

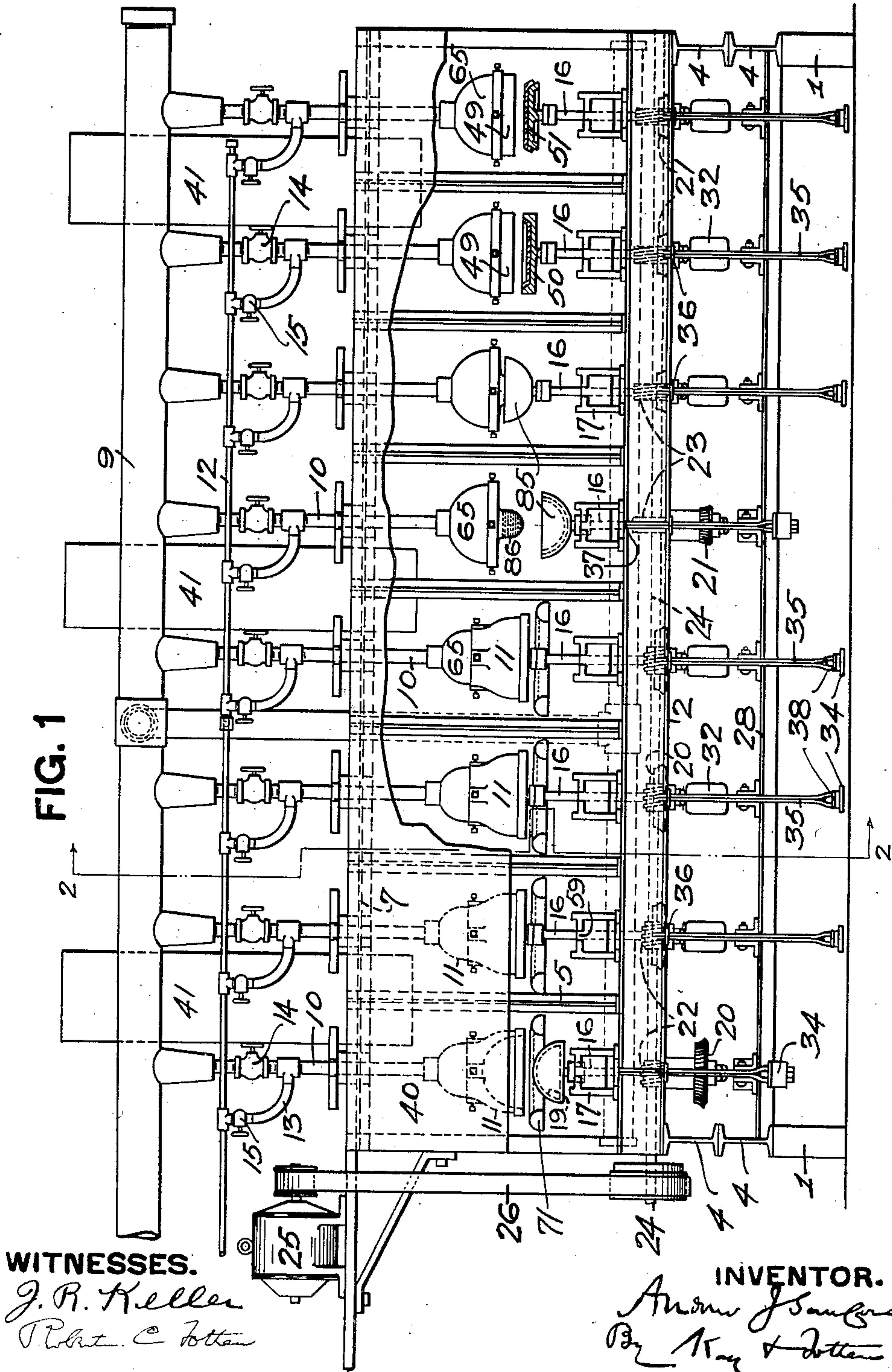
A. J. SANFORD.  
 APPARATUS FOR FIRE POLISHING GLASSWARE.  
 APPLICATION FILED JUNE 26, 1909.

