rotatably and axially movable in a bearing bushing 34 (Fig. 2) in the fork arm 23 of the yoke 21. The shaft 33 is connected by a rod 35 to a plunger 36 operating in a cylinder 37 to which fluid pressure is admitted at one side of the plunger to

impart work-clamping movements to the shaft and its clamping plate. The outward movement of the rod 35 is induced by a spring 38 and such movement is limited by a stop screw 39 in the outer end of the cylinder.

A work-gauge means is carried by the shaft 27 between the arbor arm 24, and clamp plate 28, and is shown in Figs. 2 and 3 and in enlarged detail in Figs. 7, 8, 9, 10 and 11. This means comprises, in the present instance, a body member 40 substantially of rectangular form and having an opening receiving the shaft 27 with one side wall of said opening split, as at 41 (Fig. 7), to permit contraction of the opening wall around the shaft by action of a screw 42. Two brackets 43 and 44 are fixed to and project from the member 40 at opposite sides of the shaft 27, and the former carries two side gauge units 45 and 46 and the latter carries one end gauge unit 47 (Fig. 7) for gauging the positioning of the work-plate A between the clamping members 28 and 31.

Each gauge unit comprises a cylinder 50 fixedly attached to its bracket, a rockshaft 51 extending endwise from its cylinder and carrying a gauge arm at its outer end with the two side gauge arms designated 52 and the end gauge arm designated 53. An adjusting screw 58 is threaded transversely through each gauge arm for position-gauging contact at its end with a respective edge of the work-plate preparatory to being clamped in edge grinding position between the clamping plates 28 and 31.

A vane 54 is fixed to each shaft 51 for rocking movements in the respective cylinder 50 and is limited in such movements by a fixed stop wall 55. Air or other suitable pressure is admitted through a respective port 56 (Fig. 10) to the interior of each cylinder 50 to act against the associated vane 54 and move it and its respective gauge arm 52, 53 to work-plate gauging position. A coil spring 57 is disposed around each shaft 51 with one end fixed thereto and the other end fixed to the stop wall 55 and acts to normally turn the shaft and its gauge arm to retracted or non-gauging position, as indicated by dotted lines in Fig. 8. Each arm 52, 53 carries transverse thereto at its outer end a gauge screw 58 the head of which stands in work edge gauging position when the shafts 51 are respectively turned in one direction, as shown in Fig. 7. The two gauge screws 58 of the units 45, 46 have lower side edge engagement with a work-plate, while that of the unit 47 has engagement with one end edge of the plate. It is thus apparent that when the gauge screws 58 are in work-gauging position and the work-clamping plates 28 and 31 are relatively separated to work-released position, a work-plate to be edge ground may be inserted in position therebetween with its lower longitudinal edge resting on the gauge screws of the lower units 45 and 46 and with its rear or far end edge bearing against the gauge screw of the end unit 47, as shown in Fig. 7. After the clamping of a work-plate the gauge members are withdrawn to inoperative positions.

During a work-edge grinding operation, the work-plate A rests edgewise by gravity of its carrying parts on the periphery of a subjacent grinding wheel 60 that is mounted in a standard 61 on the top of the base frame 1. The shaft 62 for the wheel is driven through a pulley and belt connection 63 from a motor 64 in the base frame. A pump 65 delivers a liquid coolant to the grinding wheel through a tube 66 and nozzles 67.

The drive for the work-plate rotating shaft 27 is from the shaft 3 through a train of gears 68, 68, disposed in the side recess 25 of the work-carrying yoke 21 (Fig. 2). The template 30 rests edgewise on the periphery of a subjacent supporting wheel 70 that is mounted as an idler on a bracket 71 on the top of the base frame. The template 30 is the same shape as the work-piece A and bears the same relation to the shaft as the work-piece. The periphery of the wheel 70 is concentric to its axis and is preferably of broad frusto conical form to permit wear of the grinding wheel to be compensated for by axial adjustment of the supporting wheel 70. For this purpose, the bracket 71 is adjustable on the frame toward and away from the grinding wheel, and adjustment is accomplished by an adjusting screw 72.

