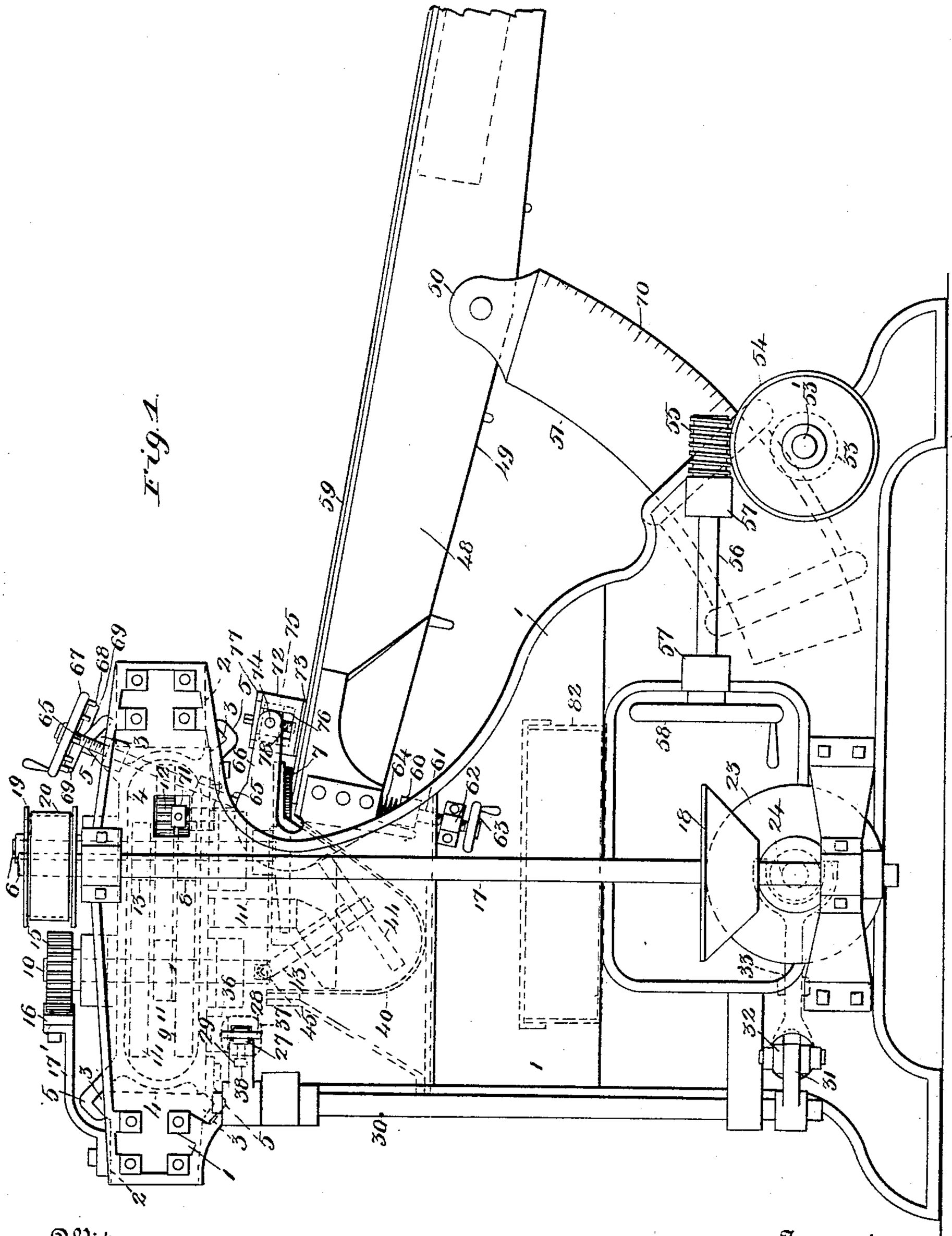
(No Model.) 4 Sheets—Sheet 1.

R. A. SCHLEGEL.

MACHINE FOR BEVELING GLASS.

No. 591,936. Patented Oct. 19, 1897.

Fig. 1.



Witnesses
Alfred A. Mulhey
Chas Barrett

Inventor
Robert A. Schlegel.
By his Attorneys
Kilgore & Starck

(No Model.) 4 Sheets—Sheet 2.

R. A. SCHLEGEL.

MACHINE FOR BEVELING GLASS.

No. 591,936. Patented Oct. 19, 1897.