962,863.

Patented June 28, 1910.

3 SHEETS—SHEET 1.

FIG. 1



WITNESSES.

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 Robert C. Totten

INVENTOR.

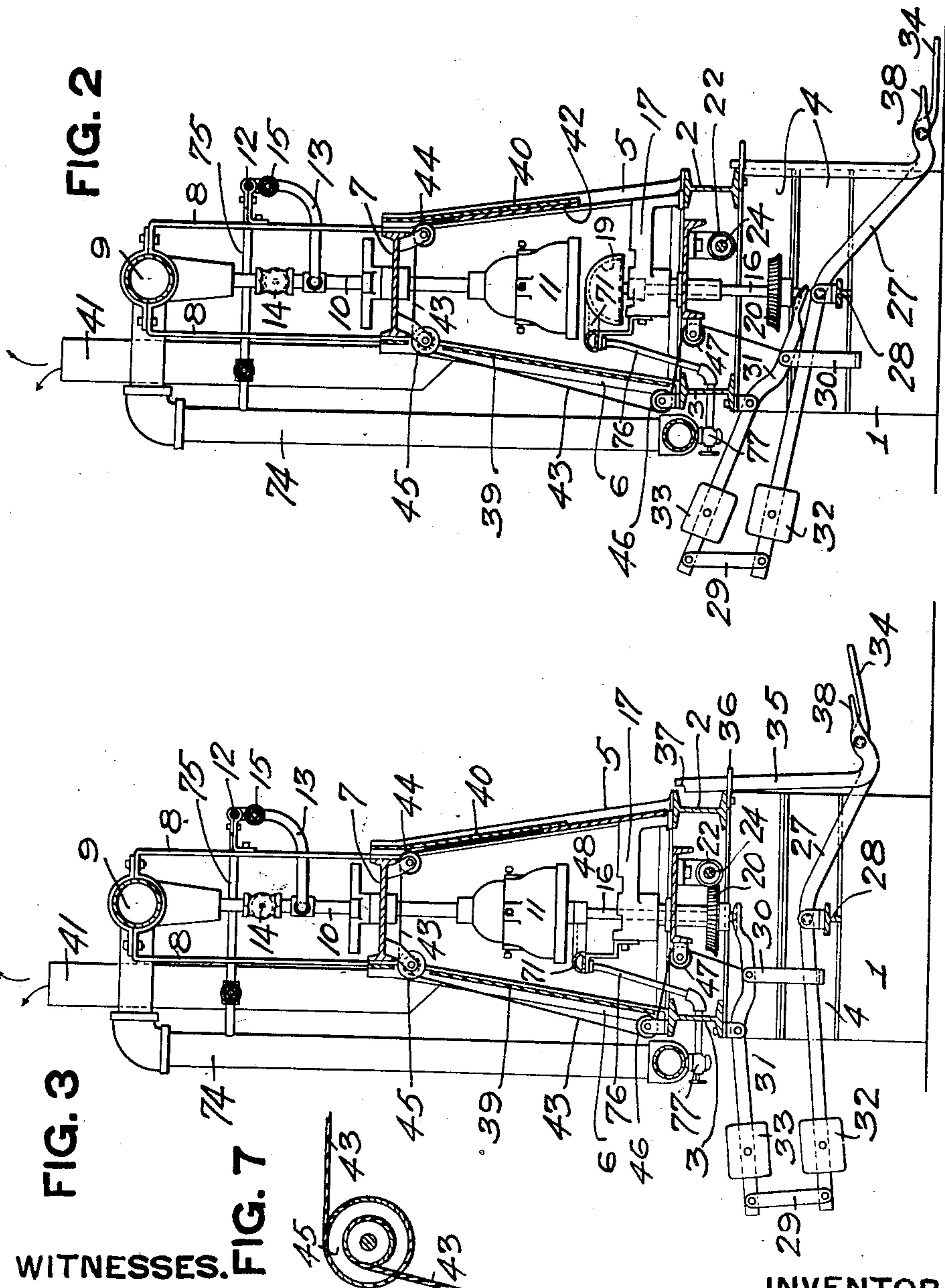
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3 SHEETS—SHEET 2.



