No. 657,724. Patented Sept. 11, 1900.

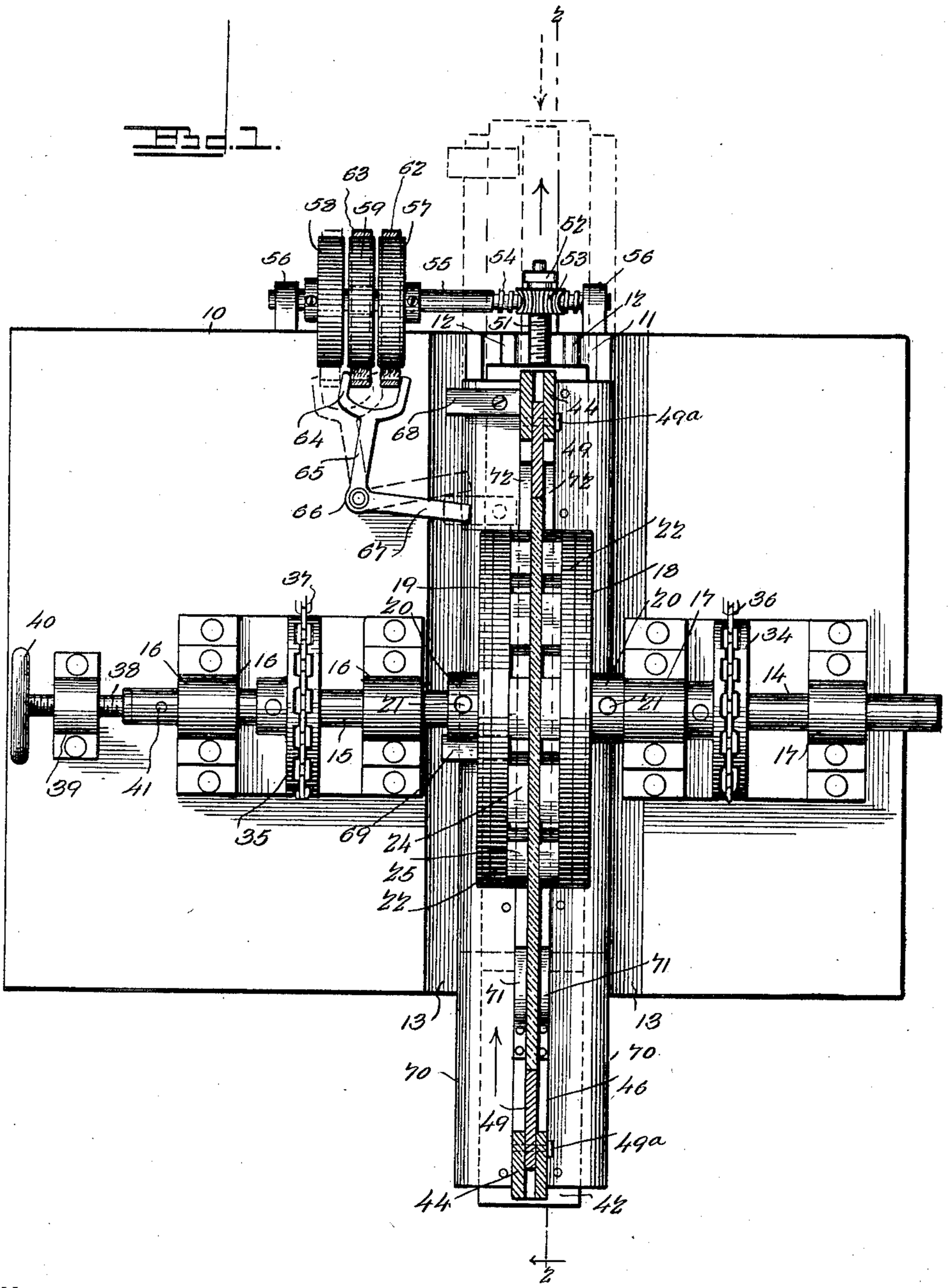
D. BEATTY.

MACHINE FOR GRINDING AND POLISHING PLATE GLASS.

