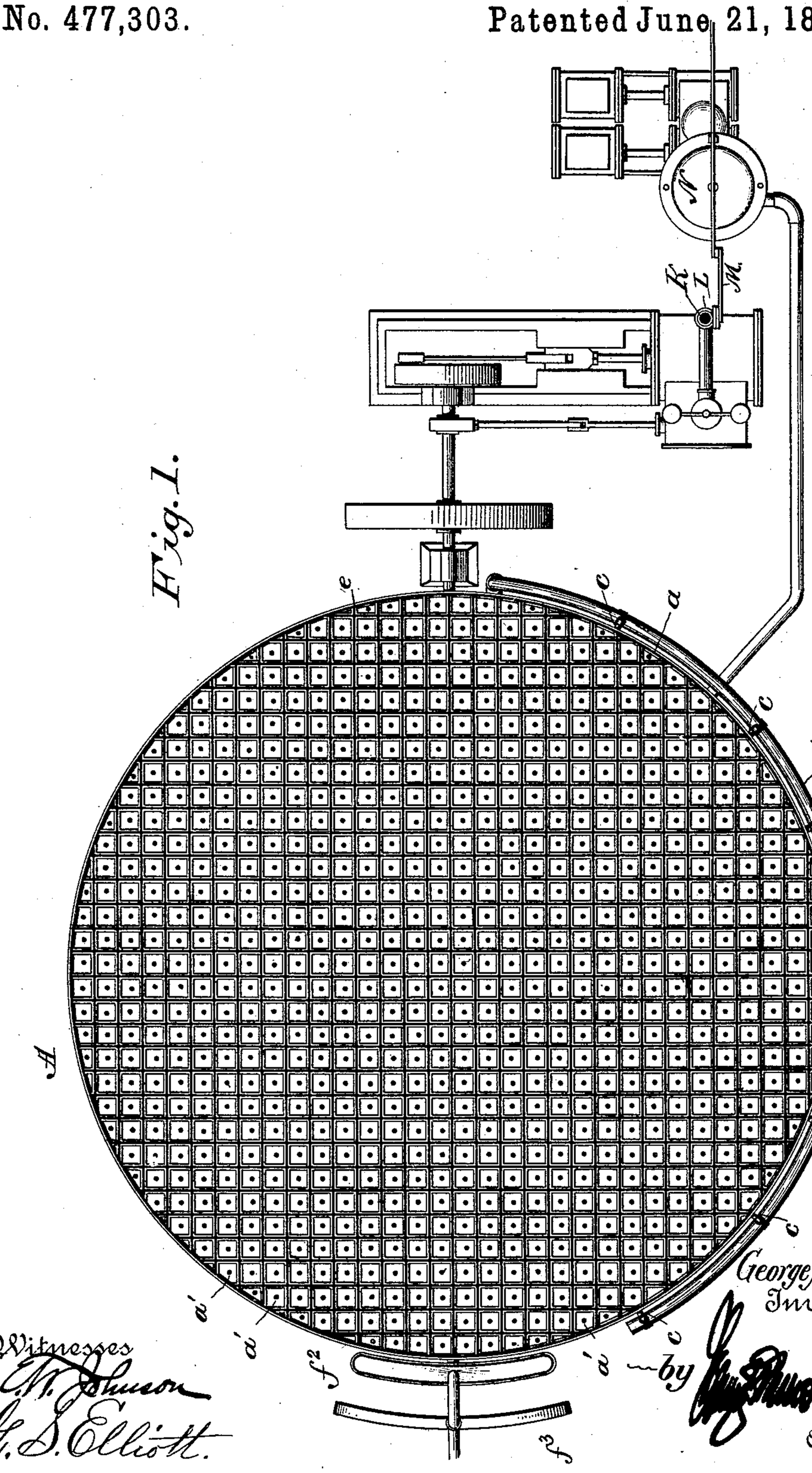
(No Model.) 4 Sheets—Sheet 1.

G. A. MARSH, Jr.

APPARATUS FOR GRINDING AND POLISHING GLASS.

No. 477,303. Patented June 21, 1892.

Fig. 1.



Witnesses
A. Johnson
L. S. Elliott.