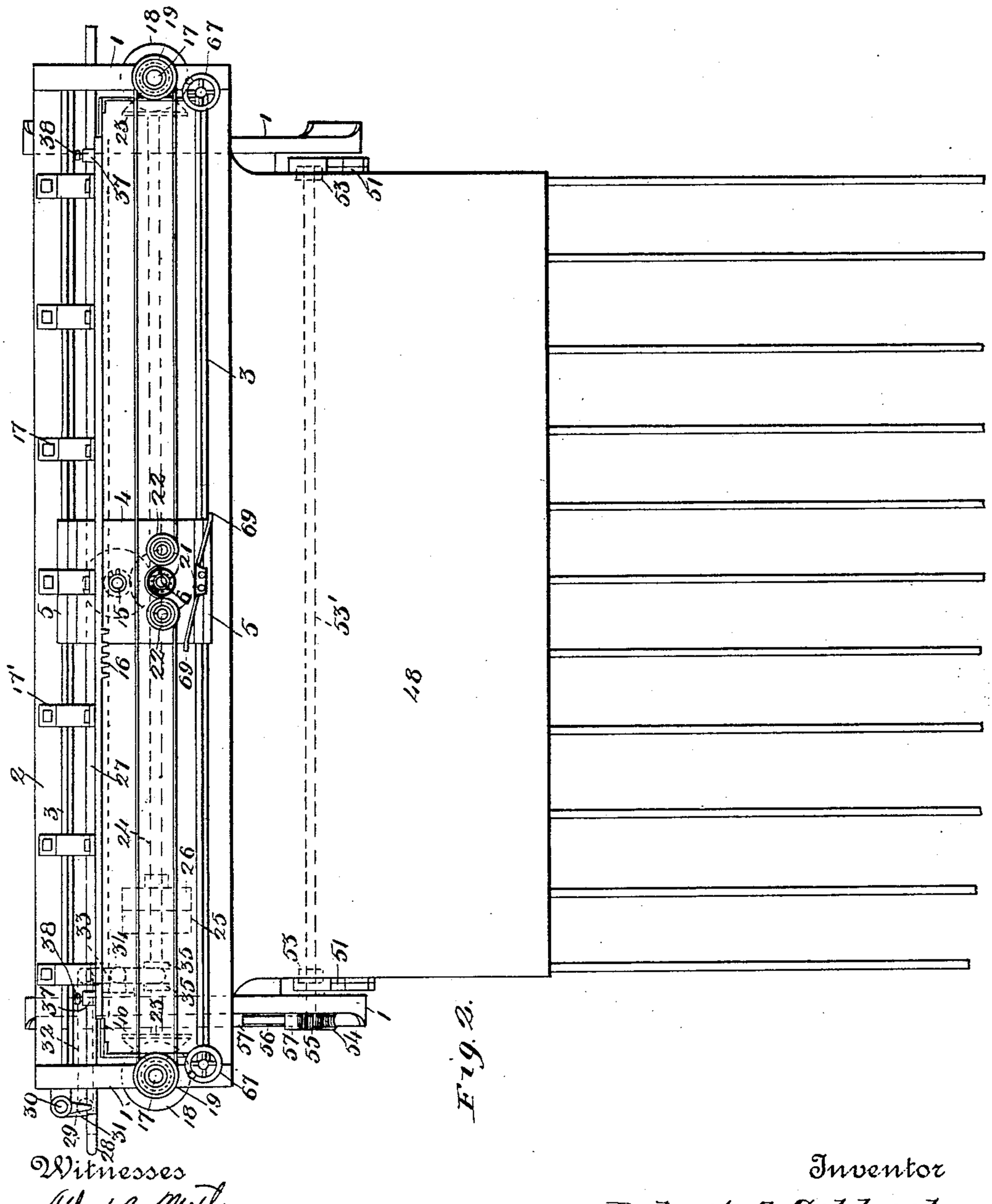


Fig. 2.

Witnesses
Alfred A. Mathey
Chas Barrett

Inventor
Robert A. Schlegel.
By his Attorneys
Keller & Starck

(No Model.)

4 Sheets—Sheet 3.

R. A. SCHLEGEL.

MACHINE FOR BEVELING GLASS.

No. 591,936. Patented Oct. 19, 1897.

Fig. 3.

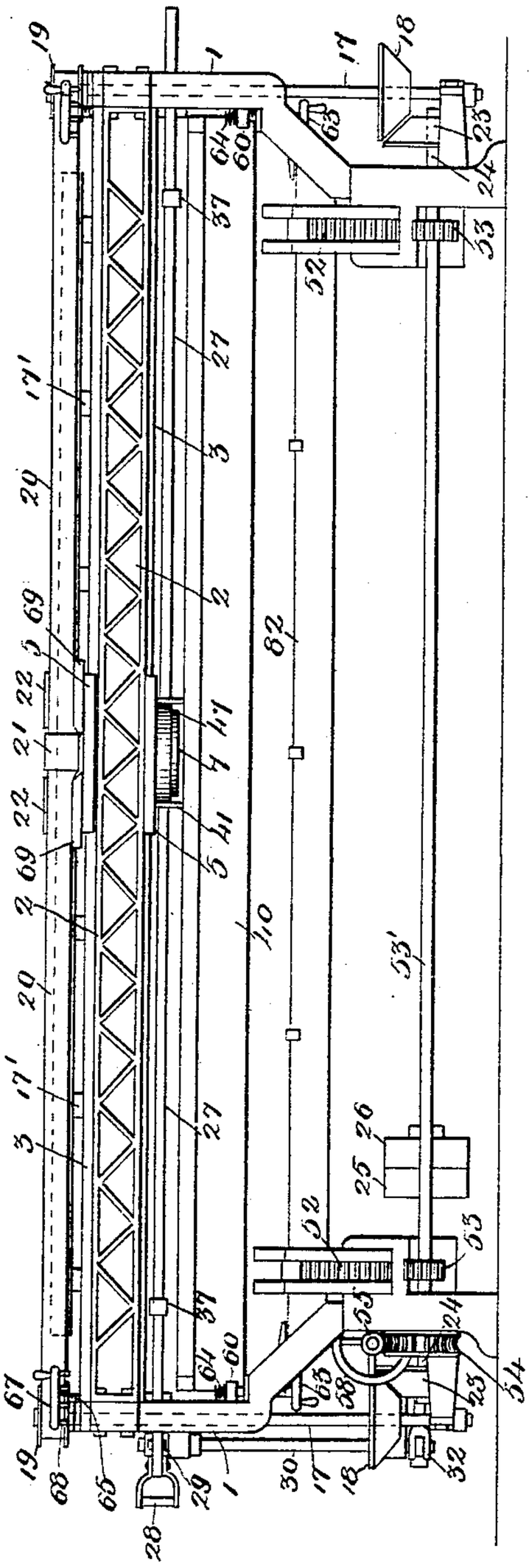


Fig. 6.