(Application filed Nov. 7, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses
E. K. Stewart.
H. J. Bernhofs

Daniel Beatty Inventor
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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

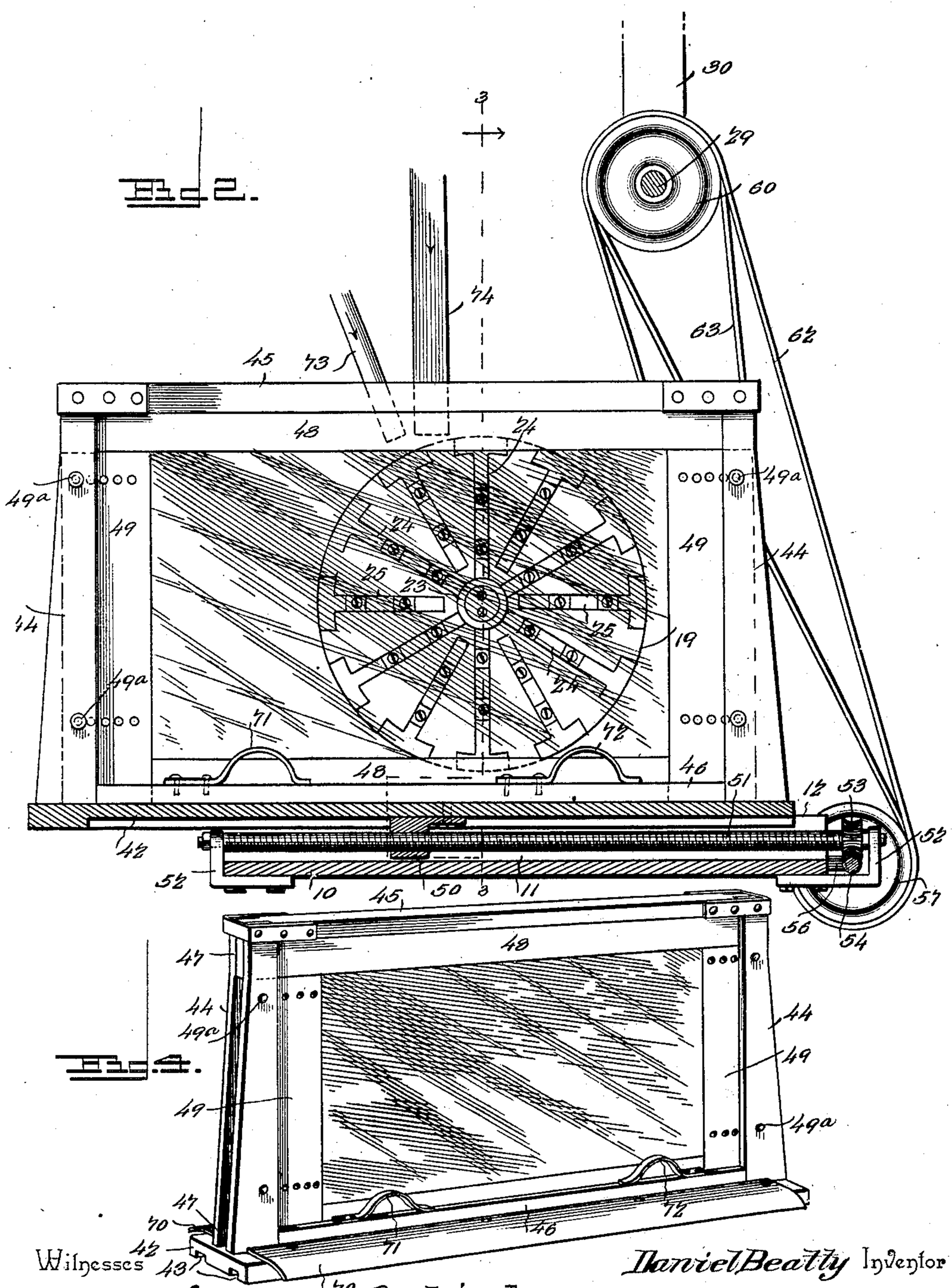

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

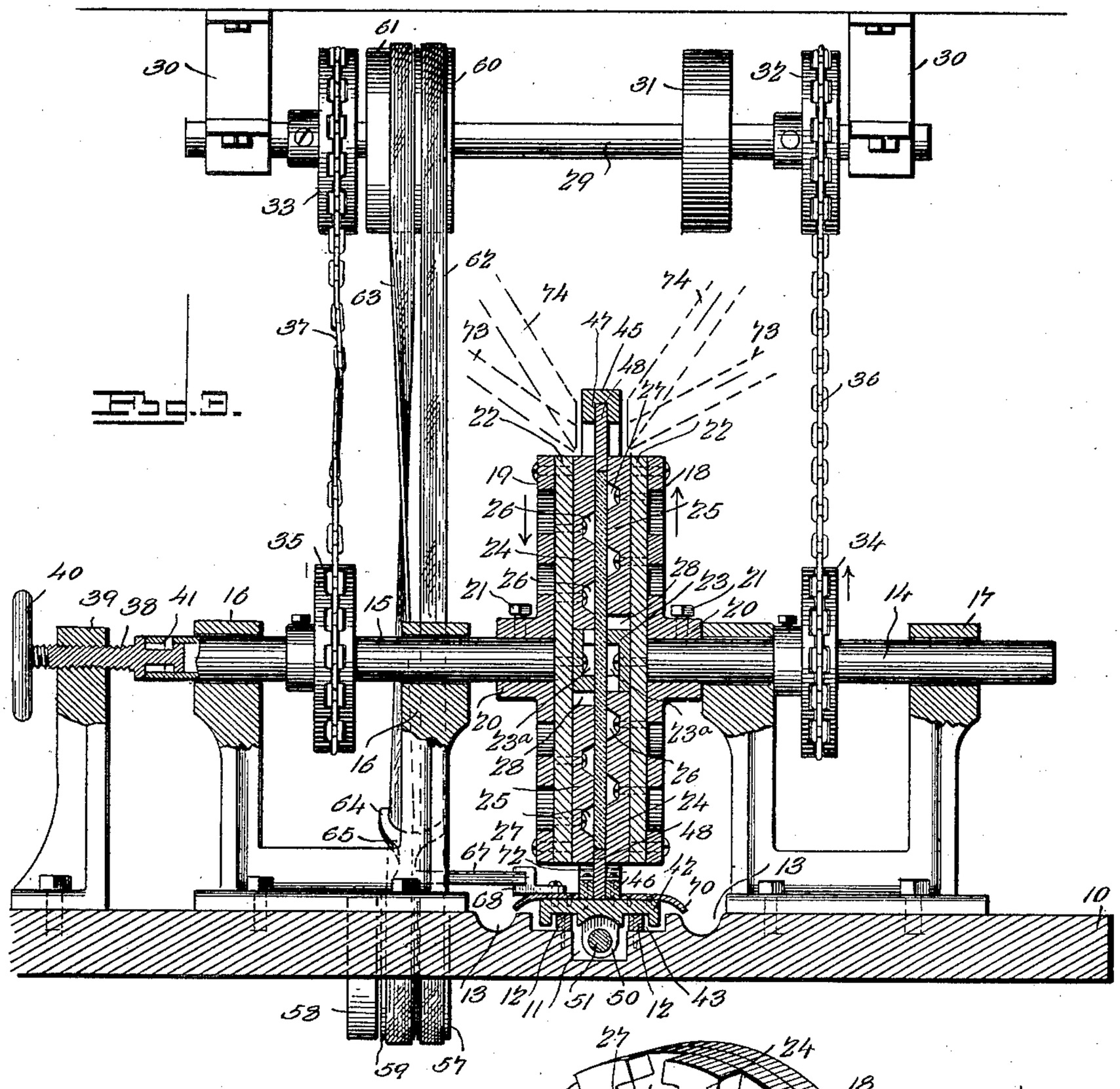

Fig. 3.