George A. Marsh Jr.
Inventor
by
Attorney

(No Model.) 4 Sheets—Sheet 2.

G. A. MARSH, Jr.

APPARATUS FOR GRINDING AND POLISHING GLASS.

No. 477,303. Patented June 21, 1892.

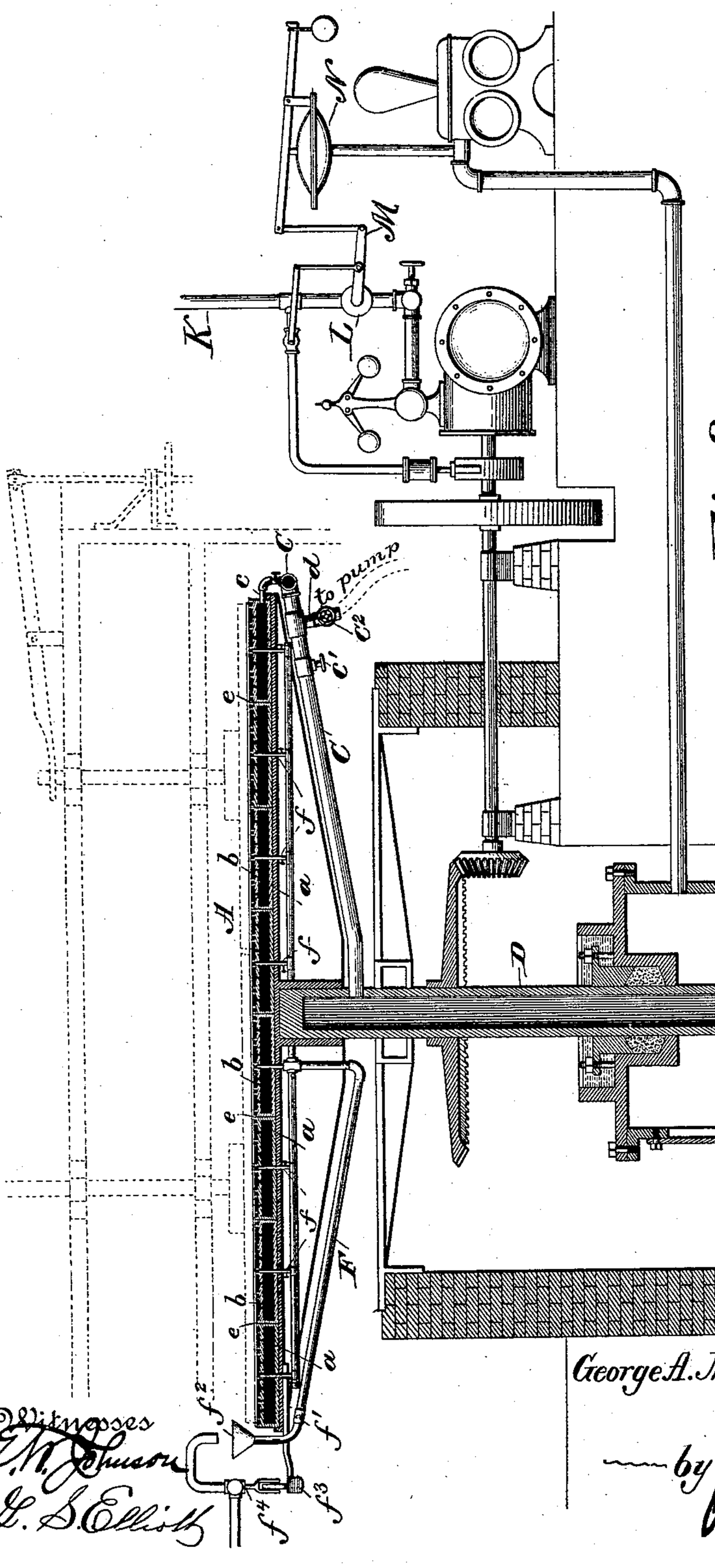


Fig. 2.