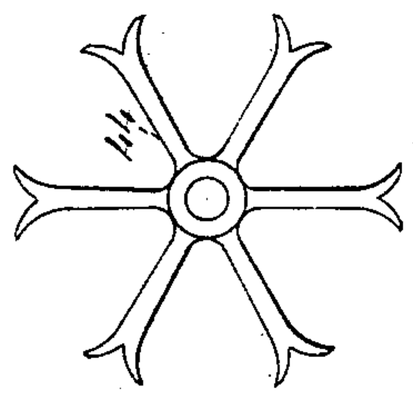


Fig. 5.

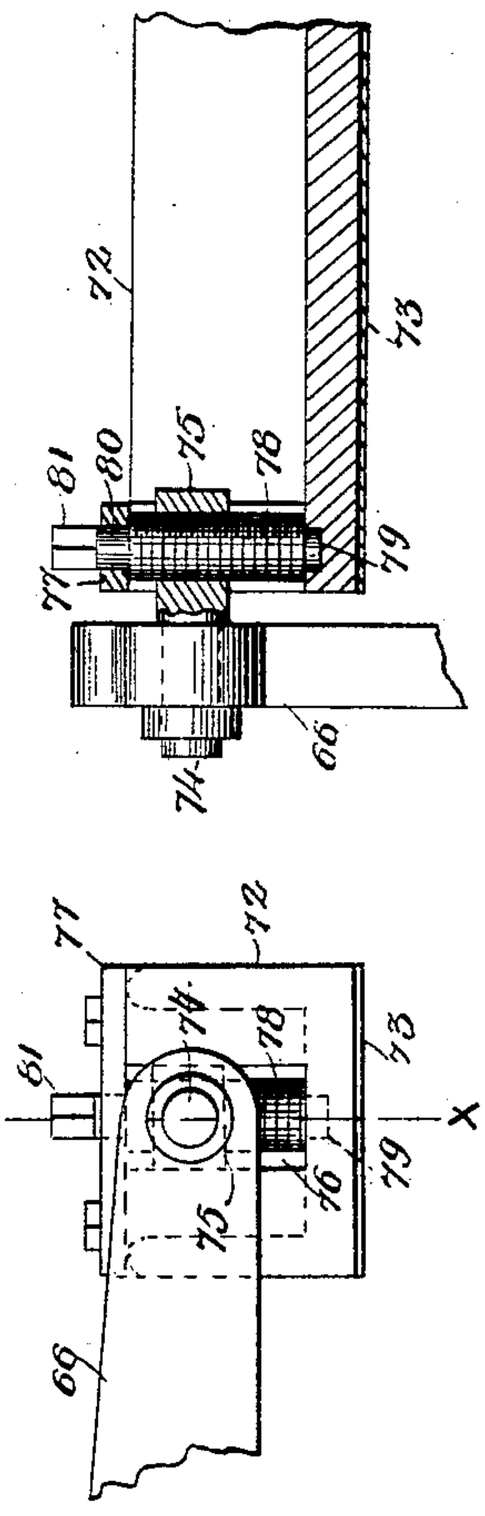


Fig. 4.

Witnesses
Alfred A. Mathey
Chris Barlett

Inventor
Robert A. Schlegel.
By his Attorneys
Miller & Starck.

(No Model.) 4 Sheets—Sheet 4.

R. A. SCHLEGEL.

MACHINE FOR BEVELING GLASS.

No. 591,936. Patented Oct. 19, 1897.

Fig. 8.

