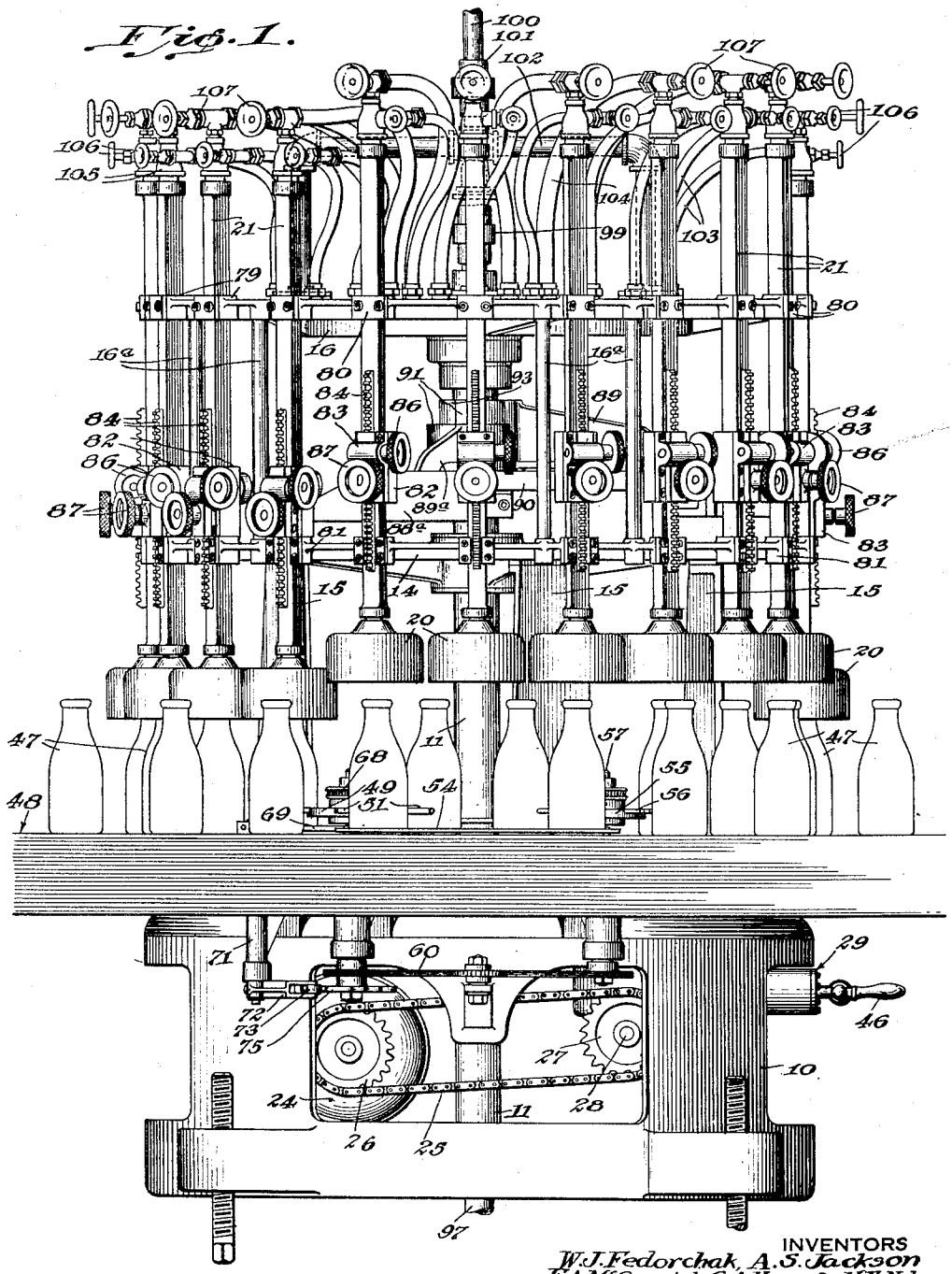
Jan. 11, 1944. F. J. FEDORCHAK ET AL 2,338,841

FIRE POLISHING MACHINE

Filed June 10, 1941 5 Sheets-Sheet 1

Fig. 1.