Witnesses
E. M. Johnson
L. S. Ellis

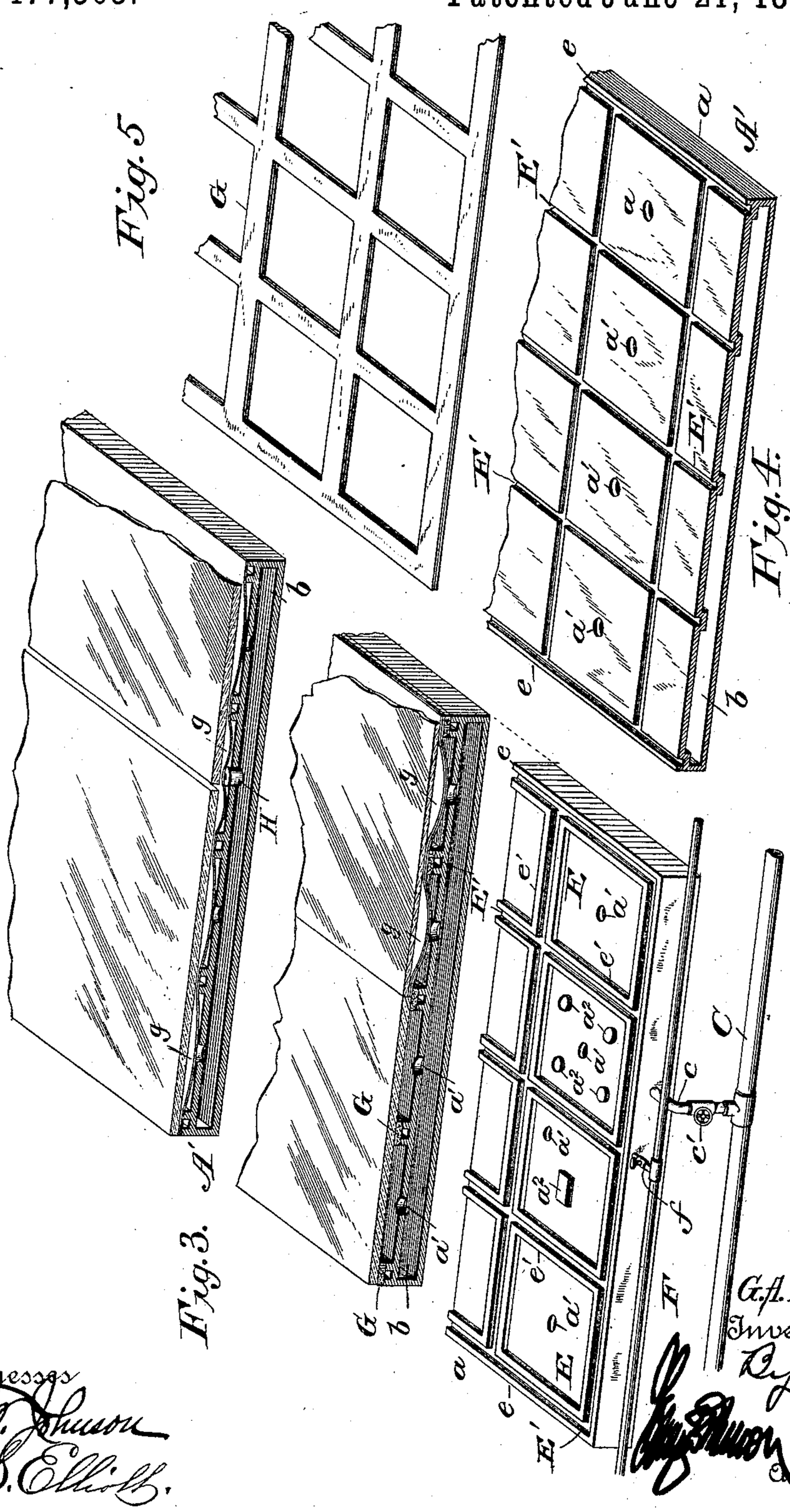
George A. Marsh Jr. Inventor
by Chas. E. Mason Attorney

(No Model.) 4 Sheets—Sheet 3.

G. A. MARSH, Jr.

APPARATUS FOR GRINDING AND POLISHING GLASS.

No. 477,303. Patented June 21, 1892.



Witnesses
C. W. Johnson
L. S. Elliott.