An operating cycle preferably constitutes one complete turn of the shaft 3 and this is controlled by a stop switch 80 (Fig. 6) in the electrical operating circuit. For this purpose the shaft 3 carries at one end a pinion 81 driving a timing gear 82. This gear, in the present instance, is twice as large as the pinion 81 and carries two stop pins 83 in 180° spaced relation for successive operating engagement with the switch operating arm 84, thus terminating a cycle at each half revolution of the gear. Should it be desired that a cycle include two complete rotations of the shaft 3 so that the work-plate may be twice operated on, one of the pins 83 may be removed.

The operating means for the yoke 21 includes a fluid pressure cylinder 85 carried by and extending rearwardly from the frame part 2 substantially centrally of the yoke 21. A piston 87 operates in this cylinder and its rod 88 projects forwardly through the frame part 2 beneath the rear end of the yoke 21, and on its forward stroke engages a roller 89 on an arm 90, projecting downwardly from the rear end portion of the yoke, and rocks the yoke to the upper limit of its movement, as indicated in dotted lines in Fig. 5. A hydraulic check is provided for the movement of the piston 87 and comprises a rod 91 projecting rearwardly from the piston 87 and connected to a plunger 92 in a cylinder 93. Fluid in the cylinder 93 is permitted to slowly flow from one side to the other of the plunger, as is well understood in the art.

Fluid pressure, in the present instance air, is supplied to the cylinder 85 from a working pressure line branch 95 through a branch 95a, and this, as well as the exhaust from the cylinder, is controlled by an electrically operated valve shown conventionally at 96 in Fig. 13. The electrical control means for the valve 96 will be later described.

A control valve for the main drive clutch cylinder 14 is attached to the rear bottom portion of the yoke 21 and is conventionally shown at 100 (Figs. 5 and 13). This valve has a connection 101 with the air pressure supply line 95 and another connection 102 with the cylinder 14 for admission to and exhaust of air pressure therefrom. This valve is normally open. A lever 103 on the arm 90 beneath the yoke 21 has a short arm located in the path of movement of the forward end of the piston rod 88 and has a long arm in position to engage a movable part 104 of the valve 100 and close the valve, thus permitting release of the driving clutch 8 by the action of

the spring 15 and stopping the upward working of the yoke 21.

Mounted on the frame part 2 adjacent to the rear end of the yoke 21 are two fluid pressure control valves conventionally shown at 106 and 107 (Figs. 4, 5 and 13). The valve 106 connects with the air pressure supply line 95 and controls the air pressure supply line 108 to the cylinder 37 so as to effect clamping and release movements of the work clamping plate 31. The other valve 107 controls the air pressure supply from the line 95 through the line 110 to the gauge cylinders 50 through passages 111 in the shaft 27 and connected parts, as shown in Figs. 2 and 7 to 10. The valve 106 is normally open to line pressure and closed to the exhaust, so that the work clamp 31 is normally held clamped against the work. The valve 107 is normally closed to line pressure and open to exhaust so that the gauge arms normally stand in retracted non-gauging positions. These valves have respective upwardly projecting movable operating parts 112 and 113 (Figs. 4 and 13). These valve parts are engaged and depressed by respective contact screws 114 and 115 (Fig. 4) threaded through a shelf or projection on the rear end of the yoke 21, such engagement taking place at approximately the limit of the upward rocking movement of the yoke. The engagement is so timed, however, that the valve part 113 is first depressed. This causes an opening of the valve 107 to the pressure line and a consequent moving of the gauge arms 52 and 53 to work supporting position, as shown in Figs. 7 and 8, before the valve 106 is closed to the pressure line and the work clamp 31 released from the work. As each valve 106 and 107 is closed to the pressure line, it opens an exhaust for the respective line 108, 110. The reverse action of these controls and the parts they operate takes place as the yoke 21 begins its lowering movement at the start of a cycle. When the yoke 21 is at rest at the upper end of its stroke the gauge arms are projected and stand in work supporting positions.