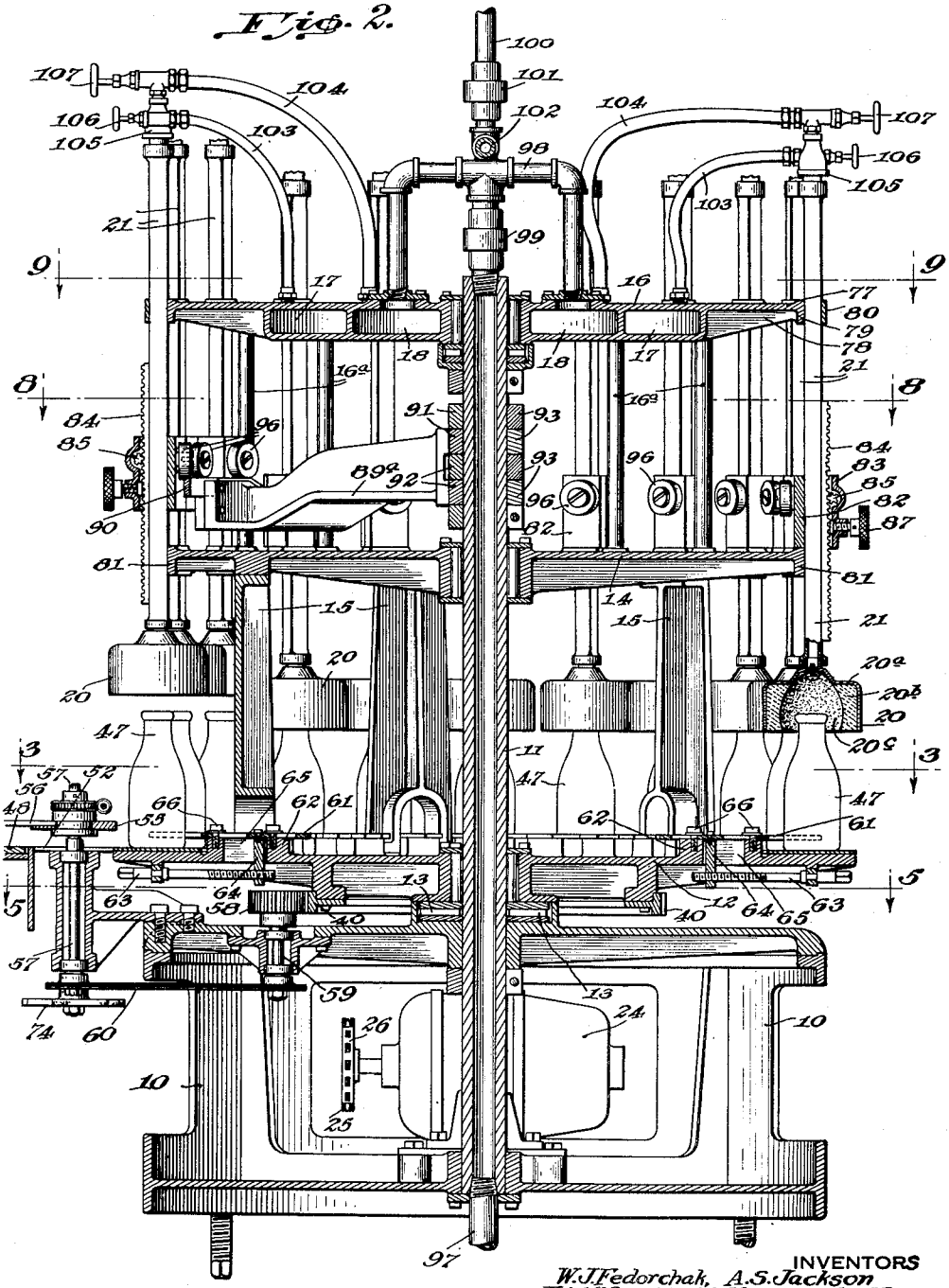
INVENTORS
W. J. Fedorchak, A. S. Jackson
F. A. McCormick, C. A. Heyne & H. E. Nelson
BY
Rule and Hoge
ATTORNEYS

Jan. 11, 1944. F. J. FEDORCHAK ET AL 2,338,841

FIRE POLISHING MACHINE

Filed June 10, 1941 5 Sheets-Sheet 2

Fig. 2.



INVENTORS
W. J. Fedorchak, A. S. Jackson
F. A. McCormick, C. A. Heyne & H. E. Nelson
BY
Rule & Hoge
ATTORNEYS

Jan. 11, 1944. F. J. FEDORCHAK ET AL 2,338,841

FIRE POLISHING MACHINE

Filed June 10, 1941 5 Sheets-Sheet 3

Fig. 3.