G. A. Marsh, Jr.
Inventor
By
Attorney

(No Model.) 4 Sheets—Sheet 4.

G. A. MARSH, Jr.

APPARATUS FOR GRINDING AND POLISHING GLASS.

No. 477,303. Patented June 21, 1892.

Fig. 6.

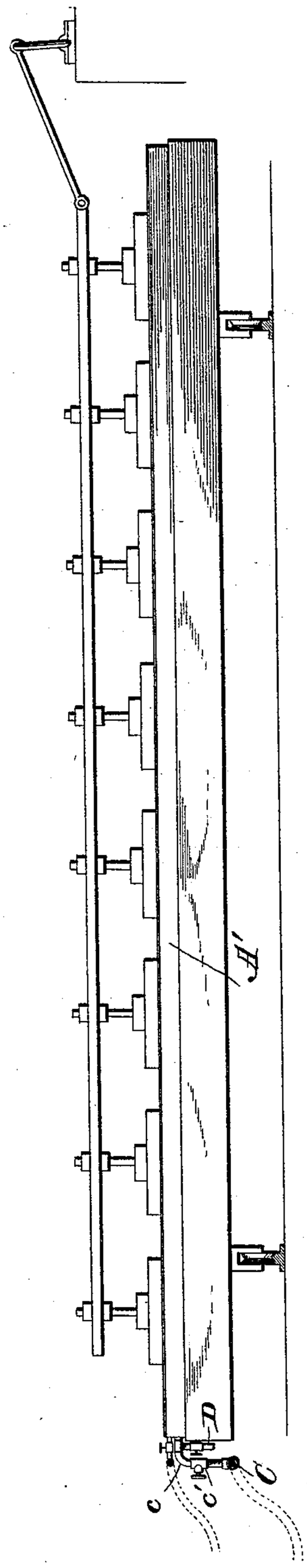
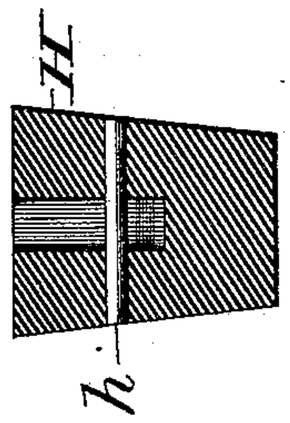


Fig. 7.



Witnesses
E. M. Johnson
L. S. Elliott.

George A. Marsh. Jr.
Inventor
by [signature]
Attorney

UNITED STATES PATENT OFFICE.

GEORGE A. MARSH, JR., OF SANDUSKY, OHIO.

APPARATUS FOR GRINDING AND POLISHING GLASS.

SPECIFICATION forming part of Letters Patent No. 477,303, dated June 21, 1892.

Application filed February 12, 1891. Serial No. 381,190. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. MARSH, Jr., a citizen of the United States of America, residing at Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Apparatus for Grinding and Polishing Glass; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in apparatus for grinding and polishing plate-glass.

In grinding and polishing plate-glass as heretofore practiced the plates are first secured to tables by means of calcined plaster or stucco, so as to bring each plate placed upon the grinding-table to the same level, as these plates vary in thickness. After one side has been ground they are removed, the table cleaned, and new plaster in a moist condition applied. The plates are then reversed, and the opposite sides ground. After all inequalities have been removed from both sides of the plates they are secured to the reciprocating polishing-table in substantially the same manner as they were secured to the grinding-table. To secure the plates of glass to the tables requires large quantities of calcined plaster or stucco, which after once being used is useless, and skilled labor of a high order is necessary to place the plates properly upon the tables so that the upper faces of the plates will be on the same plane. If the plates are not so placed, the edges are liable to be caught by the grinding and polishing mechanism and forced from the table or broken, and if this does not occur the surface of the glass adjacent to the uneven joints will be left unground or unpolished. It is also extremely difficult to remove the plates of glass from the grinding or polishing tables, and in so doing under the old process many plates were broken, and even after the polished glass is loosened from the table should there be any flint or foreign substance in the plaster or stucco it would be liable to scratch the polished surface of the glass and thus render the same unsalable until such scratches or imperfections are removed by hand grinding and polishing.

