No. 619,399. Patented Feb. 14, 1899.

# F. F. FISCHER.

## GLASS GRINDING AND POLISHING MACHINE.

(Application filed Aug. 23, 1898.)

(No Model.) 3 Sheets—Sheet 1.

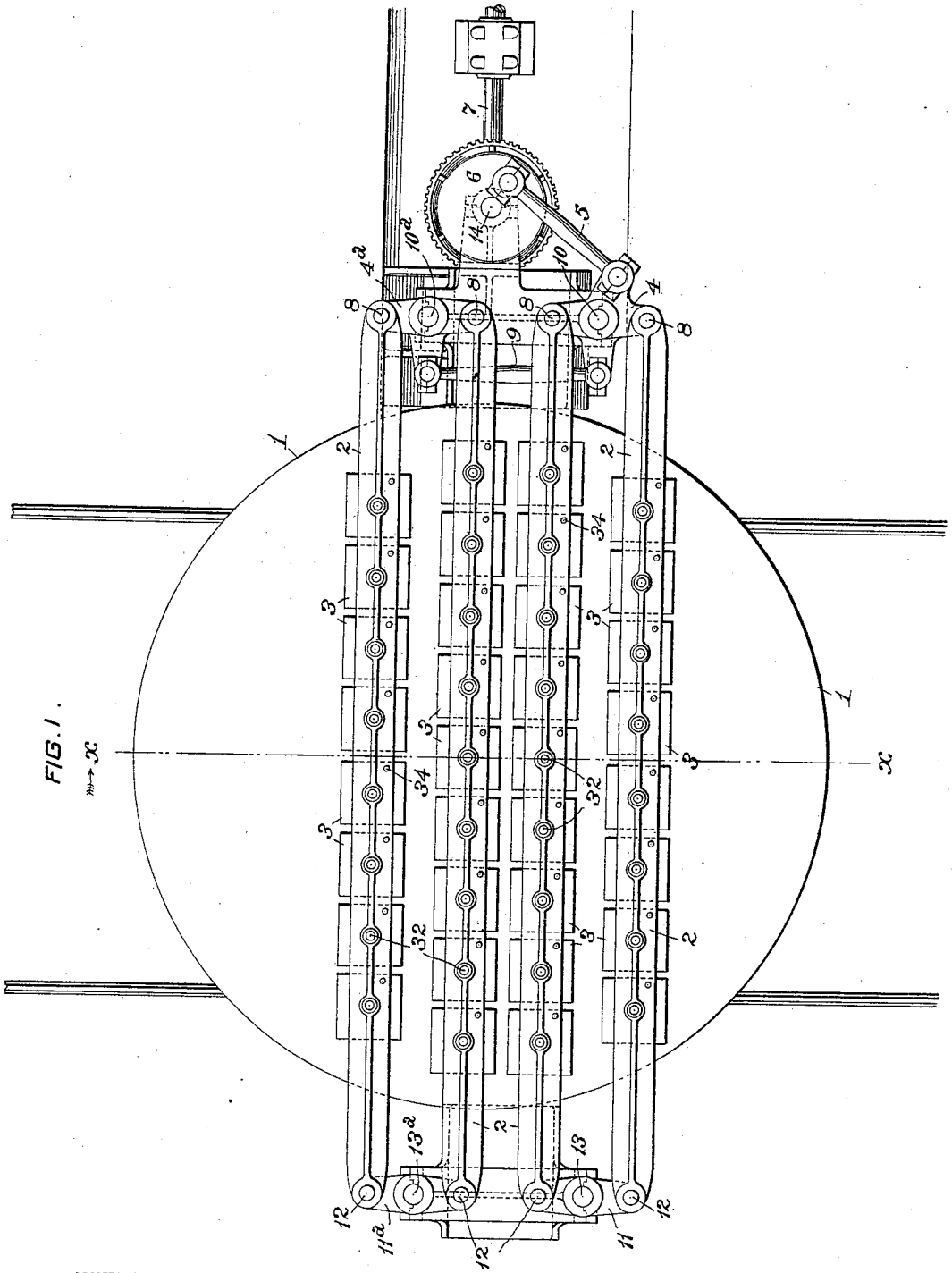



FIG. 1.