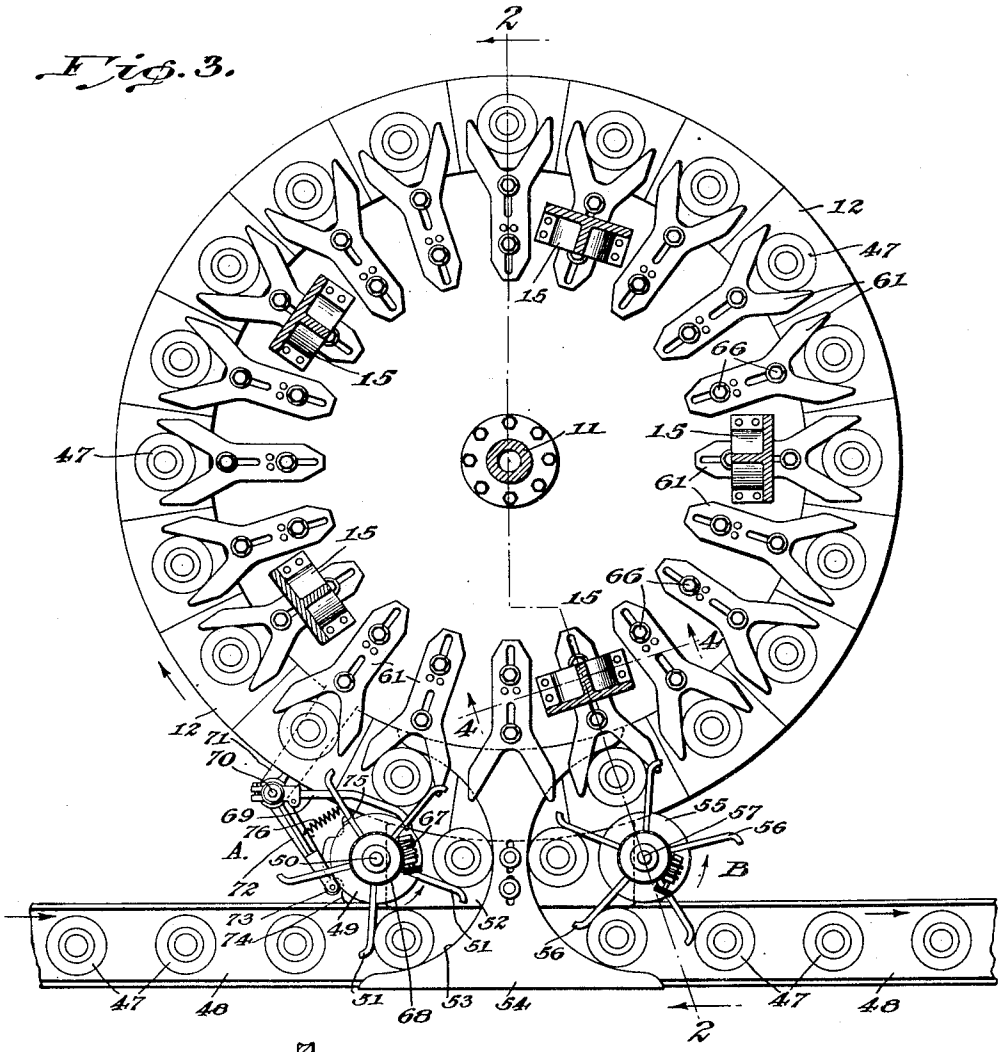
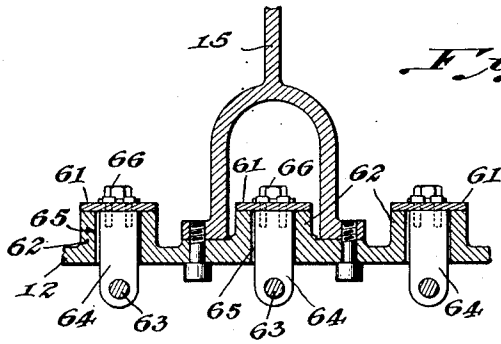


Fig. 4.



INVENTORS
W. J. Fedorchak, A. S. Jackson
F. A. McCormick, C. A. Heyne & H. E. Nelson,
BY
Rule & Hoge
ATTORNEYS

Jan. 11, 1944. F. J. FEDORCHAK ET AL 2,338,841

FIRE POLISHING MACHINE

Filed June 10, 1941 5 Sheets-Sheet 4

Fig. 5.

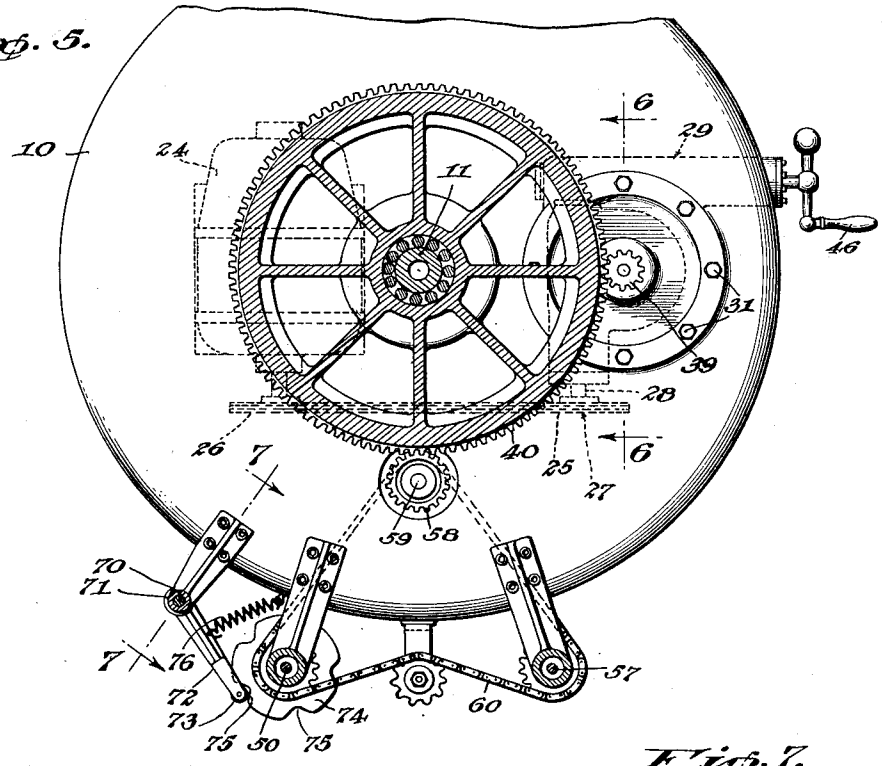


Fig. 6.

