

No. 873,340.

PATENTED DEC. 10, 1907.

E. BAGNALL.

MACHINE FOR GRINDING, SMOOTHING, AND POLISHING PLATE GLASS.

APPLICATION FILED AUG. 18, 1904.

7 SHEETS—SHEET 1.

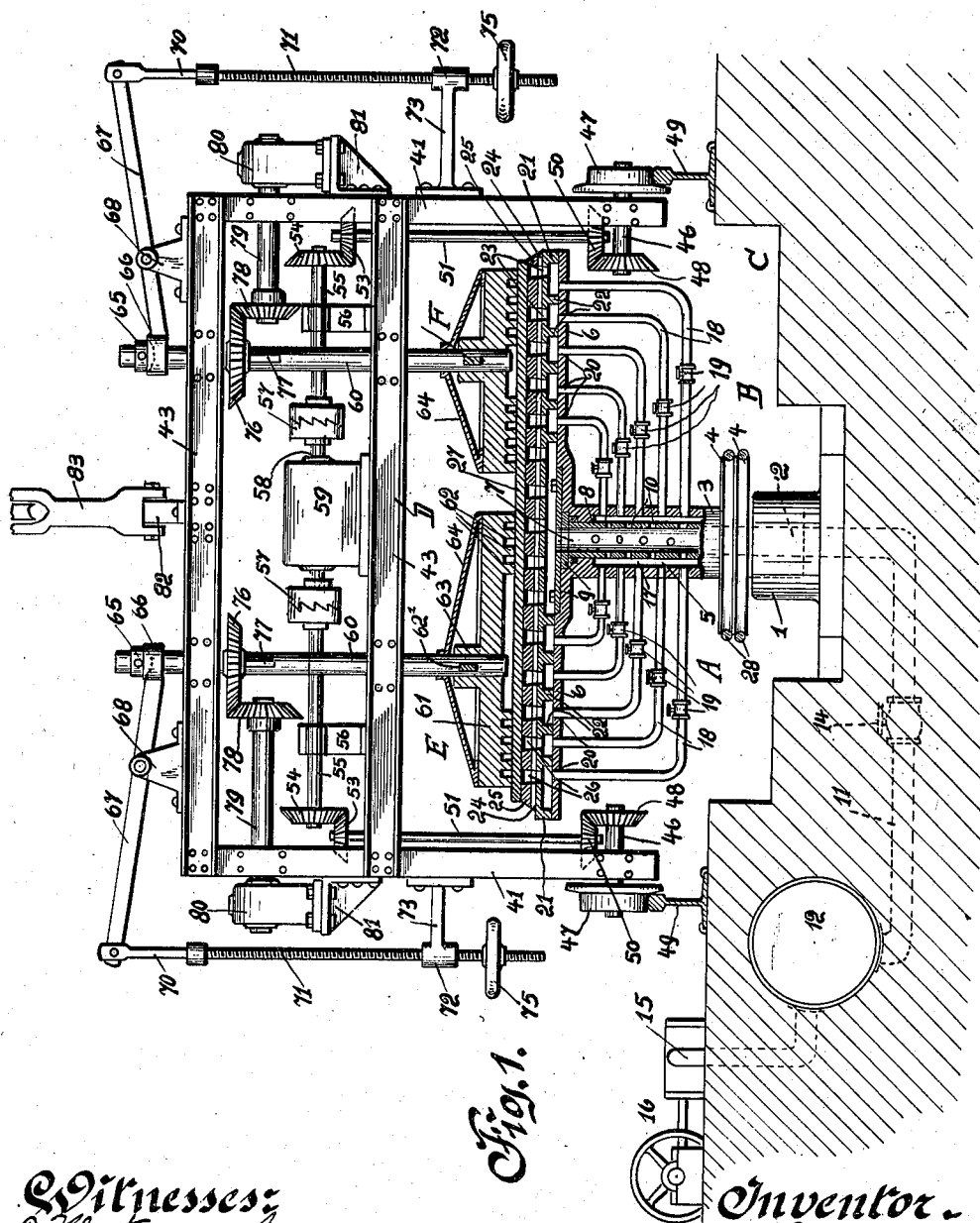


Fig. 1.