WITNESSES.  
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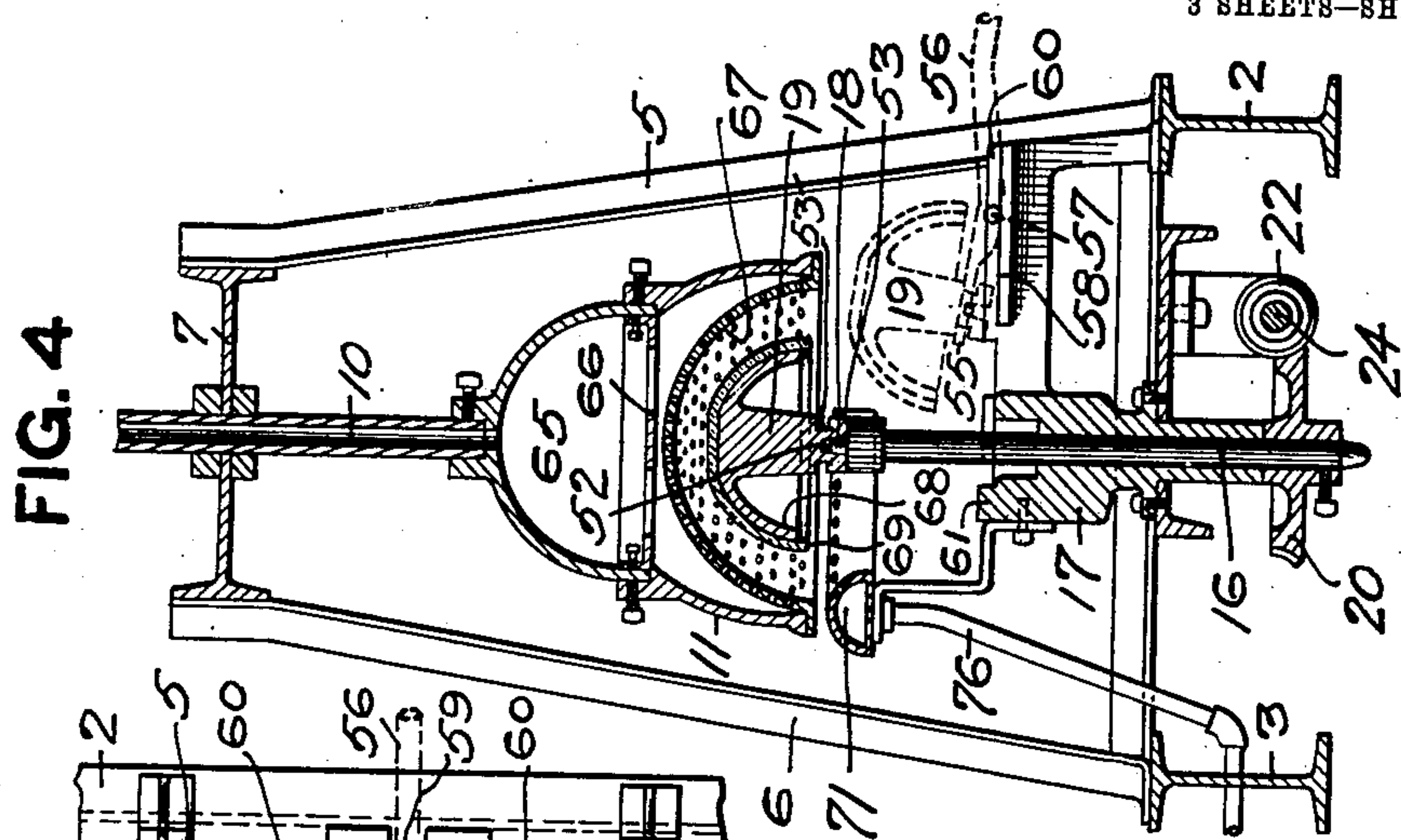