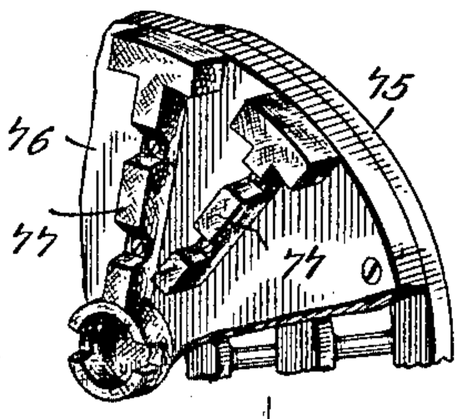

Fig. 6.

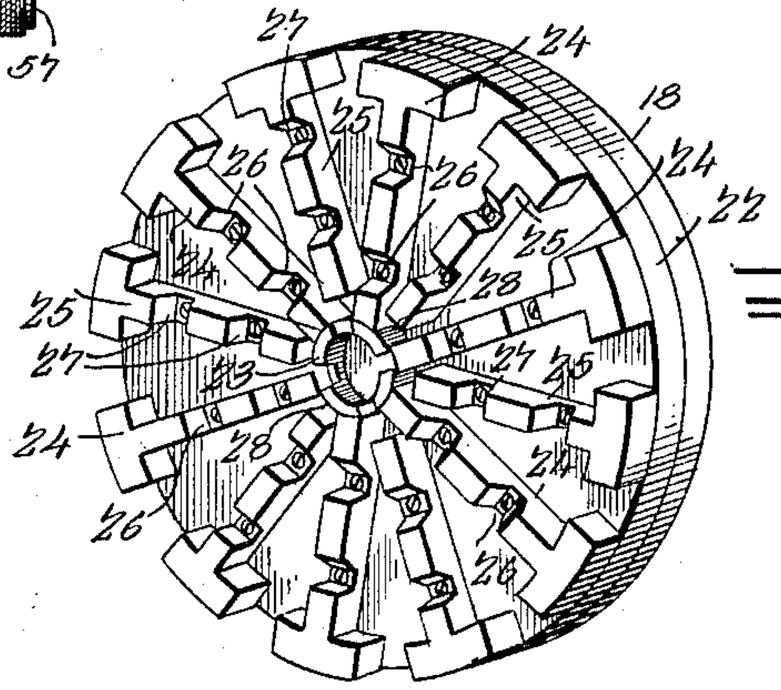

Fig. 5.

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UNITED STATES PATENT OFFICE.

DANIEL BEATTY, OF NEW KENSINGTON, PENNSYLVANIA.

MACHINE FOR GRINDING AND POLISHING PLATE-GLASS.

SPECIFICATION forming part of Letters Patent No. 657,724, dated September 11, 1900.

Application filed November 7, 1899. Serial No. 736,121. (No model.)

To all whom it may concern:

Be it known that I, DANIEL BEATTY, a citizen of the United States, residing at New Kensington, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Machine for Grinding and Polishing Plate-Glass, of which the following is a specification.

My invention relates to machines for grinding and polishing glass; and one object in view is to provide an improved structure adapted to simultaneously act on both surfaces of a plate of glass and throughout the area thereof during its treatment in the machine.

A further object is to provide a grinding-disk with an improved abrading-surface capable of renewal when worn down with ease and facility, and said abrading-surface is constructed to permit of the expeditious passage or circulation of the abrading material—usually sand—throughout the full area of the grinding-disk.

A further object is to provide an improved work-carrier arranged to carry the glass plate to and fro between the grinding-disks, said carriage having work-clamps which are adjustable to different sizes of the plate-glass and are easily removable when worn.

A further object is to provide means for propelling the carriage uniformly and steadily between the grinding-surfaces and for automatically reversing the carriage as it approaches the limit of its travel in either direction.

With these ends in view the invention consists in the novel combination of mechanisms and in the construction and arrangement of parts, as will be hereinafter fully described and claimed.