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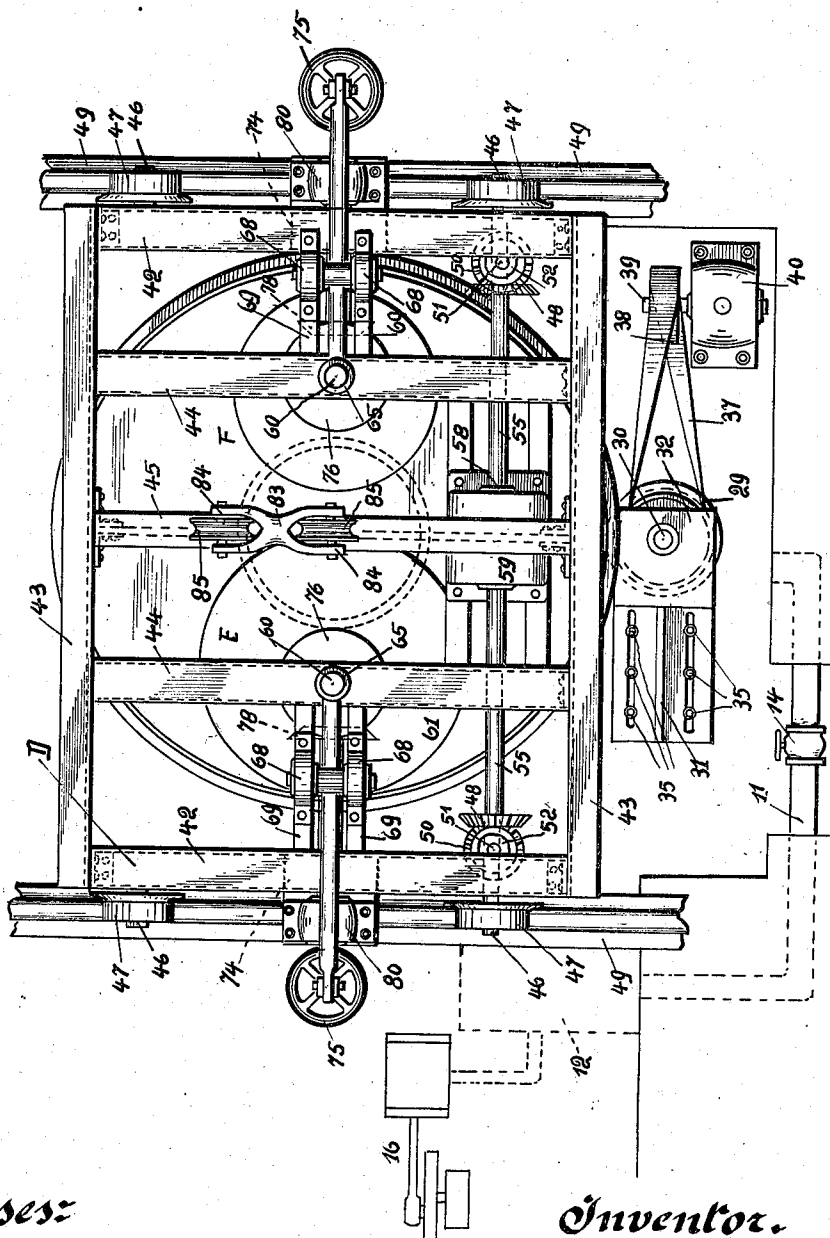
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7 SHEETS—SHEET 2.

Fig. 2.



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7 SHEETS—SHEET 3.

Fig. 3.

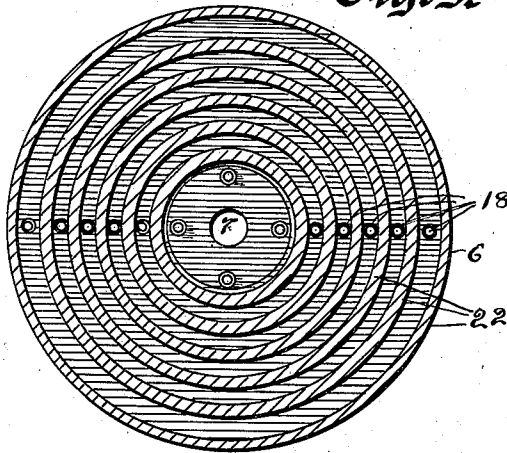


Fig. 4.

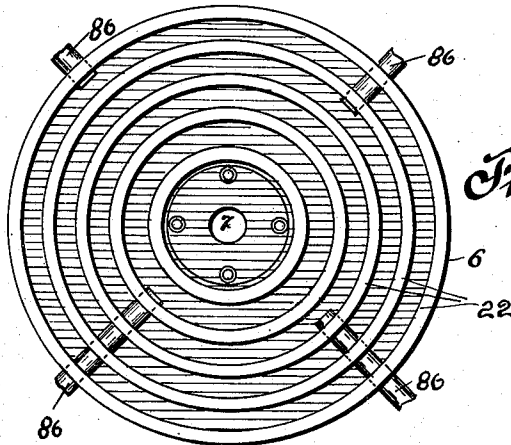
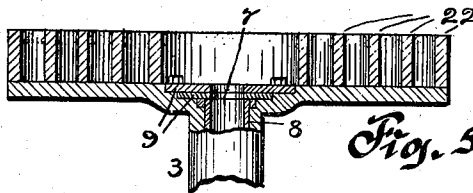


Fig. 5.