It has been proposed in foreign countries where the manufacture of plate-glass is extensively carried on to dispense with plaster or stucco as a means for retaining the plates of glass upon the grinding and polishing tables and to use in lieu thereof atmospheric pressure or a vacuum beneath the glass; but the construction of the tables and the means employed are such that a successful method has not, as far as I am aware, been devised, no practical means being provided for producing, keeping up, or retaining the vacuum, or properly leveling the plates, it being understood that a large number of different-sized plates of glass are placed upon each table, and that before the grinding or polishing can be proceeded with it is essential that the tables must be completely covered or overlaid with glass plates, each of which must have their upper faces on the same level.

By means of the improved apparatus or mechanism forming the subject-matter of this specification I am enabled to dispense entirely with the use of plaster and place the glass properly upon the tables by the employment of practically unskilled labor, obviate any liability of breakage in removing the ground or polished plates from the tables, and avoid all liability of injuring the surfaces of the plates in removing the same from the tables.

In carrying out my invention I employ specially-constructed grinding and polishing tables which have a multiplicity of vacuum-cells of comparatively small size, each cell being surrounded by a water-channel which is connected with a water-supply, the cells communicating with vacuum-chambers. I also employ an improved absorbent packing made up of fibrous material, which is rendered soft and air-tight after contact with water, which is placed over the water-channels, and upon which the glass plates rest.

In the accompanying drawings, forming part of this specification, Figure 1 is a plan view of a grinding-table for plate-glass, showing my improvements applied thereto. Fig. 2 is a vertical sectional view. Fig. 3 is a perspective view, partly in section, of one of the sections of the table, said section being broken

away and plates of glass shown on a part thereof. Fig. 4 is a detail perspective view of a modification of my invention. Fig. 5 shows the packing of absorbent fibrous material which is used thereon. Fig. 6 is a side view of the polishing-table. Fig. 7 is a sectional view of the plug.

The tables A and A′, one for grinding and the other for polishing, are substantially the same in construction as far as the upper surfaces are concerned, the contour of the grinding-table being round, while that of the polishing-table is rectangular. Both of these tables are mounted so as to be movable, the grinding-table having a rotary motion, while the polishing-table has a reciprocating motion. These tables are made up of a series of longitudinal sections which are joined together or held adjacent to each other in any suitable manner, each section *a a* having hollow longitudinal spaces *b*, which are connected by a series of branch pipes *c c* with an exhaust-pipe C, leading to or connected with the exhaust mechanism as a compressor or air-pump. Each of the connecting-pipes *c* is preferably provided with a valve *c′* by means of which any section of the table can be cut out.

The polishing-table shown in Fig. 6 is mounted on suitable ways, and the pipe C has a jointed or flexible connection therein to permit the desired reciprocating movement of the table upon its ways.

The grinding-table, which revolves, is mounted on a hollow standard D, with which the pipe C is connected, the lower end of said standard opening into an air-tight chamber D′, with which the pipe communicating with the air-pump or exhaust mechanism is connected. The hollow standard is also provided with a gear-wheel, which meshes with a pinion the shaft of which is driven by a suitable engine and the steam-supply pipe K, leading to said engine, for driving the same, has a suitable valve L, which is connected by means of an arm M, connecting-rods, and a lever operated by a valve or governor N, connected with the air-pump, so that should at any time while the table is revolving the vacuum be lost the steam-supply to the engine will be immediately cut off and a brake applied to the driving-shaft, so as to stop the revolving of the table. If such mechanism or the equivalent thereof were not provided, the glass, which is only held upon the table by gravity when there is no vacuum, would be driven off the same by centrifugal force, thereby entailing great loss.