To enable others to understand the invention, I have illustrated a preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a plan view of my invention adapted for service as a machine for grinding plate-glass. Fig. 2 is a longitudinal sectional elevation taken in the plane of the dotted line 2 2 of Fig. 1 looking in the direction of the arrow. Fig. 3 is a vertical transverse sectional elevation taken in the plane of the dotted line 3 3 of Fig. 2 looking in the direction of the arrow. Fig. 4 is a detail perspective view of the work-carriage removed from the machine. Fig. 5 is a detail perspective view of a part of one abrading-wheel. Fig. 6 is a detail perspective view of a revoluble disk constructed with a surface for polishing the plane-surface of a glass plate.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

10 designates the base or platform, of proper dimensions and shape to support the several working parts of the machine. This platform is provided with a carriage-way or recess 11, and on the upper side of this platform are secured the track-rails 12, which are disposed on opposite sides of the carriage-way 11 and in parallel relation to each other for the purpose of directing and guiding the work-carriage in a rectilinear path between the oppositely-revoluble grinding or polishing disks. The base or platform is, furthermore, provided with the discharge-channels 13 13, which lie on opposite sides of the carriage and into which the water and sand are discharged from the abrading mechanism, said channels serving to convey the water and sand to suitable receptacles or otherwise discharge them from the apparatus.

14 15 designate short horizontal shafts arranged, substantially, in alinement with each other and supported in bearings on opposite sides of the carriage. The shaft 15 is mounted in bearings 16, so as to rotate freely therein and be capable of a limited endwise adjustment; but the other shaft 14 is mounted in the bearings 17 in a well-known manner for the purpose of rotating freely in its bearings without permitting any endwise movement of said shaft.

In my machine I employ a pair of revoluble elements, preferably in the form of disks mounted on the shafts 14 15 in opposing relation to each other and revoluble in opposite directions. One of the disks is indicated at 18 on the inner end of the shaft 14 and adapted for the purpose of rotating therewith in a certain vertical plane at all times. The other revoluble element or disk 19 is fast with the shaft 15 for the purpose of rotating therewith and capable of a limited adjustment later-

ally with respect to the disk 18, whereby the space between the opposing disks may be widened to facilitate the introduction or removal of the plate of glass in the work-carriage, as well as to accommodate the two disks to glass plates of different thicknesses. Each revoluble element or disk is in the form of a metallic casting with a hub 20, supporting a binding-screw 21 and adapted to firmly hold the disk on the inner end of one shaft; but it is evident that a skilled mechanic may vary the means for making the disk fast with its shaft. In the embodiment of my invention in a glass-grinding machine I construct each revoluble disk 18 or 19 with a wooden face-plate 22, which is secured by screws to the metallic element or disk, and this abrading element is equipped with a renewable working surface that is adapted to permit the circulation of the abrasive sand throughout the full area of the working surface on said element or disk. This working surface in the present embodiment of the invention consists of a central annulus or ring 23 and a series of T-shaped ribs or plates 24 25. The central annulus is secured to the wooden face-plate 22 by means of screws, which have their heads countersunk in radial channels 23^a, which are provided in the exposed edge of the annulus. The ribs or plates 24 25 are each cast in a single piece of metal with a straight shank and a cross-head, and these ribs are arranged on the wooden face-plate 22 for their shanks to lie radially to the central ring 23, the heads of the ribs being concentric with the peripheral edge of the face-plate 22 and the carrier-disk 18 or 19. The ribs designated as 24 alternate with the ribs indicated by 25. Said ribs 24 are provided with a series of transverse notches 26 in the straight shanks thereof. The other ribs 25 have a series of transverse notches 27, and at their inner ends said ribs have the recesses 28. The ribs are fastened to the face-plate 22 by means of screws which have their heads countersunk in the recesses, and the two series of radial ribs are fastened to the carrier-disk, or rather to the wooden face-plate, in positions for the transverse notches of the ribs in one series to be out of alinement with the transverse notches in the ribs of the other series. The employment of the notched ring and the ribs or plates with notches arranged in the manner described provides for the circulation of the abrasive sand throughout the full area of the working surface on each revoluble element or carrier-disk, and these ribs and the central ring insure the distribution of the abrasive sand so that the surface of the glass plate may be ground uniformly.