The electrical operating means includes the main drive motor 9, the work spindle drive motor 64 and the coolant circulating motor 65, all connected to a suitable electrical supply source and preferably controlled by a single main starting switch. The various electrical controls for cycle movements of the yoke 21, the operating of the work spindle, the clamping and release of the work-pieces and the projecting and retracting of the work gauges are included in a reduced voltage circuit indicated as an 8-volt circuit in Fig. 13. This circuit includes the limit switch 80, a cycle starting switch 121 and an emergency stop switch 122. This reduced voltage circuit also includes a solenoid 130 which, when energized, moves the valve 96 to close the air pressure supply to the cylinder 86 and to open its exhaust, thus permitting the piston 87 and its thrust rod 88 to be retracted and the yoke 21 to lower to grinding position.

The operation of the machine is as follows: Considering the operating parts to be at rest with the yoke raised, with work clamp 31 retracted, and with the gauge arms 52 and 53 in projected work engaging positions, the operator places a work-piece A to be ground between the clamp pieces 31 and 28 with its lower edge resting on the two supports 58 of the gauge arms 52 and with its far end bearing against the gauge part of the gauge arm 53. This having been done, he closes the starting switch 121 which causes an energizing of the solenoid 130 to operate the valve 96 to cause retraction of the yoke raising plunger 87 and its pusher bar 88, so that the yoke will lower by gravity to work-grinding position. As the plunger 87 and its bar are retracted the lever 103 on its under side is caused to move away from the valve 100 thus permitting it to open and admit air line pressure through the lines 101, 102 to the cylinder 14 to effect a closing of the pulley clutch 7, 8 and a consequent driving of the shaft 3 and the connected work holder shaft 27. Also the lowering of the yoke 21 from raised position releases the engagement of the rear end of the yoke from the valves 106 and 107. This admits air line pressure to the work clamp cylinder 37 to clamp the work and also closes the air line connection 111 and 110 with the gauge cylinders 50 so that the gauge arms will be retracted from engagement with the work by the action of gauge springs 57. This leaves the edges of the work-piece free for grinding as it lowers into engagement with the rotating grinding wheel 60. The lowering movement of the yoke now stops so that the work dwells in engagement with the grinding wheel during the grinding operation while the plunger 88 has a predetermined lost motion movement relative to the yoke. During this dwell the work is slowly turned by rotation of the shaft section 27 and work-clamping parts, as is also the template 30, which upon a lowering of the yoke rests at its edge on the idler wheel 70 in the same relation that the work-piece A engages the grinding wheel. The template is of the same size and shape as the clamped work-plate A and by riding on the wheel 70 causes the yoke to rise and fall in conformance with the shape of the work-plate as it turns in peripheral engagement with the grinding wheel. The grinding pattern is thus caused to conform to the shape of the template. When a grinding cycle has been completed a stop pin 63 on the timing gear 62 strikes and moves the switch arm 84 to open-circuit position. This de-energizes the solenoid 130 so that the valve 96 is moved by spring action to open the air pressure arm 95 thus admitting line pressure to the cylinder 86 at the left of the piston 87 and forcing the piston and its thrust rod 88 outward to engage the arm 90 and rock the yoke 21 to its raised inoperative position. During this movement the lever 103 is moved by the thrust of the rod 88 to engage the valve part 104 and actuate the valve 100 and close the air line 101, 102 to the main clutch cylinder 14, thus relieving the cylinder pressure and permitting the spring 15 to release the pulley clutch 7, 8 and stop the driving of the work turning shaft 27. When such rotation of the work has been stopped the contact screws 114 and 115 will have been lowered sufficiently to actuate the two valves 106 and 107 to first open the air pressure line 111, 110 to the gauge cylinders 50 to cause projection of the gauge arms to work gauging positions, and then to close the air pressure line 108 to the clamp cylinder 37 and permit the spring 38 therein to move the work clamp 31 to release the ground work-piece A. The work which is now resting freely on the gauge arms may be removed and an unground work-piece substituted therefor preparatory to the next operating cycle.