WITNESSES:

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GLASS GRINDING AND POLISHING MACHINE.

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(No Model.) 3 Sheets—Sheet 2.

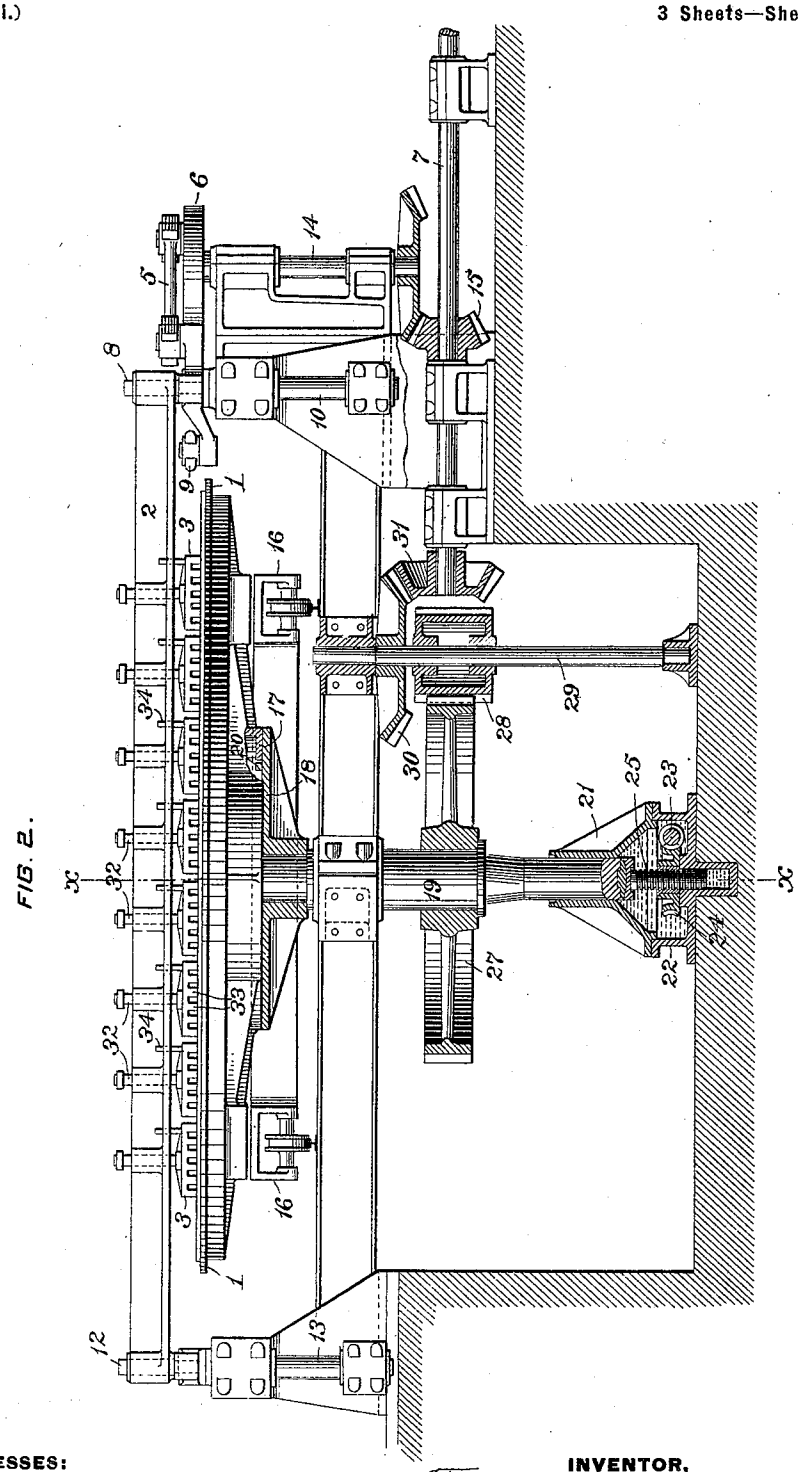



FIG. 2.