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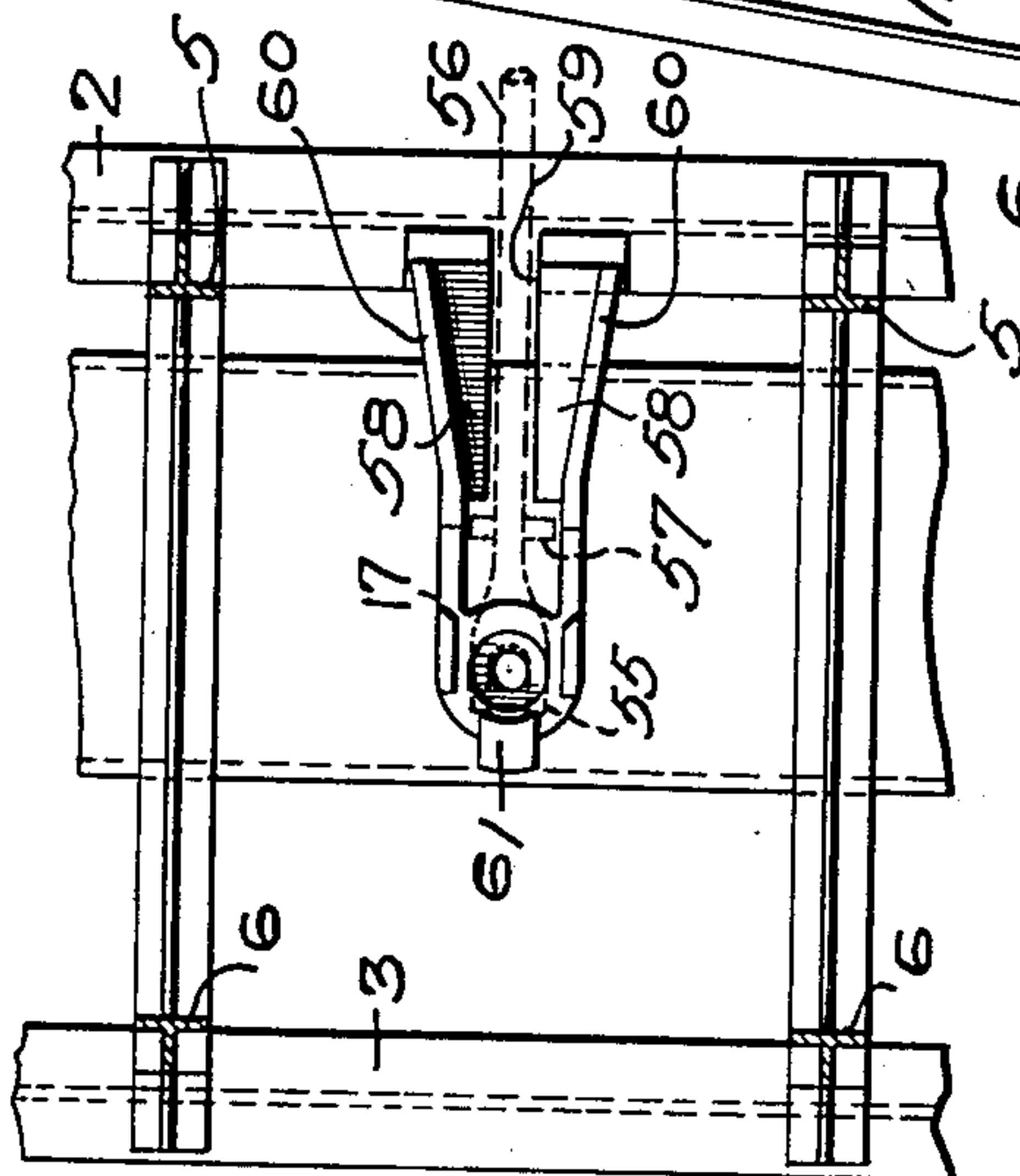