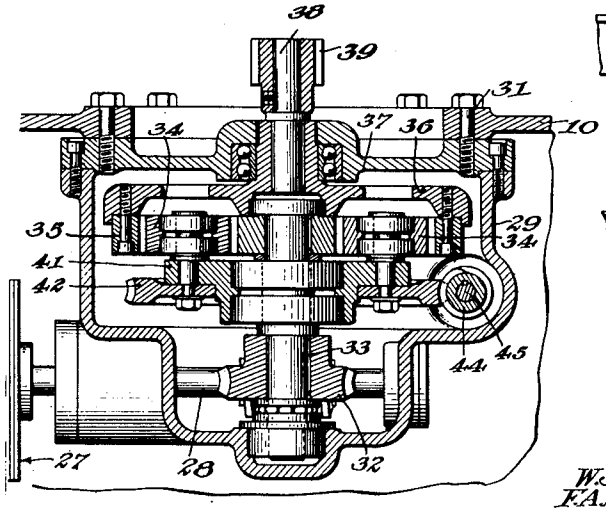
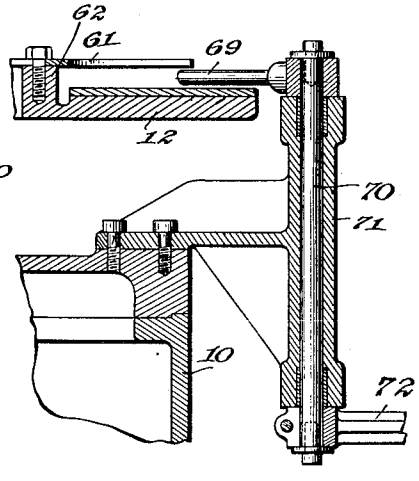


Fig. 7.



INVENTORS
W. J. Fedorchak A. S. Jackson
F. A. McCormick C. A. Heyne H. E. Nelson,
BY
Rule & Hoge
ATTORNEYS

Jan. 11, 1944. F. J. FEDORCHAK ET AL 2,338,841

FIRE POLISHING MACHINE

Filed June 10, 1941 5 Sheets-Sheet 5

Fig. 8.