WITNESSES:

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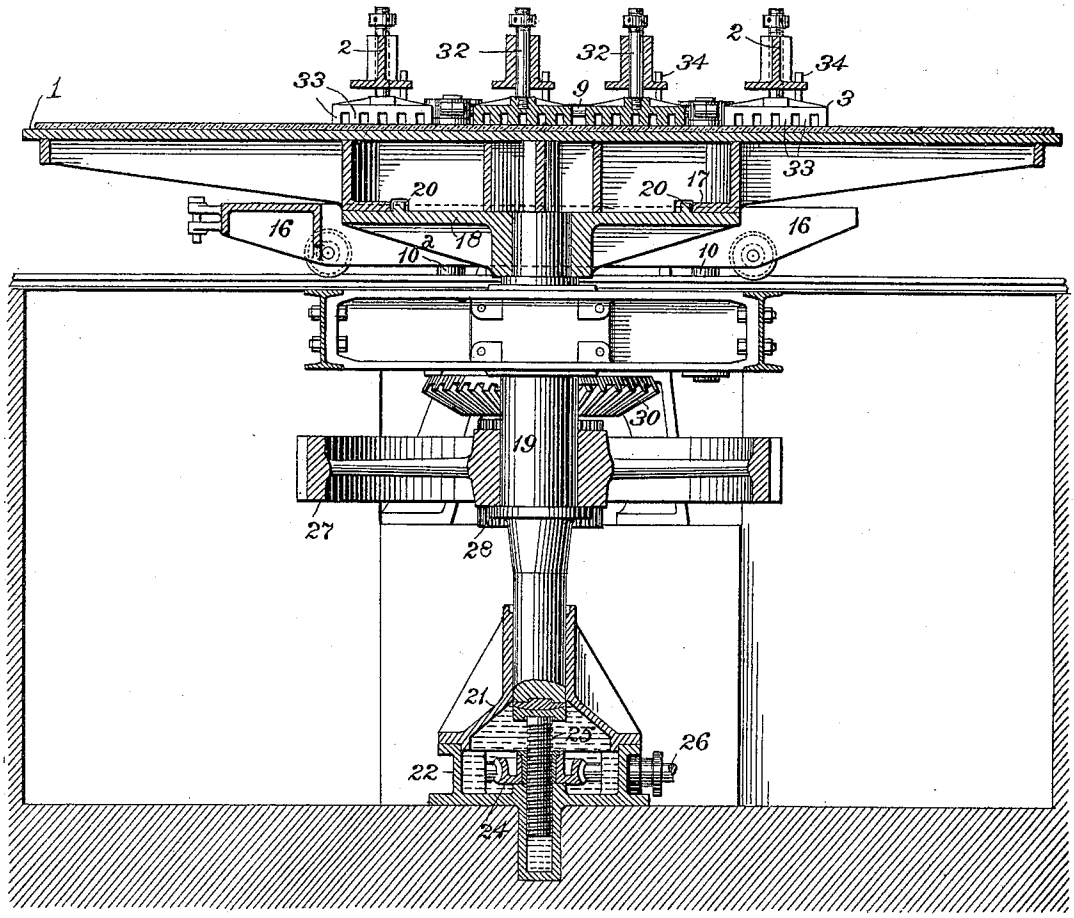
# F. F. FISCHER.

## GLASS GRINDING AND POLISHING MACHINE.

(Application filed Aug. 23, 1898.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 3.




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# UNITED STATES PATENT OFFICE.

FREDERICK F. FISCHER, OF PITTSBURG, PENNSYLVANIA.