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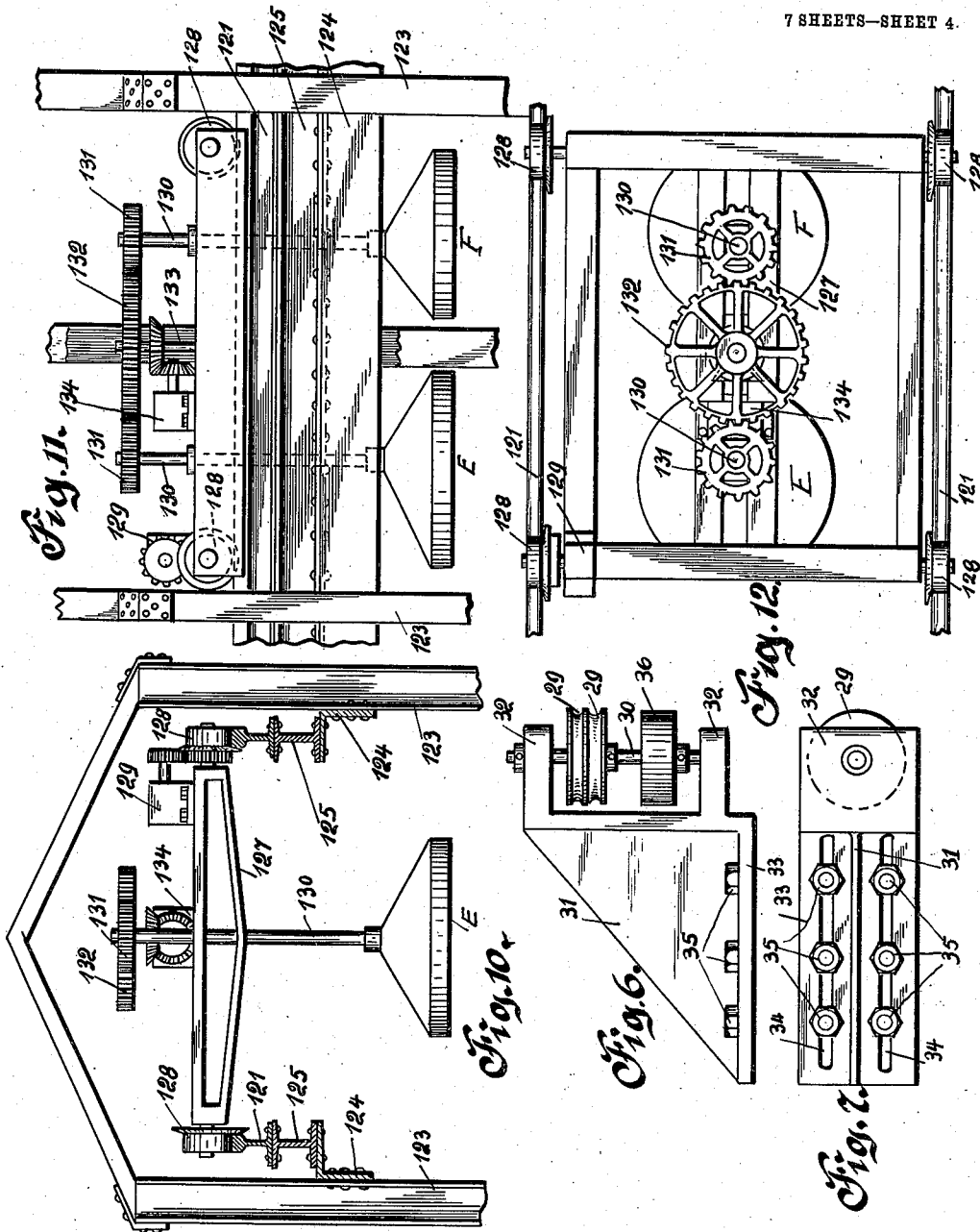
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7 SHEETS—SHEET 4.



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7 SHEETS—SHEET 5.

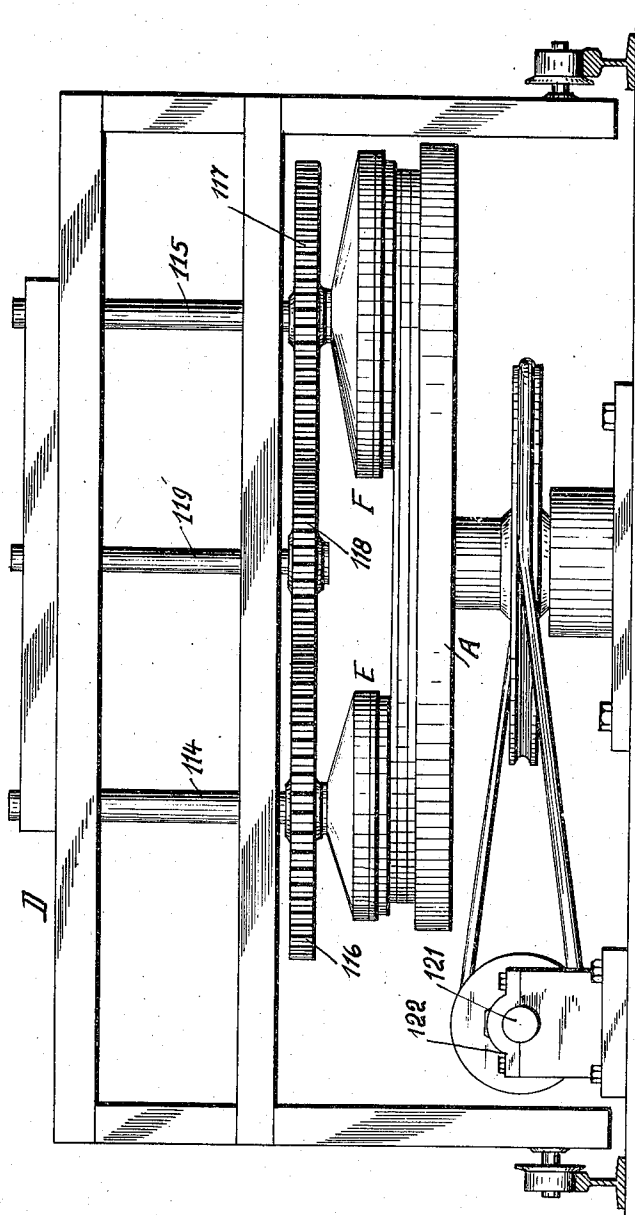


Fig. 8.