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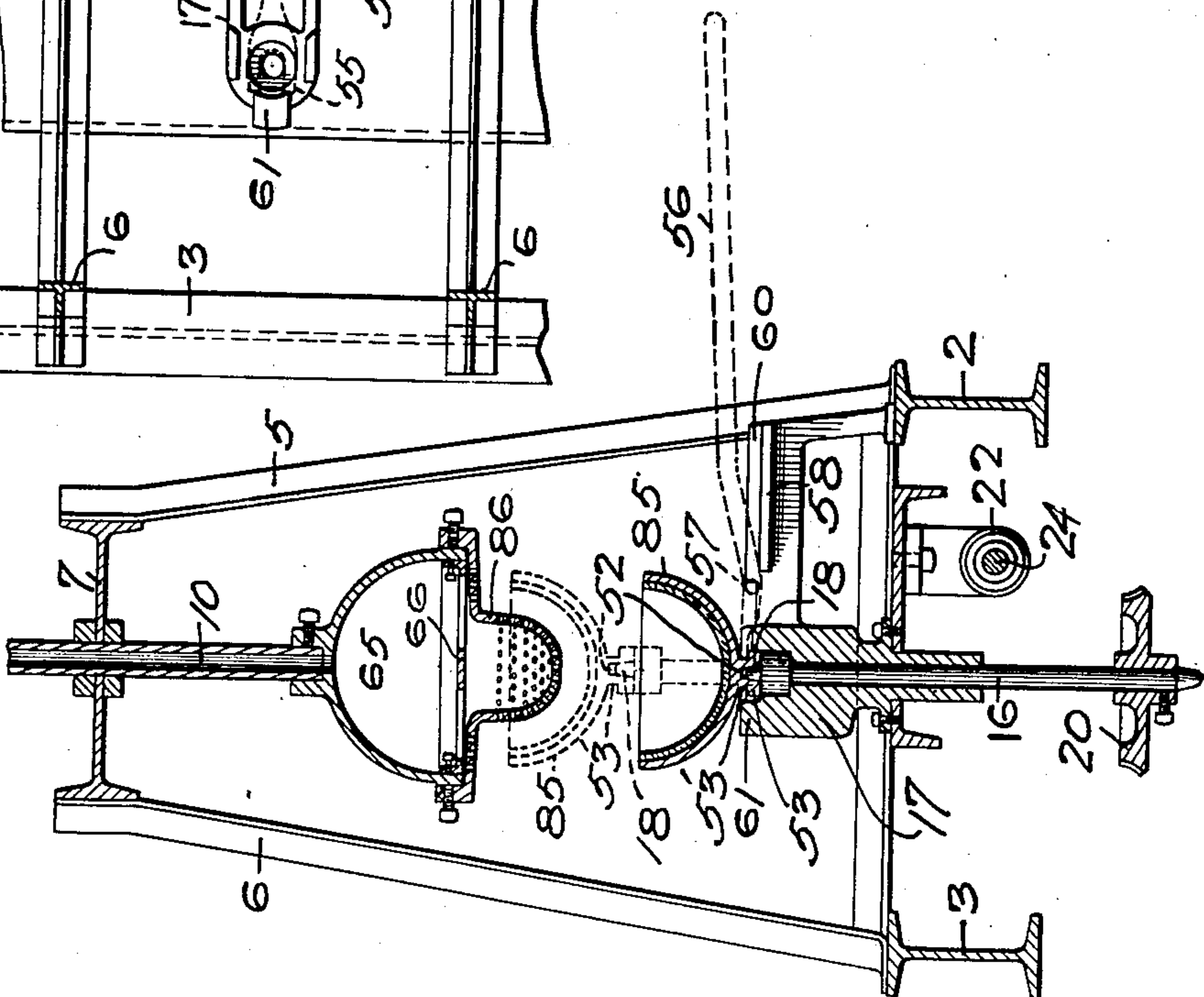
3 SHEETS—SHEET 3.