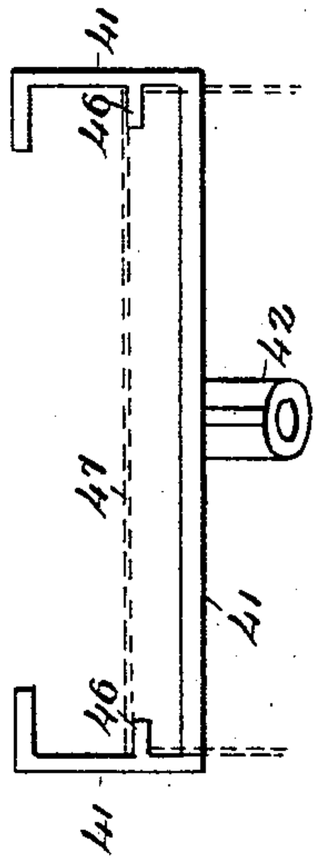
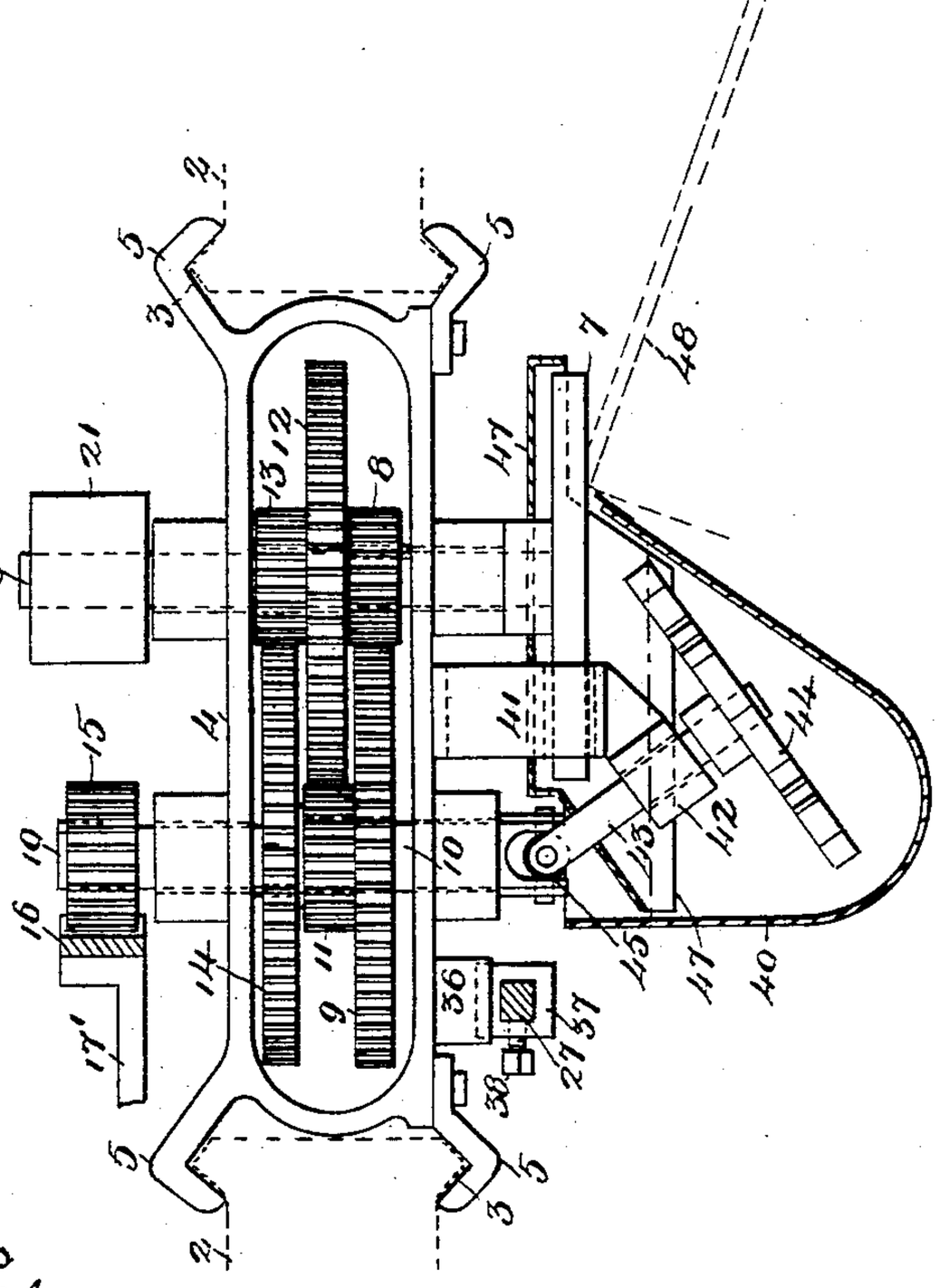


Fig. 7.



Witnesses
Alfred A. Mathey
Chris Barlett

Inventor
Robert A. Schlegel.
By his Attorneys,
Keller & Starck

UNITED STATES PATENT OFFICE.

ROBERT A. SCHLEGEL, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE SCHLEGEL PATENT BEVELING MACHINE COMPANY, OF MISSOURI.

MACHINE FOR BEVELING GLASS.

SPECIFICATION forming part of Letters Patent No. 591,936, dated October 19, 1897.

Application filed December 21, 1896. Serial No. 616,530. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. SCHLEGEL, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Machines for Beveling Glass, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in machines for beveling glass plate; and it consists in the novel arrangement and combination of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a top plan view thereof. Fig. 3 is a front view with the supporting table or bed removed. Fig. 4 is an enlarged view of one end of the bar by which the plate is firmly held against the table and the supporting-arm therefor. Fig. 5 is a section on line *x x* of Fig. 4, but showing an end view of the arm. Fig. 6 is a detail plan view of the rotating armed disk for feeding the sand to the grinding disk or block. Fig. 7 is a side elevation of the reciprocating carriage, showing the sand-trough in section; and Fig. 8 is a front elevation of the bracket carried by the carriage for supporting the spindle of the sand-feeding disk.