## GLASS GRINDING AND POLISHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 619,399, dated February 14, 1899.

Application filed August 23, 1898. Serial No. 689,283. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK F. FISCHER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Glass Grinding and Polishing Machines, of which improvement the following is a specification.

The object of my invention is to provide an improvement in grinding and polishing machines; and to this end my invention consists in a new and improved machine for grinding or polishing glass or other material and in certain combinations and features of construction, all as hereinafter set forth.

In the accompanying drawings, Figure 1 is a plan view of a machine constructed in accordance with my invention; Fig. 2, a view of the same machine, partly in elevation and partly in section; and Fig. 3, a section on the plane of the line $x$ $x$ in Figs. 1 and 2, but on a somewhat larger scale.

My invention provides means specially adapted for grinding and polishing plate-glass, although it may be employed on other material either for grinding or polishing.

As shown in the drawings, I employ a rotary table 1, on which the material to be operated on is secured, and in combination therewith I employ a beam or carrier 2, to which the runners 3 or other rubbing devices are connected and by which they are moved over the surface to be ground or polished and which is given such a movement as to produce a complex relative movement of the rubbing devices and of the material acted on, by which a very high degree of efficiency is secured. This is an important feature of my invention and has been found in practice to produce improved results in the quality of the work done and economical advantages in the time required in the way of hand labor during the operation and in the quantity and quality of the abrading material required to do the work.

The important feature of my invention by which the peculiar relative movement of the rubbing-surfaces is effected is not confined to the employment of either runners for grinding or buffers for polishing, which form separate parts of the machine, but is applicable where the abrading-surface is continuous and formed on or secured to the beam, bar, or other structure by which the desired movement is effected.

In accordance with my improvement the table 1, on which the glass or other material is carried, is rotated continuously and the beams 2 and the runners 3 are moved so that each point in them is moved in an arc of a circle with a reciprocating motion. This movement of the beams is secured by connecting the ends of the beams to the bell-cranks 4 and $4^a$, which, as shown in the drawings, are oscillated by the movement of a rod 5, connected at one end to a rotating disk 6, driven from a main shaft 7. In the drawings two pairs of beams are shown connected by pins 8 to the bell-cranks 4 and $4^a$, and the bell-cranks 4 and $4^a$, which are connected by a link 9, are secured to and oscillate with the shafts 10 and $10^a$, respectively. The opposite ends of the beams are connected by pins 12 to the levers 11 and $11^a$, which are mounted on vertical shafts 13 and $13^a$. The rotating disk 6 is fixed on a shaft 14, which is driven from the main shaft 7 by the bevel-gears 15 and 14.

The table 1 is adapted to be rotated from the main driving-shaft 7 and to be raised to any extent necessary to bring it into the desired position for the performance of the work or lowered onto the truck 16 when it is desired to remove it from its position under the beams and runners. My invention provides new and improved means by which the table may be raised and lowered and supported in position and means whereby the vertical movement of the table may be effected without uncoupling the driving mechanism.

As shown in Figs. 2 and 3, the lower side of the table is formed with a flange 17, which rests on a plate 18, secured to the top of a vertical shaft 19, which is adapted to be moved up and down for the purposes of raising and lowering the table 1. The table is centered and held in position by projections 20 on the plate 18, which may extend all the way around and form an annular flange, if preferred. The lower end of the shaft 19 extends downward through the cylindrical opening in the cover 21 of a casing 22, which is

kept filled with oil, and which contains a worm-gear 23 24, with a screw 25 fitting into and passing through a screw-threaded opening in the worm-wheel. The lower end of the shaft 19 rests on a head or cap on the screw 25, and the shaft 19 is raised and lowered by rotating the worm-shaft 26 and the worm-wheel 24, the rotation of the worm-wheel in one direction or the other causing an upward or downward movement of the screw 25.

The bearings for the worm-shaft 26 in the casing 22 are so formed as to prevent the passage of oil therethrough, and the interior of the casing is kept filled with oil, so that the parts are well lubricated.