**FIG. 6**



**FIG. 5**



WITNESSES.

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# UNITED STATES PATENT OFFICE.

ANDREW J. SANFORD, OF NEWARK, OHIO, ASSIGNOR TO A. H. HEISEY & CO., INC., OF NEWARK, OHIO, A CORPORATION OF WEST VIRGINIA.

## APPARATUS FOR FIRE-POLISHING GLASSWARE.

962,863.

Specification of Letters Patent. Patented June 28, 1910.

Application filed June 26, 1909. Serial No. 504,554.

*To all whom it may concern:*

Be it known that I, ANDREW J. SANFORD, a resident of Newark, in the county of Licking and State of Ohio, have invented a new and useful Improvement in Apparatus for Fire-Polishing Glassware; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to apparatus for polishing or finishing glassware.

It relates to the same subject matter as other applications filed by me, of even date herewith, for example, application Serial No. 504,552, the present application having reference more especially to the apparatus for handling the material to subject it to the fire polishing treatment, though it also includes certain improvements relating to the burners themselves. The apparatus illustrated can be employed in connection with different burners and methods of treatment for different shaped articles.

The general method involved in the use of the apparatus includes the support of the article upon a suitable former fitting within or around the article to be polished according as it is employed with outside or inside polishing, and the downward projection of multitudinous small flame jets directly upon the surface of the article to be polished, for example where in the polishing of bowls the bowl itself enters within the burner which extends below the bottom edge thereof, the flame jets being projected directly against such bowl; or in case of inside polishing the article being supported within a bowl shaped former or support and the burner entering directly within the article and the flame being projected from the same directly against the surface to be polished; the space between the article and the opening in the burner being very short, for example, generally about two inches, so that direct polishing action under practically perfect control can be obtained. In the polishing of flat or approximately flat articles the same principle is applied through the employment of jets projected from the burner downwardly directly into contact with the surface of the glass.

The apparatus of the present invention has for its object to provide means for properly handling the glassware in such fire pol-

ishing operations, and also to provide for the control of the gas and air for the same purpose and to protect the workmen from heat in connection with the fire polishing operation.

It comprises certain improvements in the means for feeding the blanks to the machine, for raising and lowering the same, for rotating the same at different speeds as well as other improvements, as will hereinafter be set forth and claimed.

In the accompanying drawing Figure 1 is a side elevation partly broken away illustrating the invention; Figs. 2 and 3 are sections on the line 2—2 Fig. 1, showing the apparatus in different positions; Figs. 4, 5 and 6 are enlarged views illustrating more clearly the burner construction and the position of the parts in connection with fire polishing, and the means for feeding and withdrawing the blanks. Fig. 7 is a detail sectional view illustrating the means for raising the shield.

The invention is illustrated in connection with a gang machine having numerous different stands, each separately operated for the fire polishing of different articles, it being understood that in use different burners can be substituted at such different stands according to the work to be performed, though in general practice the machine is equipped so that it works at one time on one particular class of goods. The apparatus has the machine base 1 which supports the longitudinal beams 2, 3, forming the main portion of the frame of the machine, these longitudinal beams being carried on the cross beams 4, 4, resting on the base 1. Between each different stand I provide uprights 5, 6, illustrated as formed of T-iron and supporting at the top the horizontal beam 7, these parts forming the main frame of the machine. Carried on suitable uprights 8 leading up from said top beam 7 are the means for supplying gas and air to support combustion. For this purpose I employ the longitudinal air supply main 9 carrying air under pressure and having extending down for each burner a down-take pipe 10 which passes through the top beam 7 and is supported therein and carries the burner 11, and the gas supply main 12 extends along the front of the machine and has branch pipes