The shafts 14 15, which carry the opposing elements or disks, are driven in opposite directions through intermediate gearing from a single driving-shaft 29, the latter journaled in suitable bearings or hangers 30 and provided with a driving-pulley 31, over which pulley may pass a suitable driving-belt. (Not shown.) This driving-shaft is, furthermore, equipped with the chain-wheels 32 33, which are disposed opposite to the shafts 14 15, and other chain-wheels 34 35 are secured to the shafts 14 15 in alinement with the chain-wheels 32 33. A straight chain 36 passes around the chain-wheels 32 34 on the shafts 29 14, respectively, for the purpose of rotating the shaft 14 and the disk 18 thereon in one direction. A crossed chain 37 passes around the chain-wheels 33 35 on the shafts 29 and 15, respectively, to rotate the shaft 15 and the disk 19 in an opposite direction to the shaft 14 and the disk 18 thereon.

Any suitable means may be provided for giving the endwise adjustment to the shaft 15 and to the disk 19 thereon; but in the drawings I have illustrated an adjusting-screw 38, which is supported in a bearing 39 in alinement with the shaft 15. At one end this adjustment-screw is provided with a hand-wheel 40 for its convenient manipulation, but the other inner end of the screw has a swiveled coupling at 41 (see Fig. 3) with the outer end of the shaft 15, whereby rotation of the screw adjusts the shaft 15 endwise without, however, interfering with the free rotation of the shaft under the propulsive energy of the crossed chain 37.

The work-carriage is adapted to travel on the track-rails 12 in a rectilinear path between the opposing abrading-disks, and with this work-carriage are associated devices which operate to firmly hold a sheet or pane of glass thereon and to positively propel the carriage to and fro. This carriage has a base 42, which is provided in its lower under side with longitudinal parallel grooves 43. This grooved base is adapted to fit upon and to loosely embrace the parallel tracks 12; but while these tracks serve to direct the base of the carriage in a generally-rectilinear path between the abrading-disks said base 42 of the carriage is capable of a limited lateral play on the rails 12, because the grooves 43 are a little wider than the rails, thus permitting the carriage to accommodate itself to variations in the thickness of the sheet or plate of glass while securing uniformity in the engagement of the abrading-disks with opposite faces of the glass plate. On the base of this carriage is provided a vertical frame adapted to confine securely in place the interchangeable strips which engage with the plate of glass. This frame consists of the slotted posts 44, a cap-rail 45, and the base-rail 46, all of which are firmly secured together and are arranged to provide within the frame a space which exceeds the dimensions of the plate or sheet of glass adapted to be treated by the improved machine, and the base and top rails of this frame are provided on their inner edges with grooves 47, which are disposed in the plane of the slots in the posts 44. The insertible strips 48 extend lengthwise of the frame to engage with the cap and bottom rails thereof, while other

insertible strips 49 are arranged to engage with the posts 44. The end strips meet or join with the end portions of the longitudinal strips, so as to assist in holding the latter in place, and these end strips are held in place on the posts by the fasteners 49ª, such fasteners being shown by the drawings as embodied in the form of pins adapted to fit in either of the series of openings provided in the end strips 49. The horizontal and vertical strips 48 and 49 are equal in thickness to the plate or sheet of glass which is to be treated, and these strips are made of wood or other soft material and are adapted to lie flush with the plane surfaces of the glass plate, whereby the strips are adapted to be ground down with the surfaces of the plate by the abrasive action of the revoluble disks. These insertible strips may be easily renewed at a small cost when they are worn down to such an extent as to not justify the continued use thereof. The adjustment afforded to the end strips and the interchangeability of the several strips provide for variation in the size of the sheets or plates of glass adapted to be held in the carriage and subjected to the abrasive action of the revoluble disks. In inserting the work in the carriage it is passed through the slotted posts 44, and the horizontal and vertical strips 48 49 are properly adjusted in grooves of the cap and bottom rails, so as to support the work clear of and within the limits of the work-frame. The insertible strips serve to firmly confine the sheet or pane of glass, so that it will travel with the carriage, and the diameter of each abrading-disk is equal to or greater than the width of the glass plate, (see Fig. 2,) whereby the plate is moved longitudinally by the carriage for the entire surface of the plate on each side to be subjected to the action of one abrading-disk.