The tables A and A′, in addition to the valved air-exhaust pipes *c*, are provided with a valved pipe *d*, which leads to a water-supply under pressure, so that when the valve *c′* is closed the castings can be filled with water under pressure and fill each of the cells formed in the upper surface of the table, the object thereof being to provide means for readily loosening the plates of glass upon the tables. The pipe *d* may connect with the air-exhaust pipe C above its valve c^2, as shown. The upper face of the castings which make up the tables are provided with raised circumferential walls *e*, and surrounding each cell is a wall *e′*, thus forming around each of the cells E channels E′. Through one of the outer walls of each section passes a pipe *f*, which is connected with a water-supply pipe F, and through these pipes F and *f* water or other liquid is admitted to the channels E′. The water-supply pipe F, used in connection with the grinding-table shown in Figs. 1 and 2, has a series of pipes *f*, and the pipe F below its source of supply is provided with a check-valve *f′* of any suitable construction and above the surface of the table with an elongated funnel f^2, adjacent to which is a curved plate f^3, having downwardly-bent ends adapted to engage, when the table revolves, with a valve-stem of a valve f^4 in the water-supply pipe, the end of said water-supply pipe being bent to be located over the funnel. In this manner a constant supply of water or liquid may be kept up in the channels E′ to replace that which may be drawn therefrom by the vacuum-pump.

Instead of providing the tables A and A′ with raised walls around the vacuum-cells, I may simply provide each section with channels E′, as shown in Fig. 4, and use in connection with such a table reticulated mats G, preferably made up of wood pulp or other suitable material, which when placed over the channels E′ will form cells which will be substantially the equivalent of those shown in Fig. 3. Each of the cells E is provided with an aperture *a′*, which is located in the central portion thereof or adjacent to one of the corners, and when so placed each of the cells is provided centrally with a raised portion a^2, which will provide a bearing-surface or rest for the glass plates and prevent excessive bending by suction or atmospheric pressure. The apertures *a′*, which lead into the hollow sections of the table are preferably conical, so that they can be readily plugged or stopped up, this being often desirable, especially where the plates of glass are of such a size that their edges will overlap one or more of the cells, for if any one of the cells should be open it is evident that the vacuum in the hollow section of the table would be lost.

The packing which I use is preferably made up of wood pulp, which is formed into thin sheets of a predetermined thickness, it being noted that the reticulated packing G (shown in Fig. 5) is of a uniform thickness, and this is first placed upon the table. The plates of glass to be ground are not usually of the same thickness, and before placing them upon the table they are measured by a suitable gage, the large plates being placed as near the center of the table as possible, and sheet-packing *g* of a proper thickness is placed under the same and immediately above the reticulated packing shown in Fig. 5. If the adjacent

plate of glass measures less in thickness than the one upon the table, a sheet of paper-pulp *g* of the proper thickness and same size as the plate of glass is placed upon the reticulated packing and the glass placed thereon, thereby bringing the plates to the same level. The sheets of paper I use for supplemental packing to raise the glass to a level are made of pulp to a gage so that the workman will, after having measured the thickness of the plate of glass, have simply to cut from a sheet of packing of the proper thickness, the sheets varying in thickness or laminæ from one one-hundred-and-eightieth of an inch to half an inch, the same scale being adapted for the thickness of the paper as is employed in gaging the glass. By using this laminated paper and a gage the tables can be covered with plates of glass by practically unskilled labor, and the material employed as a packing after being used can be reground, molded, and used over again, thus entailing no loss in carrying out my method.

It will be observed that the cells in the upper surface of the table are comparatively close together—that is, a multiplicity of cells are employed—and adjacent to each cell there is an upwardly-extending wall upon which the glass rests.

It is not practical to hold a sheet or sheets of glass against the friction occasioned in grinding and polishing by a single vacuum-chamber, or even by several distant vacuum-chambers. The reason that such construction is impractical is that the glass has a certain amount of elasticity and is liable to be bent by the suction and rendered uneven, causing depressions in the glass, upon which the grinding or polishing mechanism will not act, and distantly-spaced vacuum-chambers will result in a large percentage of breakage, which is entirely obviated by a multiplicity of vacuum-cells and adjacent supports. In polishing the glass a large amount of heat is generated, which causes vapor or steam to collect on the under side of the glass, stains the same, and necessitates repolishing. This is especially the case in the finishing operations. The heat generated precludes the possibility of successfully using rubber gaskets, as the heat generated would destroy the same, beside discoloring the glass. When blankets or textile-fabric mats are used simply to hold glass plates to a table by adhesion and exclusion of air, the glass is liable to be stained and is also liable to slip upon the mats.