The present invention is an improvement on the construction of beveling-machine covered by United States Letters Patent granted to me on the 3d day of December, 1895, and numbered 550,695, the features of improvement residing, primarily, in the means for automatically feeding the grinding material or sand to the disk by which the bevel is cut on the glass plate; in the means for preventing undue scattering of the sand as it is feed from the trough containing the same; in the means for gradually feeding the plate against the grinding disk or block; in the means for regulating the rapidity of such feed; in the means for limiting or arresting the feed at the close of the beveling operation, and in further details whose advantages will be better apparent from a detailed description of the machine.

Like the particular construction of the patented device above referred to, the present machine comprises generally a suitable frame; a pivoted or tilting table carried by said frame; means for raising and lowering the pivotal line of said table; means for controlling the angle or pitch of the table and consequently the pitch of the edge of the plate glass carried thereby; a suitable carriage carrying a rotating grinding-disk for operating against the edge of the glass plate; suitable mechanism for rotating the grinding-disk and impelling the carriage; suitable reversing mechanism controlled by the movement of the carriage; and in addition the present device consists of a special rotating radially-armed disk for feeding the sand or other material to the grinding-disk; of a spring-actuated feeding device for the table and glass plate mounted thereon; of a feed-regulating device automatically actuated by the travel of the carriage; of a screw for arresting the feed at the close of the grinding operation, and of further and other details to be particularly specified in the detailed description, which is as follows:

Referring to the drawings, 1 represents the terminal supporting-standards of the frame of the machine, the same being connected at their upper ends by the longitudinal beams 2 2, the inner faces of each of which are provided at their lower and upper edges with the bevel tracks or guideways 3 3, over which is adapted to reciprocate or ride the transverse tool-carriage 4, having terminal arms 5 embracing the bevel-tracks above referred to. Vertically mounted in suitable bearings of said carriage is the grinding-disk shaft 6 whose lower end carries a grinding-disk 7. Keyed to the shaft 6 within the housing formed by the framework of the carriage is a pinion 8, which meshes with the teeth of a large gear-wheel 9, loosely revolving or passed over a second shaft 10, mounted in the carriage parallel to the disk-shaft, the said gear-wheel 9 having formed integral therewith a pinion 11, which in turn meshes with the teeth of a large gear-wheel 12, carried loosely on the shaft 6. The gear-wheel 12 has formed integral therewith a pinion 13, which meshes with the teeth of a large gear-wheel 14, keyed to the shaft 10. By this system of differential gearing a rapid rotation imparted to the shaft 6 is transformed into a comparatively slow one when it reaches the shaft 10. The upper end of the shaft 10 carries a pinion 15, which meshes with a rack-bar 16, car-

ried by the free ends of the arms 17′, mounted on one of the longitudinal beams 2. It is apparent, therefore, that as rapid rotation is imparted to the disk-shaft 6, the carriage 4 in which said shaft is mounted is caused to travel slowly along the tracks 3, being impelled along said tracks by the pinion 15, meshing with the rack-bar 16. Inasmuch as the edge of the glass to be beveled must be swept over by the grinding-disk 7 several times before the beveling of the same is completed, it is apparent that some provision must be made for reciprocating the carriage back and forth in the path of the edge of said glass to be beveled, and to reverse the direction of rotation of the grinding-disk with each reciprocation. It is apparent from the foregoing gear construction that if the grinding-disk be reversed at the end of each stroke of the carriage, this action would reverse the direction of rotation of the pinion 15 and cause the carriage to travel or reciprocate in the opposite direction. It is therefore sufficient to provide the necessary mechanism for reversing the rotation of the grinding-disk 7 at the end of each stroke of the carriage carrying said disk. This is accomplished by suitable reversing mechanism coöperating with the mechanism which imparts motion to the disk-shaft 6, and which jointly cooperate as follows:

Mounted vertically in suitable bearings at the opposite ends of the frame of the machine are the shafts 17, their lower ends carrying bevel friction gear-wheels 18 and their upper ends being provided with the flanged belt-pulleys 19, over which is stretched the drive-belt 20, one of the laps of said belt passing between the pulley 21, carried at the upper end of the disk-shaft 6, and the idle-pulleys 22, revolving in suitable bearings in the carriage-frame. The friction between the belt-lap and the pulleys is sufficient, during the travel of the belt, to impart rotation to the pulley 21, and consequently to the disk-shaft 6, the direction of rotation of said shaft and consequent direction of rectilinear travel of the carriage depending of course on the direction in which the belt is driven. The belt is driven first one way and then the other by the following mechanism: It has been stated that the lower end of each shaft 17 carries a bevel friction gear-wheel 18. Now, each of these bevel-wheels 18 alternately is brought into engagement with a terminal friction bevel gear-wheel 23, carried at opposite ends of the main drive-shaft 24, provided with fast and loose pulleys 25 and 26, respectively, said shaft 24 being susceptible of a slight longitudinal reciprocating motion in its bearings, a motion which will be just sufficient to bring into engagement with the bevel-wheel 18 first one of the terminal bevel-wheels 23 at one end, and then bring the corresponding parts into engagement at the opposite end of the machine. It is obvious that this alternate engagement and disengagement of the friction-bevels 23 and 18 will set into motion in one direction first one of the shafts 17 and then the other in a reverse direction, and these actions in turn will cause the drive-belt to travel, and the grinding-disk to rotate, first in one direction and impel the carriage 4 along its tracks in one direction, and then to reverse the motion of these parts and cause the carriage to reciprocate in the opposite direction.