50 designates a traveling feed-nut which is made fast with the under side of the carriage 42, and this nut depends from the carriage, so as to enter and travel in the way or recess 11 in the base or foundation 10. A feed-screw 51 is arranged longitudinally in said way or recess, and it passes through and has threaded engagement with the feed-nut of the carriage. Said screw is journaled in and held from endwise movement by suitable bearings 52, which are fixed to the base 10. One end of said feed-screw extends beyond the base for the reception of a worm-gear 53, the latter meshing with a worm 54 on a worm-shaft 55. This worm-shaft is arranged at right angles to the feed-screw, so as to be journaled in suitable bearings 56, and on this worm-shaft is mounted a pair of fast pulleys 57 58, together with an idle pulley 59, which is fitted loosely on the shaft between the two fast pulleys. A pair of fast pulleys 60 61 are secured to the driving-shaft 29 in alinement with the pulleys on the worm-shaft, and around the fast pulleys 57 60 on the driving and worm shaft is arranged a straight belt 62. The crossed belt 63 passes around the pulleys 58 61, and with these two belts is engaged the fork 64 of a belt-shipper 65, whereby the belts may be simultaneously shifted from their fast pulley to the loose pulley for the purpose of driving the worm-shaft alternately in opposite directions. It is to be understood that the straight belt 62 when fitted on the pulley 57 will rotate the worm-shaft in one direction, and consequently propel the carriage through the feed-screw and the nut in one direction. The crossed belt 63 when fitted on the pulley 58 drives the worm-shaft in an opposite direction to propel the carriage in a like direction. The employment of the belt-shipper serves to simultaneously shift the two belts, so that one belt is in service while the other belt fits on the idle pulley 59. The belt-shipper is in the form of a lever fulcrumed to a support at 66 and provided with an angular arm 67, which is disposed in the path of stops 68 69, which are fastened adjustably by any suitable means to the base 42 of the carriage, whereby as the carriage moves in one direction one stop engages with the belt-shipper to reverse the belts 62 63; but on the travel of the carriage in the opposite direction the other stop engages with the belt-shifter to again change the belts, thus automatically reversing the direction of the feed of the carriage.

The water flowing from the space between the abrading-disks is deflected into the channels 13 by the employment of water-sheds 70, which consist of metallic plates fastened to the carriage 42 on opposite sides of the work-frame, said sheds extending from opposite sides of the carriage for deflecting the water into the channels of the platform.

To assist in holding the sheet or pane of glass and the bottom insertible strip in place, I employ the pairs of detaining-springs 71 72, which are fastened to the base of the carriage on opposite sides of the bottom insertible strip, each spring being arched or bowed to extend above the strip and to lie close to or touch a face of the glass plate. The springs are shown as extended into the path of the revoluble disks; but as one end of each spring is free or unconfined it is adapted to yield or give automatically as the spring travels with the carriage below the disk.

The water is conveyed to the machine and discharged against the faces of the sheet or plate of glass by the inclined pipes 73. The sand or other abrasive material is discharged to the working faces of the revoluble disks by the inclined sand pipes or chutes 74, which may receive the supply of sand from elevated hoppers (not shown) or by other suitable appliances.

The machine hereinbefore described has the revoluble disks 18 19 constructed with abrasive surfaces which are designed for use in connection with an abrasive material which is discharged against the work by the sand-pipes 74; but I also contemplate the employment of a machine in which the revoluble disks are provided with polishing-surfaces

adapted to polish the plane surfaces of the plate or sheet of glass. In this embodiment of the invention (represented by Fig. 6 of the drawings) the polishing-wheel 75 is constructed with a series of transverse ribs 76, which receive the polishing-strips 77, the latter being of felt or any other soft material suitable for the purpose. These polishing-strips may be of any suitable form and arranged in any appropriate manner; but I prefer to employ the T-shaped strips shown by Fig. 6. It is evident that these strips may be provided with notches, if desired. Two polishing-disks of the character shown in Fig. 6 are designed to be fastened in opposing relation to each other to the inner contiguous ends of the shafts 14 15, and these disks are used in connection with the slidable work-carriage and the driving mechanism hereinbefore shown and described in connection with the disks, which are adapted to the work of abrading or grinding a sheet or plate of glass.