By employing a multiplicity of cells surrounded by supports and a water-channel the packing is rendered pulpy or soft, so as to cause a tight joint around each vacuum-cell, and around each cell a supply of water is admitted, so that any vapor or steam generated by friction upon the upper surface of the glass is drawn through the aperture in the cell, so that there is no possibility of staining the glass.

When it is desired to remove the glass plates after being ground or polished, the valves in the air-exhaust pipes C are closed and water forced into the hollow sections, which finds its way through the apertures in the cells and raises or floats the glass, so that it can be readily removed from the tables without the employment of skilled labor, as heretofore necessitated.

Owing to the large size and extreme weight of the tables A and A′, it is obviously a mechanical necessity that they should be made up in sections, each section being supported upon the foundation of the table, so that the upper edges thereof and walls of the cells, as well as the projecting blocks when used, will all be on the same plane.

The polishing and grinding mechanism is the same as is ordinarily employed, and I have merely shown the same in dotted lines in Figs. 2 and 6 of the accompanying drawings, and a specific description thereof is not deemed necessary.

The reticulated packing shown in Fig. 5 is preferably molded so as to provide the openings which assist in forming the cells, and though in practice I prefer to use this fabric it can, with the table shown in Fig. 3, be dispensed with and a sheet of paper-pulp packing be spread upon the entire surface of the table. The water will soften said packing surrounding each cell, and when the vacuum is produced in the chamber the paper will be drawn into tho cells, so that it will not be in contact with the glass at the central portion. The packing is made from wood pulp, which is rolled or otherwise formed into sheets of the desired size and thickness, the same being unsized, and said packing after being used can be put into a pulp-mill or other suitable apparatus, reground, and remolded. It is obvious that a sheet packing can only be employed where raised walls on the surface of the table, as E′, are used, and when a table is made as shown in Fig. 4 a reticulated packing is used to form the cells. In connection with the reticulated packing I may employ an imperforated sheet, either above or beneath the same, preferably above.

The stopper H, which I use for closing the apertures or perforations *a′*, is preferably made of rubber centrally apertured, within which is inserted a pin *h*, so that said stopper can be forced in flush with the face of the cell, and when it is desired to remove said stopper a hooked implement is caused to engage the cross-bar for the removal of the plug or stopper. Where the edges of the plates of glass meet over the cells, especially in the final operation of polishing, the water-channel adjacent to the edges of the plates may be plugged or stopped to prevent any water finding its way to the surface of the glass, these channels being plugged as the glass is being set.

Having thus described my invention, I claim—

1. A hollow glass-holding table having a multiplicity of apertures in close proximity to each other, channels surrounding said apertures, a liquid-supply connecting with said channels, and an air-exhaust pipe connecting with the air-chamber in the table, the same being adapted to be used with a suitable packing for retaining a plate or plates of glass thereon when the air is exhausted from the table, substantially as set forth.

2. In a hollow glass-holding table having an upper plate with a multiplicity of apertures connecting with a vacuum-chamber, a channel surrounding each aperture, a raised circumferential wall forming an outer channel, a liquid-supply connecting with said channels, means for exhausting the air from the central chamber of the table, a packing adapted to rest upon the raised portions of the table, substantially as shown, so as to provide a multiplicity of vacuum-cells when the air is exhausted from the central chamber, as set forth.

3. In combination with the hollow glass-supporting table, for the purpose set forth, a series of apertures or perforations in substantially close proximity to each other, channels surrounding each of said apertures, so as to provide a multiplicity of vacuum-cells, a reticulated packing adapted to cover the liquid-channels, and means for exhausting the air from the central chamber, substantially as set forth.

4. In combination with a hollow glass-supporting table having a series of vacuum-cells, an air-exhaust pipe, and a water-supply connected with said chamber, so that liquid can be forced into each of the cells in the surface of the table, substantially as shown, and for the purpose set forth.

5. In a glass-supporting table, a central chamber and apertured upper plate having a series of channels surrounding each aperture, an exhaust-pipe connected with the central chamber, a water-supply pipe leading into the channels, and a water-supply leading into the vacuum-chambers, substantially as shown, and for the purpose set forth.