It is apparent that when a work-piece to be edge ground has been positioned on the gauge arms and a cycle of operation started by pushing the button of the starting switch 121, the successive operations of clamping the work, retracting the gauge arms, lowering the work to grind-

ing position, imparting a complete edgewise turning movement therein in edge grinding engagement with the grinding wheel, and then stopping the work rotation, raising the yoke to elevated position and during such raising projecting the gauging arms to gauging positions and then releasing the work clamp, are all performed automatically. The operator, therefore, has nothing to do but remove a ground work-piece at the end of a cycle, place another work-piece on the gauge arms and then operate the starting switch 121 to start a new cycle of operations.

I wish it understood that my 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 my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In a machine of the class described, a member mounted for vertical reciprocatory movements, means mounting the member for said movements, means for imparting said movements to said member, a rotatable work plate clamping means carried by said member, means for rotating the clamping means, work gauge means rotatable with said clamping means and movable into and out of gauging position, a grinding wheel in the path of movement of a clamped work plate with said member whereby it is edge ground when moved into engagement with the grinding wheel, mounting means for said wheel, means for driving the grinding wheel, and means automatically operable to actuate the clamping means to clamp and release a workpiece and also to move the gauging means into and out of gauged position at predetermined points in a reciprocatory movement of the member.

2. In a machine of the class described, a driven grinding wheel, a member mounted for movement toward and away from the periphery of said wheel, separate mounting means for said wheel and member, means for moving said member, work clamping means rotatably carried by said member for movement therewith to place a clamped workpiece into and out of edge grinding engagement with the wheel periphery, means for rotating said clamping means relative to the member, a work gauge means associated with said clamping means for rotation therewith, means for moving said gauge means into and out of work gauging relation to the clamping means, means operable at predetermined points in a movement of said member to actuate said clamping means to first clamp and then to release a workpiece, and another means operable in predetermined relation to said last operating means to move said gauge means first out of and then into work gauging position.

3. In a machine of the class described, a driven rotary grinding wheel, a yoke mounted for movements toward and away from the periphery of said wheel, separate mounting means for said wheel and yoke, means for moving said yoke through a predetermined cycle, work clamping means rotatably carried by said yoke for movement therewith to move a clamped workpiece into and out of edge grinding relation to the wheel periphery, work gauging means associated with said clamping means for rotation therewith and having gauge elements movable into and out of work gauging position, means for rotating both said clamping and gauging means, and separate fluid pressure means operable at different predetermined points in a cycle of movements of said yoke to clamp a workpiece and then release it and to move the gauge elements out of gauging position after a clamping action and then into gauging position after a grinding operation and before release of a ground workpiece by the clamping means.

4. A combination as called for in claim 3, together with template means for moving the yoke relative to the wheel in accordance with the peripheral shape of the work being ground.

5. In a machine of the class described, a driven rotary grinding wheel, a yoke mounted for movements toward and away from the wheel periphery, separate mounting means for the wheel and yoke, means for moving said yoke, means operable to start and stop said last means at respectively the beginning and end of a predetermined cycle of movements of the machine, work clamping means rotatably carried by said yoke for movement therewith to move a clamped workpiece into and out of edge grinding relation to the wheel periphery, work gauging means associated with said clamping means for rotation therewith and having gauge elements movable into and out of work gauging position, means for rotating both said clamping and gauging means, means automatically operable at different predetermined points in the movement of said yoke to start and stop said means which rotates the clamping and gauging means, and separate means controlling the respective operations of said clamping and gauging means and automatically operable to move the gauge elements to and then out of work gauging position and to clamp and release a workpiece at different predetermined points in a predetermined cycle of movement of said yoke.

6. A combination as called for in claim 5, wherein said automatic means for starting and stopping said means that rotates the clamping and gauging means is pneumatically operated to start its operation and is operated by other means to stop its operation.

7. A combination as called for in claim 5, wherein said separate means are pneumatically operated to perform their respective functions.

8. In a machine of the class described, a driven rotary grinding wheel, a member mounted for rocking movements toward and away from the grinding wheel, separate mounting means for said wheel and members, means operable to impart said movements to said member, means rotatably carried by said member for clamping a workpiece and moving it with the member into and out of edge grinding position, said clamping means being normally released, means automatically operable at predetermined points in a cycle of movements of said member first to actuate the clamping means to clamp a workpiece and then to release it, means for rotating the clamping means in said member, a drive means, and means automatically operable to connect said drive means to the rotating means for said clamping means and drive it during a predetermined movement of said member and then to release it.