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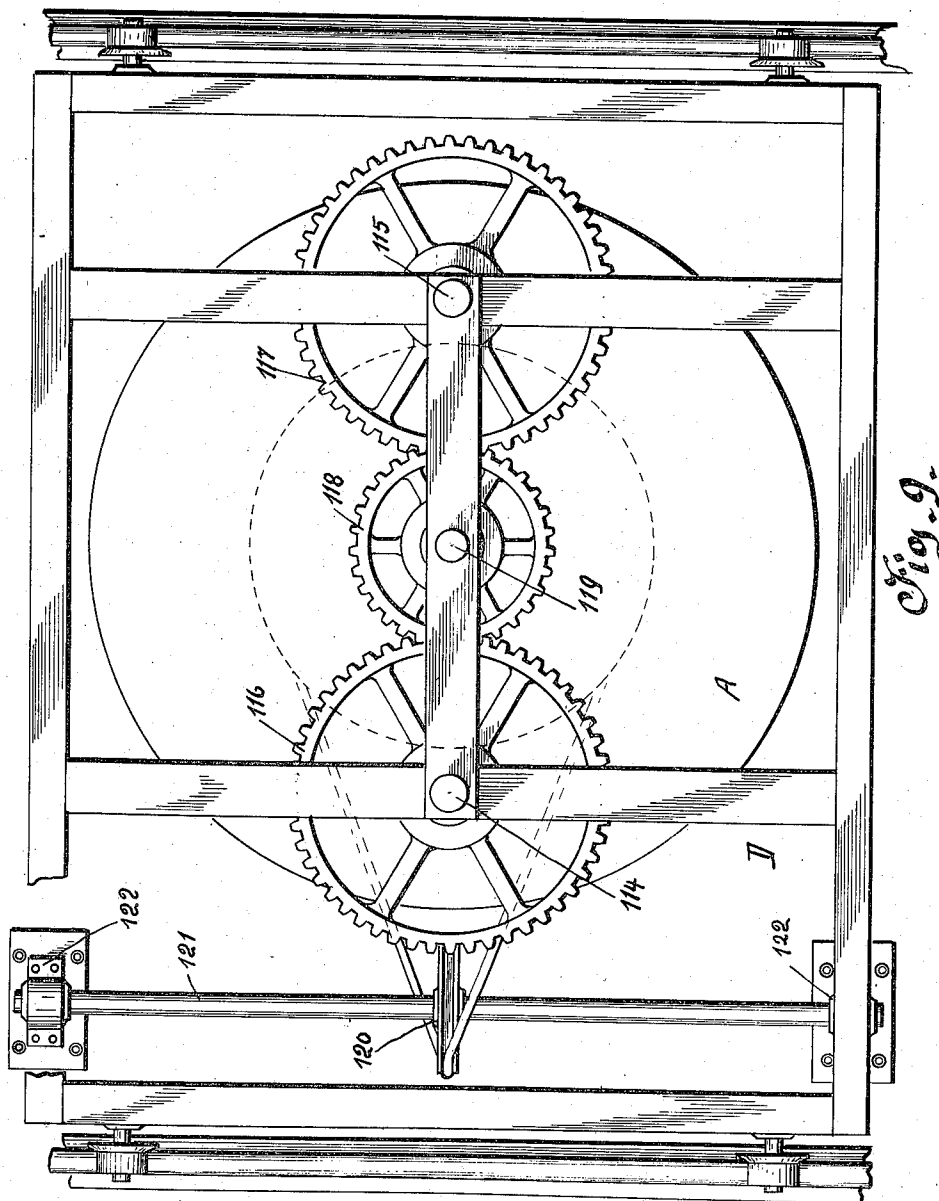
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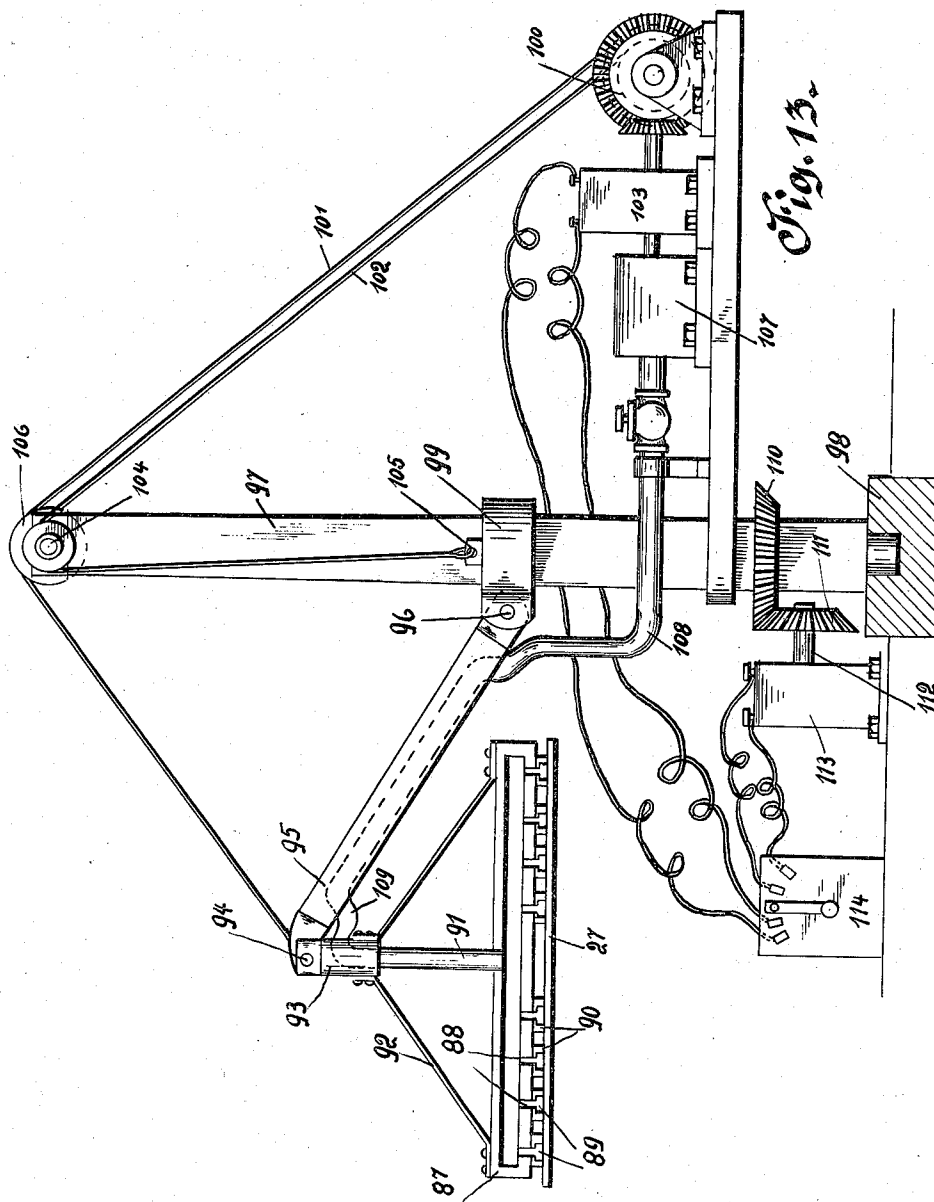
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UNITED STATES PATENT OFFICE.