A gear-wheel 27 is keyed on the shaft 19 and meshes with a pinion 28 on a shaft 29, having a bevel gear-wheel 30, secured thereon and meshing with another bevel gear-wheel 31 on the main driving-shaft 7. By means of this construction the shaft 19 and the table 1 are driven from the main shaft 7; but they may be driven, if preferred, by another shaft, which receives its motion from the same or from a different source of power from that which actuates the shaft 14 and the beams 2. The important feature of the mechanism for driving the shaft 19 and table 1 is the means by which the shaft is permitted to move up and down without any uncoupling or disengaging of the driving mechanism. For this purpose the pinion 28, which is keyed on the shaft 29, is of greater breadth than the gear-wheel 27—that is, the vertical length of the teeth on the pinion is greater than the vertical length of the teeth on the gear-wheel 27—so that the gear-wheel 27 and with it the shaft 19 and the table may be moved vertically in either direction without disengaging the teeth on the wheel and pinion, and consequently without any danger of breaking any of the teeth.

In my improvement the beams are operated from the main shaft by means of a construction which is comparatively simple and inexpensive, and the beams are so connected with the actuating mechanism that each beam moves in a direction opposite to and is balanced by the other beam of the same pair. This is an important feature in large machines, where the total weight of the beams and runners or buffers is considerable, since it permits a much lighter construction of the actuating mechanism than could be otherwise employed, and it is also of importance on account of the action of the runners or buffers on the glass or other material which is being operated upon, since the pull or push on the glass or other material in one direction by one of the beams is counteracted by the pull or push of the other beam of the same pair in the opposite direction, and this is true not only of the longitudinal but also of the lateral movement of the beams.

With my improved construction the connecting-rod 5, the link 9, the bell-cranks and levers at both ends of the beams, and the shafts 10, $10^a$, 13, and $13^a$ may be made comparatively light in construction, and all are operated from the vertical shaft 14 without any such complication of mechanism as would be required if the ends of the beams were given a complete circular motion. In that case each beam would have to be driven separately and would require to be driven from each end, so that there would be at least twice as many rotating shafts as there were beams, even if each beam were actuated by a separate motor, and it is evident that they could not otherwise be actuated without greatly increasing or complicating the gearing or intermediate driving mechanism. In my improvement the levers 11 and $11^a$ do not form part of the driving mechanism, but merely act through their connections to guide the ends of the beams to which they are connected.

The advantages of my improved construction, by which each point in the beams and in the runners or buffers is moved in an arc of a circle, consist not merely in the features of construction referred to, but also in the improved efficiency of the machine in the operation of grinding and polishing. If the beams and the runners or buffers be given a complete circular motion while the table is rotating, a part of the movement of the runners or buffers will be with and a part against the movement of the table. When the runners or buffers move in the same direction as the part of the table above which they are placed, there is very little grinding or polishing effect, and when they move in a direction opposite to but nearly parallel to that in which the portion of the table below moves the effect is about the same as would be produced by two oppositely-reciprocating surfaces. It has been demonstrated in practice that such a relative movement will not produce good results and that it requires a long time to produce even moderately good results. If the beams were given a complete rotary movement at their ends, the undesirable and inefficient relative movements referred to would occur when the ends of the beams were moving in a direction tangent to or approximately tangent to the circles described by them, and in my improvement these movements have been eliminated by limiting the movement of the beams to a travel over an arc of a circle whose chord is parallel to or approximately parallel to the longitudinal axis of the beam, so that a reciprocating movement of considerable amplitude is compounded with a curvilinear movement, by which the beam is at the same time given a comparatively small lateral movement. The result is that a highly-efficient relative movement of the rubbing-surfaces is produced with a simple, inexpensive, and well-balanced mechanism.