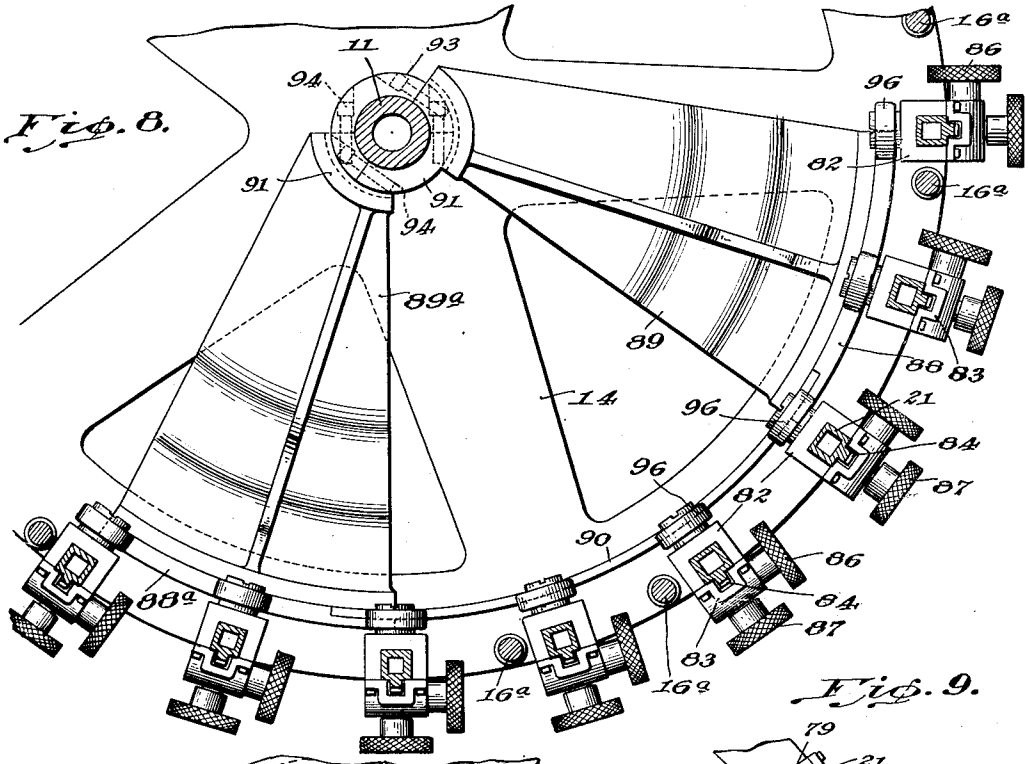
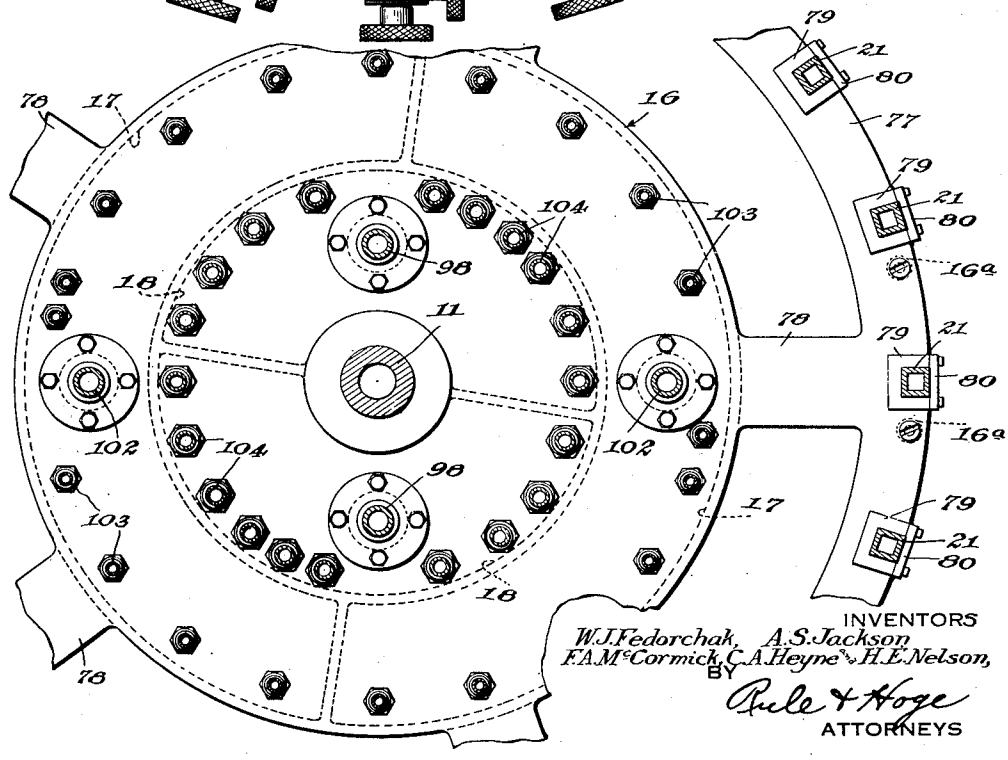


Fig. 9.



INVENTORS
W. J. Fedorchak, A. S. Jackson
F. A. McCormick, C. A. Heyne, H. E. Nelson,
BY
Rule & Hoge
ATTORNEYS

Patented Jan. 11, 1944 2,338,841

UNITED STATES PATENT OFFICE

2,338,841

FIRE POLISHING MACHINE

William J. Fedorchak, Granite City, Albert S. Jackson, Wood River, and Francis A. McCormick, Clarence A. Heyne, and Harold E. Nelson, Alton, Ill., assignors to Owens-Illinois Glass Company, a corporation of Ohio

Application June 10, 1941, Serial No. 397,414

8 Claims. (Cl. 49—58)

Our invention relates to machines for fire polishing or finishing the surfaces of glass articles and more particularly for fire polishing the lips or finishes of glass bottles, jars and the like as they are delivered from the glass blowing machine. It is customary to fire polish such articles by applying an intense flame to the surfaces to be polished, whereby the surface portion of the glass is softened or melted so that fins, cracks, mold seams and other surface irregularities are eliminated and a smooth surface obtained.

An object of the present invention is to provide an automatic machine adapted to receive the glassware as supplied from automatic blowing machines which deliver the blown articles in rapid succession, and subject them to such a fire polishing operation.

Other objects of the invention will appear hereinafter.

Referring to the accompanying drawings which illustrate a fire finishing machine embodying the present invention:

Fig. 1 is an elevation of the machine.

Fig. 2 is a sectional elevation of the same, the section being taken at the line 2—2 on Fig. 3.

Fig. 3 is a sectional plan view at the line 3—3 on Fig. 2.

Fig. 4 is a sectional detail at the line 4—4 on Fig. 3.

Fig. 5 is a horizontal section of the machine at the line 5—5 on Fig. 2.

Fig. 6 is a sectional elevation at the line 6—6 on Fig. 5.

Fig. 7 is a section at the line 7—7 on Fig. 5.

Figs. 8 and 9 are fragmentary sectional plan views taken respectively at the lines 8—8 and 9—9 on Fig. 2.