13 extending therefrom to the pipe 10, the supply of air and gas being regulated by valves 14 and 15. Directly under the burners 11 is the blank supporting shaft 16 which passes up through the feeding casting 17 and carries at its upper end a center pin or nipple 18 upon which the blank support or former 19 rests. This shaft 16 as illustrated in the different figures, carries at its lower end a worm wheel 20 or 21 engaging with a worm 22 or 23, these worms and worm wheels differing only in relative size to each other to provide for rotating the blanks at different speeds as illustrated in Figs. 4 and 5. The shafts 16 are vertically movable and means are provided for raising the same to bring their work wheels into engagement with their respective worms, the worms being carried upon the worm shaft 24 driven by a suitable motor such as the electric motor 25 which connects by belt 26 with the worm shaft. Suitable means for raising and lowering the shaft 16 are provided, that illustrated being suitable lever mechanism operated by foot treadles, the main lever 27 being mounted on brackets supported on the longitudinal bar 28 which is connected by links 29, 30, with the lever 31, the inner end of which supports the shaft 16 in a suitable seat, the levers 27 and 31 carrying the weights 32, 33, which act when the levers are free to raise the shaft 16 into operative position, raising the worm wheel into contact with its worm so as to cause the rotation of the blank carried on the shaft 16 as hereafter described. The lever 27 has the foot treadle 34 through the operation of which the shaft 16 is lowered, and pivoted on said lever 27 is the tripping arm 35 which passes through a guide-way 36 secured to the front longitudinal beam 2, said tripping lever having the notched upper end 37 which catches under the beam when the main treadle 34 is depressed so as to lower the work out of the burner and hold it in that position. The tripping lever is so pivoted that it drops of its own weight under the beam 2, and it has the treadle 38 by which it may be withdrawn and permit the weights 32 and 33 on the levers 27 and 31 to lift the shaft 16 and raise the blank into fire polishing position. The burner is preferably located within a suitable inclosed chamber during the fire polishing operation, and for this purpose the refractory back wall 39 is supported between the uprights 6 and a like front wall 40 extends downwardly from the top beam 7 part-way toward the feeding stand 17, a suitable chimney or hot air shaft 41 leading from the chamber so formed. In front of each burner I provide the sliding door or shield 42 which slides between the uprights 5 so as to inclose the work during the fire polishing operation and protect the workman and prevent the apparatus being affected by currents of air

within the plant. This shield is raised by means of a rope 43 passing around sheaves 44, 45, 46 and 47, and connected to the lever 31 so that when the inner end of that lever is raised to lift the blank up into fire polishing position, the shield 42 will be dropped into lowered position inclosing the work support 17 and closing the fire polishing chamber 48. To provide for sufficient length of play for the shield the sheave 45 may be provided with two faces, one of greater diameter than the other, and the rope 43 being provided and connected thereto to give the full raising stroke, (see Fig. 7). Upon the depression of the lever 31 and the dropping of the blank carrying shaft 16, the shield is raised to provide space for withdrawing and feeding in the blanks.

Any suitable form of blank support may be employed according to the character of the article to be fire polished. For the practical purpose of fire polishing bowls I employ for each bowl two blank holders, one conforming substantially to the inner shape of the article, as shown more particularly in Fig. 4, and one conforming substantially to the outer shape thereof, as shown in Fig. 5. These blank holders can be of any desired shape conforming to the blanks and for that purpose I have illustrated in Fig. 1 in connection with some of the separate stands of fire polishing apparatus, flat burners 49 for fire polishing and blank holders 50 and 51 for the support of that class of articles.