The mechanism by which the rotating drive-shaft 24 is automatically brought into engagement first with one of the shafts 17 and then with the other is as follows, the said mechanism being denominated the "reversing" mechanism: Disposed longitudinally within suitable bearings of the machine-frame is a shifting bar 27, provided with a suitable handle 28 at one of its outer projecting ends. Within a suitable notch in said bar there cooperates the free end of an arm 29, carrying the upper end of a vertically-mounted rock-shaft 30, said shaft being carried in suitable bearings on the outside of the frame, and the lower end of said rock-shaft having secured thereto a second arm 31, to the free end of which is pivotally secured a connecting-rod 32, whose opposite end is pivotally secured to one end of a shifting lever 33, pivoted in a suitable bearing 34, carried by the machine-frame, the free end of said lever embracing the shaft 24, between the collars 35. From the connections just described, it is apparent that if the bar 27 be shifted sufficiently in its bearings to rock the shaft 30 through the medium of the arm 29, the shaft 30 will oscillate the arm 31, causing the latter to tilt the lever 33, under which circumstances the free end of said lever will longitudinally shift the drive-shaft 24 within its bearings a sufficient distance to cause one or the other of the friction bevel-wheels 23 to engage with its corresponding bevel 18, the particular bevel 18 engaged depending on the direction in which the shaft 30 is rocked. In other words it depends on the direction in which the bar 27 is shifted.

In the operation of the machine, the shifting of the bar 27 first in one direction and then in the other is accomplished by the traveling carriage at the end of its stroke as follows: The carriage is provided with a depending lug 36, which is adapted to strike or impinge against an adjustable dog 37, held in any desirable position along the bar 27 by means of a binding-screw 38. It is apparent that the moment the lug 36 strikes one of the dogs 37 it will shift the bar 27 sufficiently to cause the latter, through the intermediate connections already described, to bring into engagement one of the bevel friction gear-wheels 23 of the drive-shaft with its coöperating bevel-wheel 18. Then when the carriage strikes the dog at the opposite end, the friction gear-wheels at that end will be brought into engagement and the mechanism will be reversed, causing the carriage to travel in the reverse direction and the grind-

ing-disk to revolve in the opposite direction. This can be kept up indefinitely until the mechanism is stopped by the operator. The lengths of the strokes of the carriage will depend on the distance that the dogs 37 are spaced apart on the bar 27, and this distance will in turn depend on the width or size of the plate of glass to be ground and beveled. To stop the machinery, the bar 27 can be seized by the handle 28 and shifted to a position as to just disengage both the bevels 23 of the drive-shaft from the bevels 18 on either side of the machine; or the drive-belt (not shown) which operates the pulleys 25 and 26 could be shifted from the fast to the loose pulley, in which event the machinery would also come to a stop.

In the line of travel of the carriage and below the rotating disk 7 is disposed a trough 40 for holding the grinding material—such as filings, sand, and the like. Secured along the under surface of the carriage and to one side of the disk-shaft 6 is a bracket 41, within the compass of which the grinding-disk revolves. Depending from the under surface of the medial portion of the base thereof is an angular bearing 42, which is adapted to support the spindle 43 of the revolving radially-armed sand-feeding wheel 44, the free ends of whose arms are split so as to better seize and force the sand or other suitable grinding material carried in the trough against the under surface of the grinding-disk, it being remembered that the wheel 44 is substantially wholly or partially submerged in the grinding material contained in the trough. The upper end of the spindle 43 is connected by a universal joint 45 to the lower end of the shaft 10, mounted in the carriage. Carried by the opposite vertical walls of the bracket 41 and disposed along the inner surfaces thereof are lugs or ledges 46, serving to jointly support the protecting casing or hood 47, surmounting the grinding-disk and the feed-wheel, it being understood that the said hood is provided with suitable openings for the free passage therethrough of the shaft 6 and spindle 43. The said feeding-wheel is disposed at an angle to the plane of rotation of the grinding-disk, and is so mounted as to direct the sand against the under surface of the grinding-disk adjacent to the line or surface of contact of the latter with the edge of the glass plate operated on. It is clear that as the carriage travels back and forth over the trough, the radiating arms of the feed-wheel will throw the grinding material against the grinding-disk, the hood 47 intercepting such material and preventing undue scattering and loss thereof; and it is obvious that the grinding material will in turn be carried up under the rotating disk and between it and the plate by the centrifugal action of the disk.