Referring to Figs. 1 and 2, the machine comprises a stationary hollow base or casing 10, a tubular center column 11 having a fixed mounting within the base, and a carriage mounted for continuous rotation about the vertical axis of the column 11. The carriage comprises a table 12 supported on roller bearings 13, and a spider 14 spaced above the table 12 and supported on an annular series of standards or castings 15 mounted on the table 12. The carriage further includes a distributing head 16 spaced above the spider 14 and connected thereto by tie rods 16a. The head 16 is formed with annular chambers 17 and 18 to which fuel gas and air or oxygen may be supplied respectively and from which the gases are distributed to the several burners as hereinafter described.

Mounted on the carriage for rotation therewith are a multiplicity of burner units 20 arranged in an annular series. Each unit comprises a hood 20a (Fig. 2) carried at the lower end of a vertical stem 21, the latter being in the form of a rectangular pipe. The hood 20a is lined on its interior with a lining 20b of refractory material which is formed with a combustion chamber 20c in communication with the passageway through the stem 21.

The carriage is rotated continuously by an electric motor 24 housed within the base 10. Driving connections between the motor and the carriage include a sprocket chain 25 (Figs. 1 and 5) trained over sprocket wheels 26 and 27 keyed respectively to the motor shaft and a worm shaft 28, the latter journalled in a gear box 29 (Fig. 6) within the base 10 and attached to the cover plate of said base by bolts 31. The worm shaft 28 drives a worm gear 32 keyed to a vertical shaft 33 journalled in the gear case 29. The shaft 33 drives a set of planetary gears 34 which in turn drive a ring gear 35 to which is bolted a spider 36. The hub of the spider is journalled in the cover plate 37 of the gear case and is keyed to a shaft 38 in vertical alignment with the shaft 33. A pinion 39 keyed on the shaft 38 meshes with a ring gear 40 (Figs. 2 and 5) bolted to the under surface of the table 12. The planetary gears 34 are mounted on a plate 41 (Fig. 6) to which is bolted a worm gear 42. Means for rotatively adjusting the plate 41 about the axis of the shaft 33 includes a worm 44 keyed to a shaft 45 journalled in the gear case and to which is attached a hand crank 46. This adjusting means permits the shaft 38 to be rotatively adjusted relative to the shaft 33 for a purpose hereinafter described.

Referring to Fig. 3 the articles 47, herein shown as bottles, which are to be fire polished, are brought in succession to a transfer station A by a continuously traveling endless belt conveyor 48. The bottles may be supplied to the conveyor from the bottle blowing machine, conventional mechanism being used for automatically transferring the bottles from the machine to the said conveyor. When the bottles reach the station A they are transferred to the rotating carriage by a transfer mechanism comprising a transfer wheel 49 on a vertical shaft 50, said wheel having radial arms 51 to engage the articles and shift them from the traveling conveyor across a stationary supporting plate 52 and onto the table 12. The bottles are guided during the transfer along an arc-shaped surface 53 concentric with the shaft 50, said surface formed on a stationary guide plate 54 mounted over the conveyor 48,

The bottles are fire finished as hereinafter described, during their rotation with the carriage, and are then transferred back to the conveyor 48 at a transfer station B by means of a transfer wheel 55 carrying radial fingers 56. The wheel 55 is attached to a shaft 57. The conveyor belt 48 is driven in synchronism with the rotating table 12. The transfer wheels 49 and 55 are driven from the ring gear 40 through driving connections including a pinion 58 (Figs. 2 and 5) running in mesh with the gear 40 and keyed to a shaft 59 journalled in the machine base. A sprocket wheel attached to the lower end of the shaft 59 drives a sprocket chain 60 which is trained over sprocket wheels keyed respectively to the shafts 50 and 57.

The bottles are guided into position on the rotating table 12 and held in position during the fire finishing operations by means of guide plates 61 mounted on said table and individual to the burner units. The guide plates are arranged in an annular series and extend radially of the carriage, the outer ends of the plates being bifurcated to straddle the bottles. The table 12 is formed with bosses 62 (Fig. 2) on its upper surface on which the guide plates are mounted and by which they are spaced above the surface of the table. Each guide plate is adjustable radially of the table by means of an adjusting rod 63 rotatably mounted on the under side of the table and having a screw-threaded connection with an arm 64 attached to the plate 61 and extending downward therefrom through an elongated opening 65 in the boss 62. The guide plate is held in its adjusted position by clamping bolts 66.

As each bottle is shifted from the conveyor belt onto the rotating table at the transfer station A, it is guided into position in the bifurcated end of a plate 61. The transfer wheel 49 may be rotatively adjusted relative to its shaft 50 for accurately timing the movements of the bottle relative to the traveling guide plates. This adjustment may be made by a hand operated worm shaft 67 mounted on the transfer wheel and meshing with a worm gear 68 (Fig. 3) attached to the shaft 50. Similar adjusting means is provided for the transfer wheel 55.