9. In a machine of the class described, a grinding wheel, means for driving the wheel, a member mounted for predetermined movements toward and away from said wheel, separate mounting means for said wheel and member, means operable to impart said movements to the member, means carried by said member for clamping and rotating a workpiece in position to edge-wise engage the grinding wheel during a predetermined

portion of the member movement, means for rotating said clamping means during a predetermined portion of its said movement, means operable to impart work clamping and releasing movements to said clamping means at predetermined points in a movement of said member, a driving means, a releasable clutch connection between said driving means and clamp rotating means, and means automatically operable to engage and release said clutch connection at different predetermined points in a movement of said member and intermediate the points of clamping and releasing of said clamping means.

10. A combination as called for in claim 9, together with means for stopping the operation of the machine at the end of a predetermined cycle of movements of the member operating means.

11. A combination as called for in claim 9, together with template means associated with said member for guiding the movements thereof during a grinding operation in accordance with the peripheral shape of a workpiece being ground.

12. In a machine of the class described, a driven grinding wheel, a mount for said wheel, a yoke moveable relative thereto, a mount for said yoke, a shaft rotatably mounted in said yoke for transverse movement therewith toward and away from said wheel, means for clamping a workpiece to said shaft to turn therewith, means operable to impart a predetermined cycle of movements to said yoke to move a clamped workpiece into and out of edge grinding engagement with the grinding wheel, means for driving said shaft during predetermined portions of a cycle of movements of said yoke, and means carried by the shaft for gauging the placing of work in clamping position, and fluid pressure operated means operable to move said gauging means into and out of work gauging position at predetermined points in a movement of said yoke.

13. In a machine of the class described, a driven grinding wheel, a mount therefor, a yoke movable relative thereto, a mount for said yoke, a shaft rotatably mounted in said yoke for transverse movement therewith toward and away from said wheel, means for clamping a workpiece to an end of said shaft to turn therewith, means operable to impart a predetermined cycle of movement to said yoke to move a clamped workpiece into and out of edge grinding engagement with the grinding wheel, means for driving said shaft during predetermined portions of a cycle of movements of said yoke, a plurality of gauge arms carried by said shaft for movement into and out of work placing position, and fluid pressure means automatically operable by said yoke at one position in its movement to place said arms in gauging position and at another position in its movement to release the arms to permit retracting movements thereof, and means for retracting said arms when released.

14. In a machine of the class described, a rotatable shaft, mounting means therefor, means for driving said shaft, means operable to start and stop said driving means at predetermined intervals, means periodically operable during a running of the shaft to clamp a workpiece to said shaft to turn therewith, a plurality of work gauge arms carried by said shaft to revolve therewith and movable into and out of work placing position, and means operable in predetermined relation to the action of said clamping means to project said arms to work engaging positions and then to retract them.

15. In a machine of the class described, a driven grinding wheel, a yoke mounted for rocking movements in a vertical plane toward and away from the wheel periphery, separate mounting means for said wheel and yoke, a rotary work holding means carried by said yoke, fluid pressure operated means including a plunger operable against the yoke to move it upwards away from the wheel and to control its downward stroke and permit it to dwell in work grinding position, means for rotating the work holding means, drive means therefor, and means operable by said plunger at predetermined points in its movement to connect and disconnect said drive and rotating means.

16. In a machine of the class described, a driven grinding wheel, a yoke mounted for rocking movements in a vertical plane toward and away from the wheel periphery, separate mounting means for said wheel and yoke, a rotary work holding means carried by said yoke, fluid pressure operated means including a plunger operable against the yoke to move it upwards away from the wheel and to control its downward stroke and permit it to dwell in work grinding position, means for rotating the work holding means, drive means therefor, means operable by said plunger at predetermined points in its movement to connect and disconnect said drive and rotating means, a work gauging means for said holding means, and means operable to move the gauging means into and out of work gauging position at predetermined points in a rocking of said yoke.

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