It is now in order to describe the operating-table on which the plate-glass is mounted; the means for varying the elevation of said table; the means for adjusting the angle of the table by which the pitch or angle of the bevel edge of the glass is determined; the means for automatically feeding the free edge of the table and plate mounted thereon against the grinding-disk; the means for regulating the amount of said feed, and the device for limiting or arresting the feed upon completion of the grinding operation. The table 48 is a flat bed having supporting ribs or beams 49. To each of the lateral or outer ribs is pivoted, by means of a forked connection 50, a segmental supporting-arm 51, whose lower end is adapted to enter a suitable cavity or depression formed at the base of the frame for its reception, the outer curved surface of the arm being provided with a toothed rack 52, which is adapted to coöperate with the pinion 53, forming part of or secured to the shaft 53′ of a worm gear-wheel 54, operated by a worm-pinion 55 at one end of a shaft 56, mounted in suitable bearings 57 along the base of the outside of the frame, said shaft being actuated by a hand-wheel 58, carried at the opposite end thereof. It is clear that if the hand-wheel 58 is turned in one direction or the other, the table will be raised or lowered at its pivotal points according to the direction in which the hand-wheel is turned. The table is pivoted along a line above its center of gravity, the tendency of the lower end thereof accordingly being to drop and keep the upper end of the glass plate 59, mounted thereon, in contact with the under surface of the grinding-disk 7. The pressure of the edge of the glass plate against the grinding-disk, incident to the tilting tendency of the table, is enhanced and made more positive by the yielding feeding devices mounted on each side of the frame in the shape of a block 60, carried at the upper end of a rotatable stem 61, having a screw-threaded portion operating in a corresponding bearing 62 and controlled by a hand-wheel 63, a coiled spring 64 being interposed between the block 60 and the under surface of the tilting table, (the spring being in fact carried by the block.) The tendency of the springs 64 is to force the upper swinging end of the table and plate carried thereon against the grinding-disk, and with a force dependent on the degree of initial compression imparted to the springs 64, which will of course depend on the proximity to which the blocks 60 had been originally screwed toward the table before the beveling operation was begun, and this proximity of course depending on the thickness and character of the plate to be operated on—a fact ascertained by actual experience. The rotatable and adjustable stem 61, with its block 60 and spring 64, I denominate for convenience the "automatic feeding device;" but to avoid a too rapid feed of the glass against the grinding-disk consequent upon the resilient action of the springs 64 and the tilting tendency of the table, I provide a feed-regulating device actuated automatically by the

carriage, which determines the rapidity of approach or feed of the upper edge of the plate in the direction of the grinding-disk. This feed-regulating device may be described as follows: Mounted in suitable bearings at each end of the frame, and in the path of the reciprocating carriage, is a rotatable staff or rod 65, whose inner end bears against the upper surface of the arm 66, carried at each end of the upper edge of the table. The upper portion of each staff is screw-threaded, the said screw-threaded portion operating in a similar screw-threaded bearing, and the upper end of the staff being provided with a hand-wheel 67, along the under surface of whose rim are formed a series of depending pins 68, adapted to be struck *seriatim* by the free end of one of the yielding arms 69, secured to the reciprocating carriage. The arm 69 in thus striking the pin at the end of one stroke or reciprocation of the carriage advances or rotates the hand-wheel 67 sufficiently to bring the next succeeding pin into position to be struck by the same arm on the return stroke of the carriage. The carriage in its reciprocations thus alternately operates first one hand-wheel and then the other, thus gradually unscrewing the staffs or rods 65 and permitting the feeding of the table and plate carried thereby toward the grinding-disk just so fast and no faster. The arms 69 are made yielding slightly, so that their free ends can readily pass the pin, which as a result of the impact was shifted to a position to be operated on with the next succeeding stroke of the carriage. Of course, in starting to grind any particular plate of glass, the staffs 65 are first screwed down by hand to the proper position, the lower ends thereof of course always bearing against the arm 66, whatever may be the initial angle of the table. It may be stated in passing that a heavy plate of glass mounted exclusively above the pivotal axis of the table would have a tendency to shift the center of gravity of the table, and might even cause the latter to tend to tilt away from the grinding-disk, a tendency which of course would be arrested and overcome by the feeding mechanism bearing against the under surface of the upper end of the table.

The angle of the bevel edge of the plate will of course depend on the initial position of the line connecting the pivotal supports of the arms 51 and on the degree of feed or tilting of the table thus supported. This angle is determined by the index 70, marked along the outer edge of one of the arms 51 and coöperating with the edge of the socket in which the lower end of the arm is received, the index being first marked by careful experimentation and ascertaining beforehand the relation between any position of the pivotal axis of the table and the pitch of bevel obtained for such position.

To arrest the feed upon the completion of the beveling operation—that is, to arrest the tilting of the table altogether—I provide suitable shoulder-screws 71, mounted on each side of the frame, the bases of the said screws being adapted to bear against the arms 66 of the table and arrest further tilting of the latter the moment the plate has been beveled to the desired degree.

To firmly hold the plate-glass on the bed or table, I place a transverse retaining channel-bar 72, provided at the outer surface of its base with a cushioning-layer of rubber or equivalent material 73, adapted to come in contact with the plate. The said bar is suspended between the free ends of the arms 66, and in a mechanical manner, whereby the same can be readily adjusted to and from the table for the accommodation of plates of variable thicknesses. The manner of mounting said bar is best indicated in Figs. 4 and 5. Passed through the free end of each arm 66 is the trunnion or cylindrical extension 74 of a block 75, guided between the walls of the slot 76, formed in each of the terminal walls of the bar, a cover-plate 77, spanning and covering the open end of the slot. Passed through a screw-threaded opening of the sliding block 75 is a screw 78, having a reduced basal portion or bearing 79, supported in a cavity at the base of the channel-bar and having an upper cylindrical extension 80, passing through the plate 77, the said extension 80 having a polygonal continuation 81, by means of which the screw 78 can be operated by a nut-wrench or similar tool. The plate 77 of course serves to hold the screw in place; and upon the turning of the screw in one direction or the other the position of either block 75 relatively to the base of the channel-bar is regulated, and hence the distance between the base of the channel-bar and the bed or table of the machine is carefully adjusted, the weight of the channel-bar being capable of holding the plate against the bed with any degree of firmness.