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MACHINE FOR GRINDING, SMOOTHING, AND POLISHING PLATE-GLASS.

No. 873,340.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed August 19, 1904. Serial No. 221,372.

To all whom it may concern:

Be it known that I, EDWARD BAGNALL, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Grinding, Smoothing, and Polishing Plate-Glass, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention has relation to machines for grinding and polishing glass, and the primary object of my invention is to provide novel means by which these operations will be greatly accelerated and the cost of labor thereby reduced to a minimum.

A further object of this invention is to provide effective and economical means for successfully smoothing and polishing a glass surface, and to accomplish this result, I employ several features which I believe to be new and which I desire to cover, both separately and in combination with each other.

My invention contemplates the novel combination of several elements which will now be briefly described.

The main element of my invention comprises a traveling frame upon which several mechanisms are constructed and operated, and this frame is adapted to be propelled by electricity from a trolley wire which may extend the entire length of a building constructed to operate my invention therein.

The second element consists of mounting two eccentric runners upon the frame work which will be operated by mechanism carried thereon and in conjunction with said runners I employ a novel form of agitating means for polishing and grinding a plate of glass.

Another element consists of a novel form of table upon which the plate of glass is to be supported and in connection with said table, means are employed to revolve the same and maintain a vacuum therein whereby the plate of glass will be firmly held upon the table.

A further element of my invention consists of a novel form of derrick or crane which may be employed as a convenient adjunct to my improved machine this derrick being adapted to transfer the glass plates from one table to another, and I employ novel means for operating said derrick and for gripping the plate of glass to be transferred from one table to another.

The different elements above described

comprise a great number of small mechanisms which will be hereinafter described in detail and reference will now be had to the drawings accompanying this application, wherein similar reference characters designate corresponding parts throughout the several views, in which,

Figure 1 is an end view of my improved machine showing the runners and the table in vertical section, Fig. 2 is a top plan view of the same, Fig. 3 is a horizontal sectional view of one of the tables, Fig. 4 is a top plan view of a modified form of table, Fig. 5 is a vertical sectional view of the form of table shown in Fig. 4 of the drawings, Fig. 6 is a side elevation of one of the adjustable frames used in connection with my improved machine, Fig. 7 is a top plan view of the same, Fig. 8 is a modification in side elevation of a traveling frame, Fig. 9 is a top plan view of the same, Fig. 10 is a fragmentary view of the frames of a building which may be constructed wherein my improved machine may be operated, another modified form of my improved machine being illustrated therein, Fig. 11 is a side elevation of the same, Fig. 12 is a top plan view thereof, and Fig. 13 is a side elevation of the derrick or crane which may be used in connection with either one of the constructions illustrated in the above views.

Reference will first be had to Figs. 1, 2 and 3 of the drawings wherein the preferred form of my improved machine is illustrated and in constructing this machine it is necessary that the base upon which the same is to be supported and travel, be so constructed as will facilitate the handling and operation of the same, and the reference character A designates a table in its entirety which is constructed in accordance with my invention and that the merits and general usefulness of my invention be realized, it may be stated that it is necessary that a plurality of these tables be employed, said tables being arranged in a suitable building in which my improved apparatus or machine is to be operated. In Fig. 1 of the drawings, I have illustrated a vertical sectional view of one of the tables, and in erecting my improved tables the base upon which they are to be supported is excavated or provided with a counter-sunk portion B, and in this counter-sunk portion is mounted a standard 1 which is provided with a central opening 2 and in said standard is rotatably mounted the vertical central shaft 3