In order to insure the accurate positioning of each bottle in contact with its supporting plate 61, an arm 69 (Figs. 3 and 7) is mounted in position to guide the bottle in place. The arm 69 is secured to the upper end of a vertical rock shaft 70 journalled in a bracket 71 bolted to the base 10. A rock arm 72 attached to the lower end of the shaft 70 carries at its outer end a cam roll 73 which runs on a cam disk 74 fixed to the lower end of the shaft 50. The cam disk is formed with cam recesses 75 in its periphery spaced to correspond with the angular spacing of the fingers 51. A coil spring 76 holds the arm 72 in contact with the cam disk. As the cam disk rotates, the guide arm 69 is given an inward swing each time the cam roll drops into a cam notch 75. This operation is timed to push each bottle snugly into engagement with the supporting plate 61.

The burners 20 are movable vertically into and out of operative relation to the bottles 47 during the rotation of the carriage. To permit such movement the stems 21 are mounted for sliding movement in the spinder 14 and distributing head 16. Referring to Figs. 2 and 9, the distributing head carries a ring 77 integrally connected thereto by radial arms 78. Said ring is formed with rectangular bosses 79 providing guideways for the stems 21. The stems are held in place by removable front plates 80. Like means, including bosses 81 (Fig. 1) on the periphery of the spider 14, are provided for guiding the burner stems up and down therein.

The means for moving the burners up and down include rectangular sleeves 82 individual to said stems and each including a removable front plate 83. The sleeves are individually adjustable up and down on the stems by means of adjusting devices, each of which comprises a rack 84 formed on the stem and a pinion 85 journalled in the plate 83 and running in mesh with the rack. The pinion is rotatable by a knob 86. The stem is clamped in its adjusted position by a clamping screw carrying a knob 87. The sleeves 82 serve as stops to limit the downward movement of the burners, each sleeve resting on the rim of the spider 14 when the burner is lowered.

Means for controlling the lifting and lowering of the burners comprises a cam track including a lifting cam 88 and a lowering cam 88a mounted respectively on radial arms 89 and 89a (Fig. 8) which are clamped to the center column 11. The cam track includes an intermediate section 90 (Fig. 8) in the form of an arc-shaped bar connected at its ends to the arms 89, 89a. Each of said arms is bifurcated at its inner end to provide an upper bearing or hub 91 and a lower hub 92 (Fig. 2) surrounding the column 11. Each hub includes a section integral with the arm, and a strap 93 attached thereto by clamping bolts 94 which serve to clamp the arms to the center column. The cam track section 90 may be replaced with other sections of different lengths for adjustment purposes.

The sleeves 82 have mounted thereon cam rolls 96 which run on the cam track. The lifting cam 88 is positioned and arranged to lift each burner before the latter reaches the unloading station and the lowering cam 88a is positioned to permit the burner to be moved downward by its own weight to operative position after a bottle has been positioned on the table therebeneath. The cam arms may be adjusted circumferentially of the machine to effect the lifting and lowering of the burners at any predetermined points, thereby determining the length of time the bottles or other articles are subjected to the action of the burners. The length of time required for best results may vary considerably, depending upon the size and shape of the articles which are being fire finished and on other variable factors.

The means for supplying fuel gases to the burners will now be described. Referring to Fig. 2, air under pressure may be supplied from a suitable source through a pipe 97 opening into the column 11 at the lower end thereof. The air passes upward through said column to a branch pipe 98 leading to the air chamber 18 formed in the distributing head 16. A swivel connection 99 is provided between the column 11 and the pipe 98 to permit rotation of the latter with the carriage. The fuel gas is supplied through a pipe 100 having a swivel connection 101 with a branch pipe 102 similar to the pipe 98 and which opens into the annular chamber 17 surrounding the chamber 18. The gases are distributed from the chambers 17 and 18 through pairs of pipes 103, 104, leading respectively from the said chambers to mixing heads 105 on the upper ends of the burner stems 21. Hand valves 106 and 107 connected respectively to the pipes 103 and 104 serve

to regulate the flow of gases to the burners. In this manner the rate at which the gases are supplied to each burner may be adjusted or the supply may be shut off entirely from any selected units.

The lifting cam 88 is positioned and arranged to lift each burner before the latter reaches the discharge station B and the burners are held in their lifted position by the cam track until they have passed beyond the station A. This permits the transfer of the articles to and from the carriage without interference from the burners. The cam track is adjusted to hold each burner in its lowered or operative position a length of time determined by the requirements of the particular articles which are being fire finished. When a burner is lowered, the lip portion or finish of the bottle therebeneath is brought within the chamber 20c (Fig. 2) and subjected to the heat of the gases which are burning within said chamber. This heat may be sufficiently intense to soften or melt a surface layer of the glass before much of the heat has time to penetrate the glass to any considerable depth. In other words, the heating effect is confined mainly to the surface of the glass. A smooth surface or glaze is thus produced and all fine cracks, fissures, fins, mold seams or other irregularities smoothed out and eliminated.