6. A glass-holding table made up of a series of hollow sections supported so that the upper surfaces thereof will be on the same plane, each section having a multiplicity of apertures, air-exhaust mechanism for forming vacuum-cells adjacent to said apertures, a support or supports surrounding each aperture or vacuum-cell, an exhaust-pipe connected to the chamber of each section, and means for producing a vacuum therein when a plate is placed over the cells, together with means, as a plug or plugs, for closing the apertures of one or more of said cells, substantially as shown, and for the purpose set forth.

7. A glass-holding table made up of a number of hollow castings arranged side by side and supported on a suitable frame, each casting having a hollow chamber and raised walls projecting upward from the top plate thereof to form vacuum-cells above the top plate, apertures connecting each vacuum-cell with a hollow chamber, means for closing one or more of said apertures, an exhaust-pipe connecting the hollow chambers with an air-exhaust mechanism, said pipe having valves for disconnecting one or more of the castings from the exhaust mechanism, and a packing adapted to rest upon the raised walls surrounding each vacuum-cell, substantially as set forth.

8. The combination, with a glass polishing or grinding mechanism, of a hollow table, a shaft having an air-duct which communicates with air-exhaust mechanism and with the table, whereby the plate or plates of glass are held on the table by a vacuum or atmospheric pressure, for the purpose set forth.

9. The combination, with a glass polishing or grinding mechanism, of a hollow supporting-table the upper plate or face of which is provided with a series of perforations or apertures, raised walls surrounding said perforations or apertures, forming with the glass independent vacuum-chambers which communicate directly with the vacuum-chamber of the supporting-table and exhaust mechanism, and a water-supply having branch pipes which communicate with channels surrounding each aperture or vacuum-cell, substantially as set forth.

10. In a glass grinding or polishing machine, the combination of a hollow supporting-table, a hollow standard connecting therewith by a pipe C, the lower end of said standard being inclosed by an air-chamber, a pipe connecting said air-chamber to an exhaust mechanism, and mechanism for connecting the hollow standard with driving mechanism, so that the table and standard can be rotated, substantially as shown, and for the purpose set forth.

11. In combination with a revoluble glass-holding table, a chamber connected to an exhaust-pipe, said exhaust-pipe leading into a hollow standard, an air casing or chamber encircling the hollow standard, and an exhaust mechanism connected with the air-chamber, a pipe having a series of branches communicating with channels in the upper surface of the revolving table, and means, substantially as shown, for causing an automatic liquid-supply to the channels, as set forth.

12. In combination with a revoluble table made up of a series of castings having a multiplicity of apertures in the upper plates thereof, a series of channels surrounding said apertures, means for exhausting the air from the chambers in the tables, so as to form a multiplicity of vacuum-cells, and an automatic liquid-supply connected with the channels, the air-exhaust pipe having a valve and a water-supply connected thereto between the valve and the chambers, substantially as set forth.

13. In combination with a revoluble grinding-table upon which the glass plates to be

ground are held by a vacuum or air-exhaust, a motor for turning said table, an air-exhaust mechanism connected to the table, and an automatic brake and power-supply mechanism adapted to be operated when the vacuum is destroyed in the table, so as to cause a stoppage of the motor and brake upon the driving-shaft which revolves the table, substantially as shown.

14. In combination with a glass-holding table made up of a series of adjacent hollow sections with circumferential raised walls united to each other, so that the upper faces will be on the same plane, each section being provided with a multiplicity of apertures communicating with the hollow chambers, a series of channels surrounding each aperture, a water-supply pipe F, having branch pipes *f* communicating with the channels, an air-exhaust pipe C, connected by branch pipes *c* to each of the chambers, and a packing adapted to cover the channels and form a multiplicity of cells, the glass plates resting directly or indirectly upon said packing, substantially as shown, and for the purpose set forth.

15. In combination with a glass-holding table having a series of apertures or vacuum-cells in close proximity to each other, water-channels surrounding each vacuum-cell, and an absorptive packing shaped to lie over the water-channels, substantially as set forth.

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

GEORGE A. MARSH, JR.

Witnesses:
EUGENE M. JOHNSON,
G. S. ELLIOTT.