The operation may be described briefly as follows: The screw-spindle is adjusted to move the shaft 15 endwise and withdraw the disk 19 away from the disk 18. The sheet or plate of glass, together with the insertible strips, is placed in position on the frame of the work-carriage and the latter is moved to the limit of its movement in one direction, after which the screw is reversed to adjust the shaft toward the head 18, and thus bring the two heads into opposing relation for operation on both faces of the work. The sand and water are supplied to the abrading mechanism by the pipes, and the disks are rotated in opposite directions by the straight and crossed belts. The carriage is propelled in one direction by the feed-screw and the nut driven from the worm-shaft, so as to carry the work between the revoluble disks, and as the carriage reaches the limit of its motion in one direction the stop thereon operates the belt-shifter, which changes the position of the belts 62 63, so as to propel the feed-screw in an opposite direction for reversing the feed of the carriage.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what I claim is—

1. In a machine of the class described, the combination of oppositely-rotating disks in opposing relation to each other, a power-shaft and connections between the same and the disks to rotate the latter, a reciprocating carriage movable in a path between said disks, a reversible driving mechanism for said carriage connected to and actuated by said power-shaft, and means operated by the carriage at the limits of its movement for automatically shifting the driving mechanism, whereby the carriage is automatically reciprocated, substantially as described.

2. In a machine of the class described, the combination of the opposing disks provided with working surfaces, a reciprocating carriage, a main driving-shaft, independent gear connections between said shaft and the disks for rotating the latter in opposite directions, a reversible driving mechanism connected operatively with the main shaft and the carriage, and automatic trip devices operated by the carriage at the limits of the movement thereof for reversing the carriage-driving mechanism whereby the carriage is automatically reciprocated, substantially as described.

3. In a machine of the class described, a work-carriage provided with a frame, and interchangeable strips inserted removably in said frame, substantially as described.

4. In a machine of the class described, a work-carriage, a frame having the slotted posts fastened to said carriage and connected by the cap and bottom rails, and strips insertible within the limits of the frame and arranged to clamp the work within and between themselves, substantially as described.

5. In a machine of the class described, the combination with a work-carriage, and a frame thereon, of the insertible work-holding strips arranged within said frame, certain of said strips being connected adjustably to said frame, for the purpose described, substantially as set forth.

6. In a machine of the class described, the combination with a pair of revoluble disks, for the purpose set forth, arranged opposite each other, of a reciprocatory work-carriage movable in a path between said disks and having stops and a traveling nut, a screw-shaft engaging said traveling nut and having a worm-gear, a worm-shaft engaging said gear, and means to rotate and reverse said worm-shaft, said means including a shifting-lever disposed in the path of the stops, a power-shaft, and connections between the same and the worm-shaft, whereby said revoluble disk and carriage are operated simultaneously, and whereby reciprocatory motion is automatically imparted to said work-carriage, substantially as described.

7. In a machine of the class described, the combination of the revoluble disks, a power-shaft and connections to rotate said disks, a work-carriage, a feed-nut fast with said carriage, a feed-screw having threaded engagement with said nut, a shaft geared to the feed-screw, oppositely-rotating driving elements on said shaft, connected to and operated by the power-shaft and a reversing trip mechanism operated by the carriage at the limits of the movement thereof to automatically reverse the action of the driving elements, substantially as described.

8. In a machine of the class described, the combination of a base provided with water-channels, a carriage movable on said base be-

tween the channels, the water-sheds fast with the carriage and arranged to deflect water toward the channels, the oppositely-revoluble disks, and means for supplying water and an abrasive material to the disks, substantially as described.

9. In a machine of the class described, a work-carriage provided with a frame, the insertible work-holding strips confined within said frame, and springs attached to the carriage and disposed on opposite sides of the strips, in combination with revoluble disks on opposite sides of the carriage and in the path of the springs, and means for propelling the carriage, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DANIEL BEATTY.

Witnesses:

E. K. STEWART,

N. PERRY HAHN.