this shaft being provided with the double pulleys 4, 4 upon its lower end, the object of which will be hereinafter described. The shaft 3 is hollow as designated at 5 and formed integral with said shaft at right angles thereto is an annular plate 6 which forms the bottom of my improved table. Centrally of said table is provided an aperture 7 which communicates with the hollow shaft 3 and in said aperture is mounted a pipe 8 which is secured therein by plates 9. The pipe 8 is perforated as indicated at 10 and to the lower end of said pipe is connected a pipe 11 which passes through the base C and communicates with a reservoir or tank 12. This pipe is provided with a valve 14. The reservoir 12 is connected by a pipe 15 to an exhaust pump 16 the object of which will be later described. The shaft 3 is provided with a plurality of apertures 17 in which are secured pipes 18 carrying valves 19 and these pipes are bent upwardly and engage in apertures 20 provided in the annular plate 6. Upon this plate is secured a casing 21 which is provided with depending ribs 22 that are circular in form as clearly shown in Fig. 3 of the drawings whereby a plurality of partitioned compartments are provided and with each compartment one of the pipes 18 is adapted to communicate. The casing 21 is provided with a plurality of apertures 23 which communicate with one of the compartments formed by the ribs 22 and upon the top of the casing is placed a sheet of resilient material such as rubber 24 which supports a plate 25, said plate and resilient material being provided with apertures 26 which communicate with the apertures 23 of the casing, and upon the plate 25 is adapted to be supported the sheet of glass 27 to be ground or polished. The manner of manipulating and handling the pieces of glass upon this table is as follows: The table A is revolved by cables or belts 28 which pass around the pulleys 4, 4 and around pulleys 29, 29 keyed to a shaft 30 which is vertically mounted within the triangular frame 31, said shaft being carried by arms 32, 32 carried by said frame. The base 33 of the frame is provided with slots 34, 34 and the frame 31 is adapted to be adjusted by the bolts and nuts 35 whereby the tension of the cables or belts 37 may be increased or decreased as desired. The shaft 30 is provided with a pulley 36 over which passes a belt 37 to a pulley 38 carried upon the shaft 39 of a motor 40 which is placed in a convenient place to said machine. Upon a piece of glass to be ground or polished being placed upon said table, the valves 19 of the pipes 18 are opened and the exhaust engine 16 is started to exhaust the reservoir 10, the standard and the compartments formed by the partitions 22, and as a vacuum is formed within said compartment the sheet of glass

27 will be held upon the table by suction and may be maintained thereon while the table is being revolved and if it be so desired the valve 19 may be closed to maintain this vacuum within the table and the exhaust engine 16 may be used for other purposes until it is again necessary to renew the vacuum which has been created within the table.

As heretofore stated, to fully accomplish the purposes of my invention it is necessary that a plurality of tables, constructed as above described, be employed, whereby while a piece of glass is being placed upon one table, another table may be in operation, this procedure facilitating the rapidity with which glass may be ground. In order to grind the glass upon different tables, I have constructed a traveling frame D which is adapted to travel over the tables A and grind the glass upon each table. The traveling frame D comprises four vertical standards 41 which are braced together by the side frames 42, 42 and the end frames 43, 43 and the longitudinal braces 44, 44 and 45, the brace 45 being located centrally of said frame. Between the standards 41, 41 upon each side of the frame are provided braces in which are journaled the shafts 46, 46, 46 carrying upon their outer ends the flanged wheels 47, 47 and upon their inner ends the beveled gears 48, 48. The frame is adapted to travel upon tracks 49, 49 arranged upon each side of the tables and upon each side of the base which supports said tables. To propel said frame along the tracks, the gear wheels 48, 48 mesh with beveled gears 50, 50 mounted upon the lower ends of the vertical shafts 51, 51 journaled in suitable brackets 52, 52 carried by the side frames of the frame D. The upper ends of these shafts are provided with beveled pinions 53, 53 which mesh with beveled pinions 54, 54 carried upon the outer ends of shafts 55, 55, that are journaled in the bearings 56, 56 carried upon the lower longitudinal braces 44, and the inner ends of said shafts 55 are provided with clutches 57, 57 which are connected to the ends of the shaft 58 of the motor 59 the clutches 57 being of the usual well known type and operated in any well known or approved manner.

The mechanism which comprises the grinders and polishers consists of the runners E and F these runners comprising vertical shafts 60 and as each runner is identical in construction I deem it only necessary to describe one of said runners, but before doing so I desire to call attention to the fact that one of said runners is of a smaller diameter than the other whereby during the travel of said runners a greater area will be covered upon the glass and a more changeable and irregular path described by said runners as will be particularly brought out in the de-

scription of the construction of one of said runners. The runner as constructed by me consists of the vertical shafts 60, 60, these shafts being rotatably mounted in the upper and lower longitudinal braces 44, 44 and upon the lower end of each shaft are eccentrically mounted the runners proper which consist of an annular head 61 the under face of which is provided with depending abraders or grinding rubbers which are of any desired material whereby the surface of the glass may be ground or polished and it will of course be understood that different materials are employed for grinding the glass than what would be employed for polishing the same, and I have so constructed the runners whereby the heads 61 may be removed quickly and easily and other heads placed thereon. By so constructing the runners it will be possible to provide a head particularly for grinding and another head may be readily employed for polishing. The heads are therefore secured upon the lower end of the vertical shafts by keys 62' which pass through the collar 63 carried by said heads and to prevent the ground glass or any other ingredients from resting upon the top of the heads 61 I have provided a two-part cone shaped cover 64 which is adapted to fit upon the runner and precipitate all ground glass or ingredients that may settle upon the same.