Modifications may be resorted to within the spirit and scope of our invention.

We claim:

1. A machine for fire finishing glass articles comprising a carriage mounted for rotation about a vertical axis, a motor connected to rotate the carriage, an annular series of burner units on the carriage, each unit comprising a burner, automatic transfer mechanism positioned adjacent to the carriage and comprising means for individually moving articles horizontally onto the carriage at a receiving station with the articles positioned below and in register with the burners, mechanism for lowering each burner into operative relation to a said article at a point beyond said receiving station, a transfer device positioned at a discharging station adjacent to the path of movement of the articles with the carriage, said transfer device comprising means operable to remove the articles from the carriage as they are brought to said discharging station, and burner lifting mechanism positioned and arranged to lift each burner during its travel as it advances with the carriage toward the said discharging station.

2. A fire finishing machine comprising a carriage, means for rotating it about a vertical axis, a series of burner units mounted to rotate with the carriage, each said unit comprising a hood formed with a combustion chamber, a vertical tubular stem carrying said hood, and a bearing sleeve mounted on the stem, means for individually adjusting said sleeves up and down on said stems, cam rolls carried on said sleeves, and a stationary cam track in the path of the cam rolls, said cam track being positioned and arranged to support each burner unit during a predetermined portion of its travel, at a height determined by the said adjustment of its bearing sleeve.

3. A fire finishing machine comprising a carriage, means for rotating it about a vertical axis, a series of burner units mounted to rotate with the carriage, each said unit comprising a hood formed with a combustion chamber, a vertical tubular stem carrying said hood, a bearing sleeve mounted on said stem, means for adjusting the sleeve up and down on the stem including a rack on the stem, a pinion carried by the sleeve and engaging the rack, means for rotating the pinion, means for clamping the sleeve in adjusted position on the stem, and means for lifting the burner units in succession comprising a stationary cam track.

4. A fire finishing machine comprising a carriage, means for rotating it about a vertical axis, said carriage comprising a table, a horizontal conveyer positioned at one side of said table by which articles are brought in succession to a transfer station, means at said station for transferring the articles from the conveyor to the said table, said transfer means including a transfer wheel, means for rotating said wheel about a vertical axis in synchronism with the rotation of the carriage, and radial fingers carried by said wheel, plates mounted on said table, said plates shaped and arranged to guide and hold the articles in a predetermined position, an arm positioned adjacent to the path of said plates for moving the articles into position in contact with said plates, said arm having a stationary mounting, and cam means for periodically actuating said arm in synchronism with the said movements of the articles.

5. A fire finishing machine comprising a carriage mounted for rotation about a vertical axis, devices on the carriage for individually positioning and holding articles each in a predetermined position on the carriage, a belt conveyor by which articles are carried to a transfer station, means at said station for transferring the articles from said conveyor to the carriage, and a device for moving each article into said predetermined position, said last mentioned device comprising a rock arm having a stationary mounting and means driven in synchronism with the rotation of the carriage for periodically rocking said arm.

6. A fire finishing machine comprising a carriage mounted for rotation about a vertical axis, devices on the carriage for individually positioning and holding articles each in a predetermined position on the carriage, a belt conveyor by which articles are carried to a transfer station, means at said station for transferring the articles from said conveyor to the carriage, and a device for moving each article into said predetermined position, said last mentioned device comprising a rock arm having a stationary mounting and means driven in synchronism with the rotation of the carriage for periodically rocking said arm, said last mentioned means comprising a cam disk formed with cams spaced along its periphery, means for rotating said cam disk, and means controlled by said cams for periodically swinging said arm.

7. A fire finishing machine comprising a carriage, means for continuously rotating the carriage about a vertical axis, a series of burners mounted to rotate with the carriage, cam rolls individual to the burners and connected to rotate therewith, means for individually adjusting the burners up and down relative to their respective cam rolls and securing them in adjusted position, a stationary circular track on which said rolls run, said track including a cam positioned and arranged to lift said rolls and their connected burners and hold them at an elevated position during a predetermined portion of the rotation.

8. A fire finishing machine comprising a carriage, means for continuously rotating the carriage about a vertical axis, a series of burners

mounted to rotate with the carriage, cam rolls individual to the burners and connected to rotate therewith, means for individually adjusting the burners up and down relative to their respective cam rolls and securing them in adjusted position, a stationary circular track on which said rolls run, said track including a cam positioned and arranged to lift said rolls and their connected burners and hold them at an elevated position during a predetermined portion of the rotation, said carriage including an article supporting table positioned beneath and spaced below the burners, and automatic means for placing articles on said table beneath and in register with the burners at a position in which the burners are held lifted by said cam, and automatic means for removing the articles from said table, said removing means being located in position to remove the articles after the burners thereover have been lowered and again lifted.

WILLIAM J. FEDORCHAK.
ALBERT S. JACKSON.
FRANCIS A. McCORMICK.
CLARENCE A. HEYNE.
HAROLD E. NELSON.