It is of course obvious that the present machine might be altered in many details without departing from the spirit of my invention.

82 represents an overflow-pan for the mixture contained in the sand-trough.

Having described my invention, what I claim is—

1. In a machine for beveling glass, a suitable traveling carriage, a grinding disk or block mounted in said carriage, and a rotating device for feeding the grinding material to the disk during the grinding action of the latter, substantially as set forth.

2. In a machine for beveling glass, a suitable carriage, a rotating grinding-disk mounted in said carriage, and a rotating wheel having a series of radiating arms mounted in the carriage and adapted to operate upon and feed the grinding material toward the disk during the rotation of the latter, substantially as set forth.

3. In a machine for beveling glass, a suitable tilting table, a traveling carriage mounted in

proximity thereto, a rotating grinding-disk mounted thereon, means for automatically feeding the edge of the plate carried by the table, into contact with the grinding-disk, and rotatable feed-regulating devices normally bearing against the table and adapted to be actuated by the carriage for regulating the rapidity of feed, substantially as set forth.

4. In a machine for beveling glass, a suitable tilting table, a traveling reciprocating carriage mounted in proximity thereto, a rotating grinding-disk mounted in the carriage, suitable springs for automatically feeding the edge of the glass mounted on the table against the grinding-disk, and means for adjusting and varying the tension of said springs, substantially as set forth.

5. In a machine for beveling glass, a suitable tilting table, a traveling carriage mounted in proximity thereto, a rotating grinding-disk mounted in the carriage, suitable springs for automatically feeding the edge of the glass mounted on the table against the grinding-disk during the rotation of the latter, means for adjusting or varying the tension of the springs, suitable rotatable staffs or rods adapted to bear against the table, and intermediate connections between the staffs and the carriage for intermittently rotating the staffs by the action of the carriage and unscrewing the same, whereby the action of the feeding devices located on the opposite side of the table may be regulated, substantially as set forth.

6. In a machine for beveling glass, a suitable frame, a tilting table mounted in connection with said frame, a reciprocating carriage carrying a grinding-disk mounted on the frame and in proximity to one end of the table, a rotatable staff at each end of the frame adapted to move by rotation in a direction parallel to itself in the nature of a screw, a hand-wheel carried at one end of each staff, a series of pins disposed along the rim of the wheel, arms carried by the carriage and extended in opposite directions, each arm adapted at the end of each stroke of the carriage to strike a pin of the wheel at that particular end of the machine, and rotate the hand-wheel and staff of which it forms a part, a distance equal to the space between any two pins, thereby gradually unscrewing the staffs, the opposite ends of the staffs being adapted to bear against the end of the table which is adjacent to the path of the carriage, and suitable feeding devices adapted to press the table and plate carried thereby against the grinding-disk, the rotating staffs being adapted to regulate the intensity and speed of feed of the table and plate mounted thereon, substantially as set forth.

7. In a machine for beveling glass, a suitable frame, a traveling carriage mounted thereon, a rotating grinding-disk mounted in the carriage and adapted to come in contact with the edge of the glass plate, a rotating sand-feeding wheel also carried by the carriage, and actuated upon the rotation of the grinding-disk during the travel of the carriage, substantially as set forth.

8. In a machine for beveling glass, a suitable frame, a reciprocating carriage mounted thereon, a rotating grinding-disk mounted in the carriage and adapted to come in contact with the edge of the glass to be beveled, a rotating sand-feeding wheel also carried by the carriage, and suitable gearing interposed between the rotating disk and the sand-feeding wheel whereby the latter is operated upon the rotation of the disk during the travel of the carriage, substantially as set forth.

9. In a machine for beveling glass, a suitable frame, a traveling carriage mounted thereon, a rotating grinding-disk carried by the carriage, a rotating wheel for feeding the grinding material to the grinding-disk, a spindle for the wheel, a bracket having a bearing for said spindle, intermediate gearing between the grinding-disk and the spindle of the sand-feeding wheel, a hood supported by the bracket and adapted to cover the grinding-disk and sand-feeding wheel, substantially as set forth.

10. In a machine for beveling glass, a suitable frame, a table or bed for the glass, arms pivoted on each side of the table, suitable sockets or cavities formed at the base of the frame for the reception of the lower free ends of the arms, a graduated index carried by one of the arms, said index coöperating with the edge of the socket through which the lower end of the particular arm passes, and suitable mechanism for simultaneously raising or lowering the arms and hence raising or lowering the pivotal axis of the table, substantially as set forth.

11. In a machine for beveling glass, a suitable frame, a tilting table mounted in connection therewith, arms disposed on each side of one end of the table, a block having a trunnion supported by the free end of each arm, a channel-bar having suitable slots or guideways for the blocks, a screw passed through each block, the base of the screw being adapted to be supported at one end by the base of the channel, a cap-plate spanning the open end of the slot or guideway adapted to hold in place the opposite end of the screw, whereby upon the turning of the screw the position of the block is shifted and hence the position of the channel-bar relative to the table is adjusted, substantially as set forth.

12. In a machine for beveling glass, a suitable sand-feeding wheel comprising a series of radiating arms, the free end of each arm being split, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT A. SCHLEGEL.

Witnesses:

ALFRED A. MATHEY,

EMIL STAREK.