To the upper ends of the vertical shafts 60, 60 of the runners are secured collars 65, 65 and under this collar is arranged a collar 66 which is carried on the end of a lever 67 which is pivotally mounted in a bearing 68 mounted upon two transverse beams 69, 69 carried between one of the side frames and the frame 44. To the outer end of the lever is pivotally connected a rod 70 this rod being screw threaded as indicated at 71 a portion of its length, and passing through a screw threaded sleeve 72 carried by a bracket 73 secured to a central vertical standard 74 indicated by dotted lines in Fig. 2 of the drawings. The lower end of the screw threaded portion of the rod 70 is provided with a hand wheel 75 and by rotating said wheel until it engages the sleeve 72 and further rotating said wheel the rod 70 can be drawn downwardly and through the medium of the levers 67 the shaft 60 can be raised. Between the upper and lower end frames 44 and upon the shaft 60 is mounted a beveled gear 76, this gear being slidably mounted upon the shaft and the shaft is provided with a rib 77 whereby if the gear wheel 76 is rotated said shaft 60 will rotate in unison therewith. Meshing with this gear wheel 76 is a beveled gear wheel 78 which is carried upon the outer end of an operating shaft 79 of a motor 80. The motor 80 is secured to a bracket 81 carried by the central vertical standard 74. This construction just described is duplicated in

connection with the other runner upon the opposite side of the frame as will be clearly seen in Figs. 1 and 2 of the drawings.

The longitudinal brace 45 is provided with a post 82 to which is pivotally connected a two-armed trolley 83 and each arm of the trolley is bifurcated as indicated at 84, 84 and has mounted therein a trolley wheel 85. In the building in which my improved frame D and the tables A are mounted, I intend to employ a trolley system and the trolley just described is adapted to travel upon a wire (not shown) and the movement of said frame D is to be controlled by a suitable controller carried either by the frame or mounted upon a suitable platform adjacent to the path of travel of said frame. By employing the two-armed trolley pole 83 one trolley will always be engaged with the wire and when desiring to go in an opposite direction from what the frame has traveled the opposite trolley wheel is placed upon the wire whereby the direction of travel of the frame D may be easily changed by simply raising or lowering the trolley pole to engage one or the other of said trolley wheels with the trolley wire.

The operation of the frame just described is as follows: We will assume that the tables A are in operation and a piece of glass is upon each table employed and it is desired to grind, smooth and polish the same. The operative placed the clutches 57 in engagement with each other and then places the motor 59 in operation and from said motor a rotary movement will be transmitted to the wheels 47 and the entire frame work carrying the runners E and F may be moved over a table A and it may be moved from one table to the other when the glass upon one table has been ground and polished. The frame having been positioned over a table the motors 80, 80 are placed in operation by the operator and a rotary movement will be transmitted from said motors to the runners E and F and while said runners are revolving the hand wheels 75 are operated to lower the runners into engagement with the piece of glass carried by the table. The amount of surface to be ground off of the glass is governed by the pressure and the movement of said runners E and F upon the glass, and it will be readily understood that a greater quantity of glass may be ground from off the plate by forcing the runners into engagement with said plate of glass. The revoluble movement transmitted to said runners will cause the abraders or grinding-rubbers 62 to grind the surface of the glass and as these runners are eccentrically mounted, the glass will be evenly ground upon its top surface as the table revolves. When it is desired to remove the plate of glass from the table, the motors 80, 80 are placed out of action and the hand wheels 75 are rotated to raise the runners from engagement with the plate of

glass, at which time the motor 59 may be operated to move the frame B from over the table, and upon the vacuum formed in the table being relieved, the plate of glass 29 may be removed from said table.

In Fig. 4 I have illustrated a modified form of table wherein a different arrangement of the pipes is shown and in the arrangement illustrated in this figure exhaust pipes 86, 86 enter the edge of the table and pass through the partitions to different compartments. Each of the pipes 86 passes to a different compartment from the others whereby when the exhaust engine 16 is placed in operation each one of the compartments formed by the partitions will be exhausted. In connection with the table A and the frame D of my improved machine I intend to employ novel means for transmitting the plates of glass from one table to another or from any suitable place to said tables. It is a well known fact that it requires some skill to handle large plates of glass without breaking or injuring the same, and where my improved tables are employed I intend to construct a suitable derrick upon one side of the tables whereby a plate of glass may be lifted from said table and transmitted to another or to a suitable place. The form of derrick which I intend to use is illustrated in Fig. 13 of the drawings yet I do not care to limit myself to this specific form but may embody the mechanisms shown in connection therewith, into an overhead crane. The main feature of my improved derrick is the provision of novel means for engaging the plate of glass to be moved and this novel means consists of the casting 87 which is preferably annular in form and this casting is constructed upon similar lines to the casting 21 of the table, said casting being provided with a plurality of apertures 88 which communicate with the compartment 89 formed by the annular partitions 90. The casting is supported by a central pipe 91 and by the angularly disposed rods 92 said rods and pipe being carried by a member 93 which is pivotally connected as indicated at 94 to the hollow boom 95 of the derrick. This boom is pivotally connected as indicated at 96 to the mast 97, said mast being suitably braced and revolvably mounted in the base 98. The mast 97 is provided with a ring 99 to which said boom 95 is pivotally connected and I employ drums 100 and cables 101, 102 to raise and lower the boom 95 carrying the casting 87. The drums 100 are operated by a suitable motor 103 and the cable 102 passes over a pulley 104 mounted at the top of the mast and is connected as indicated at 105 to the ring 99 whereby when said drum is operated the ring may be raised to project the boom outwardly further than what it is shown in Fig. 13 of the drawings. The cable 101 passes