The combined lateral and reciprocating movement of the beams and runners or buffers produced by my construction, in combi-

nation with the rotary movement of the table, is found to produce a much better effect than a reciprocating motion in a straight line, as it increases the complexity of the relative motion and prevents any lining or ruling effect on the surface to be ground or polished. The alternate lateral movements of the runners and buffers toward and away from one another and their curvilinear movement all tend to produce a better distribution and action of the sand or other abrading material than can be obtained with a beam reciprocating in a straight line. If the beams were moved in straight lines, they would require to be supported on rollers at both ends and would require the employment of connecting-rods for moving them. The beams being supported on the levers or bell-cranks 4 and $4^a$ at one end and on the levers 11 and $11^a$ at their opposite ends, the employment of connecting-rods connected to their middle portions, as usual, is unnecessary, and the beams being relieved of the weight and the thrust of the connecting-rods are not so liable to sag down in the middle.

Another advantage of my construction is that the beams are not liable to be bent or buckled, as in some constructions, since they are driven from one end only, the levers 11 and $11^a$ acting as guides only. This undesirable effect would be liable to occur in any constructions where the two ends of the beams were connected to and driven by cranks whenever any adjustment of the bearings became necessary.

In the construction shown in the drawings the machine is provided with a number of separate runners 3 for grinding, which are connected to the beams 2 by bolts 32, which permit a vertical movement of the runners, and the lower portions of the runners, which rub on the surface to be ground, are formed of projections or stud-like parts 33, with spaces between them, through which the sand, emery, or other abrading material may circulate. In order to prevent turning of the runners, pins 34 are fixed on the runners and extend up through holes in the flanges of the beams 2.

I claim as my invention and desire to secure by Letters Patent—

1. In a grinding, or polishing machine, the combination, with a rotary table, of rubbing devices, and means whereby a reciprocating curvilinear movement is given to the rubbing devices.

2. In a grinding, or polishing machine, the combination, with a rotary table, of beams, bars, or carriers, for carrying grinding, or polishing devices, and means for moving the ends of the beams, or bars, with a reciprocating curvilinear movement.

3. In a grinding, or polishing machine, the combination, with a rotary table, of a pair of beams, or bars, having their ends connected to cranks, or levers, by which they are reciprocated in opposite directions in an arc of a circle.

4. In a grinding, or polishing machine, the combination, with a rotary table, of two pairs of beams, or bars, for carrying rubbing devices, cranks, or levers, to which the ends of the beams are connected, and connections by which both pairs of beams are actuated from the same source of motion.

5. In a grinding, or polishing machine, the combination, with a rotary table, of a rotary shaft, two connected rock-shafts, actuated from the rotary shaft, oppositely-placed cranks on the rock-shafts, and beams connected to the cranks and carrying rubbing devices which are moved in an arc of a circle.

6. In a grinding, or polishing machine, the combination, with a rotary table, of a rotary shaft adapted to move longitudinally in its bearings, a gear-wheel rigidly fixed on the shaft, and a pinion having teeth meshing with the teeth on the gear-wheel and so formed as to permit longitudinal movement of the shaft while the gear-wheel is engaged with the pinion.

7. In a grinding, or polishing machine, the combination, with a rotary table, of a rotary shaft, a screw-threaded bolt or shaft forming a support for the rotary shaft, a worm-wheel on the screw-threaded bolt or shaft, and a worm gearing with the worm-wheel and adapted by its rotation to turn the worm-wheel and thereby to raise or lower the rotary shaft.

8. In a grinding, or polishing machine, the combination, with a rotary table, of a longitudinally-movable shaft on which the table is mounted, a driving-shaft, and toothed gearing between the driving-shaft and the longitudinally-movable shaft which permits vertical movement of the table without disengaging the gearing.

9. In a grinding, or polishing machine, the combination, with a rotary table, of a vertically-movable shaft, a bearing therefor, a chamber for containing material to lubricate the bearing, and a gearing in the chamber for raising and lowering the shaft.

In testimony whereof I have hereunto set my hand.

FREDERICK F. FISCHER.

Witnesses:
EDWARD B. VAILL,
ETHEL GALLAGHER.