over another pulley 106 and is connected to the outer end of the boom 95 whereby this end of the boom will be raised when the drum is rotated. In connection with the mechanism just described I employ an exhaust engine 107 which is operated by the motor 103 and a flexible pipe 108 is connected to said exhaust engine and the hollow boom 95 and from said boom a flexible pipe 109 connects with the vertical pipe 91 whereby when said engine is placed in operation the casting 87 may be exhausted of all air, and a suction formed between the plate of glass 27 and said casting. The reference numeral 110 designates a beveled gear which is secured to the lower portion of the mast and this gear meshes with a beveled gear 111 carried upon the operating shaft 112 of the motor 113 and by this mechanism the mast may be revolved to swing the boom from one table to another. The reference numeral 114 designates a controller or switch board which is mounted adjacent to said derrick whereby an operator may manipulate the different parts or mechanisms of the derrick. The operator, should he desire to remove a plate of glass from the table A, operates the motor 103 to lower and move outwardly or inwardly the casting 87 to position the same upon the sheet of glass 27 carried by the table. At this time the engine 107 is put in operation by the operator to exhaust the air from the casting 87 and form a vacuum between the plate of glass and the casting at which time the vacuum is maintained and the motor 103 is again operated to raise the glass a sufficient height above the table whereby the same may be swung around and to accomplish this the motor 113 is placed in operation which will revolve the mast through the medium of the gears 110 and 111 and swing the boom to the desired position above another table or platform at which time the casting 87 is lowered and the vacuum relieved in the casting 87 to release the plate of glass 27.

The construction of the tables A, the frame D and the derrick above described is the preferred form of construction and reference will now be had to Figs. 8 to 12 inclusive where I have illustrated modified forms of construction in which a simpler construction is employed and other means than heretofore described for operating the frame work D and the runners E and F. Reference will first be had to Figs. 8 and 9 wherein I have illustrated other means than those above described for revolving the runners E and F and in these figures the reference numerals 114 and 115 designate vertical shafts which carry the runners E and F, these runners being similar in construction to those heretofore described. Upon the vertical shafts 114 and 115 I mount pinions 116 and 117 which are adapted to mesh with a pinion

118 carried by the lower end of a vertical shaft 119 which is journaled in the frame D. Instead of transmitting a revoluble motion to each runner E and F independently of the other, a rotary motion may be transmitted to the shaft 119 and a revoluble motion imparted simultaneously to each runner carried by the vertical shafts 114 and 115. In this figure of the drawings and in Fig. 9 I have illustrated another way of operating the table A, the adjustable triangular frame 31 being dispensed with and the cables 28 carried direct from pulleys 4, 4 to a pulley wheel 120 mounted upon a shaft 121. This shaft is journaled in the bearings 122, 122 and to said shaft a revoluble motion may be imparted from any desired source of power.

As heretofore stated, to fully accomplish the objects of my improved machine and to expedite the grinding, smoothing and polishing of glass I preferably employ a number of tables over which the frame D is adapted to travel and to still further facilitate the general operation of my improved machine it will be advantageous to the same to construct a building in which the tables A and the frame may be operated and by referring to Figs. 10 to 12 inclusive it will be observed that I have mounted therein a modified form of frame which carries the runners E and F. Upon the vertical side frames 123, 123 of the building I have secured by means of the bracket 124 and eye-beams 125 the tracks 126 and upon said tracks is adapted to travel the overhead crane or frame work 127, this frame being supported upon the tracks by the wheels 128 which are driven by a motor 129 as clearly illustrated in Fig. 10 of the drawings. Centrally of the crane and in alinement with each other are mounted the vertical shafts 130, 130 which upon their lower ends carry the runners E and F and upon their upper ends the gear wheels 131, 131 which mesh with the gear wheel 132 carried by a vertical shaft 133 and operated by a motor 134. The manner of revolving the runners E and F is similar to that heretofore described and illustrated in Figs. 8 and 9 of the drawings and the crane or frame work 127 and its appurtenant mechanisms may be controlled by an operator stationed upon said crane or frame, or may be manipulated from a desired point within the building from where observations may be made as to

the progress of the work and at which table the runners are needed.

I do not care to limit myself to the construction herein described and illustrated but may employ other means than those shown for accomplishing the different movements of the tables and the frames and may make such other changes as will be permitted by the scope of the appended claims.

Having fully described my invention, what I claim and desire to secure by Letters Patent, is:

1. In a machine of the character described, the combination of a hollow rotary shaft, a flat plate carried by said shaft, a casing having depending annular ribs, and apertures communicating with the spaces between said ribs, said casing resting on said plate, a series of pipes each leading from one of the spaces in said casing to the interior of said hollow shaft, and means for exhausting air from said shaft.

2. In a machine of the character described, the combination of a hollow rotary shaft, a perforated pipe arranged centrally of said shaft, means for exhausting air from said pipe, a plate carried by said shaft, a casing formed with a series of depending annular ribs, and pipes leading from the interior of said hollow shaft to the spaces between said ribs.

3. In an apparatus of the character described, the combination of a stationary standard, a hollow shaft rotatably mounted in said standard, means for rotating said shaft, a stationary pipe extending through said standard and shaft and having perforations in its side walls, and a flat plate carried by said shaft, a casing having a plurality of depending annular ribs and a plurality of openings extending through the plate between said ribs, a plurality of suction pipes each extending from the space between two of said ribs to the space in said shaft exterior to said perforated pipe, each of said suction pipes being provided with a valve, and means for exhausting air from the said perforated pipe.

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

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