The blank holders can be handled in any suitable way, the preferred form of blank holder being more particularly illustrated in Figs. 5 and 6, each blank holder having a center recess 52 to fit over the centering pin 18 on the blank holding shaft 16 and having in its center stem 53 an annular seat 53' into which the forked end 55 of the carrier bar 56 fits, and by which the workman carries the blank 2 and inserts it in the machine and withdraws it therefrom. For that purpose the carrier bar has the knobs 57 on each side thereof and the feeding casting 17 has the flat flange guide-ways 58 over which such knobs slide, the carrier bar fitting into the center recess 59 so that the bar can be slid over the feeding casting and bring the blank holder directly over the centering pin 18 and drop it onto that pin. It will be noted that the feeding casting has the flaring lips 60 extending up on each side of the guide faces 58 and forming a flaring guide-way through which the carrier bar 56 can pass, the flaring side 60 centering the same so that the blank holder is easily brought directly over the centering pin of the shaft 16. Said blank holder has also the stop 61 limiting the inward movement of the blank holder.

Below the flanges 58 of the feeding casting the space is open and it will be noted



that the said flanges terminate just short of the position of the knobs 57 when the fork engages with the seat of the blank holder. This construction is employed so that by means of the carrier 56 the blank holder with its blank can be slid into position and brought directly above the shaft 16 when the carrier bar can be dropped to bring its knobs under the flanged guide ways 58, dropping the blank holder onto the shaft 16 and permitting the carrier bar to be withdrawn without touching the edge of the blank which may be of such depth as to be brought close to the feeding casting. In like manner in withdrawing the blank holder with its blank the carrier bar slides on the under faces of the flanged guide ways, being held by the workman up against the same and its fork passes upwardly underneath the blank holder and engages with the same. It can then be raised and as it is withdrawn the knobs will travel on top of the flanged guide ways, being supported thereon.

While, as above stated, any suitable character of burner may be employed with the apparatus, the burner specially illustrated in Fig. 4 forms part of the subject matter of this application and will be particularly described. The pipe 10 leads down into the mixing chamber 65 formed of a hollow casting which as illustrated is of an inverted dome shape, giving free space for the mixing of the gas and air, and may receive any suitable form of burner according to the shape of the blank to be polished, the burner proper 11 being secured thereto by means of set screws. The mixing chamber 65 has a circular lower edge against which the burner fits and the burner has a jet face 67 corresponding substantially to the shape of the article to be polished. It is illustrated as a hollow concave burner having a multitude of jet orifices formed in its face and extending down close to the lower edge thereof, the orifices being illustrated as circular holes extending through the jet faces so as to project the jets of gas on lines substantially transverse to the face of the burner, innumerable flame jets being thus projected against the blank on lines transverse to the face thereof, and so giving a uniform distribution of flame over the entire surface of the article to be polished.

On account of the high heat generated around the burner and mixing chamber, to brace the body of the mixing chamber at the point where the burner is secured thereto and also to provide for the better mixing of the gas and air, I provide the flat plate or pan 66 fitting within the base of the mixing chamber opposite the place where the burner fits around and is clamped thereto by the set screws, so fully bracing both the mixer body and the burner body. In this plate 66 are

formed any desired number of openings so that the gas and air, in passing downwardly through the pipe 10, will strike upon such plate and be deflected thereby and thus more thoroughly mixed.

In polishing the outer face of the bowl the bowl is raised so as to be entirely inclosed within the concave burner and is held in such position that the flame jets strike directly upon it all over its surface, so giving an even fire polishing action over the entire outer surface of the bowl. The blank holder 19 fits within the blank and corresponds substantially to the inner face thereof, and when the blank is raised the blank holder supports it at a short distance from the jet face of the burner, usually at a distance of about two inches, so that the multitudinous flame jets strike directly on the blank and so give uniform fire polishing action. In polishing such bowls it is desirable to obtain as great heat as possible around the edge of the bowl and for that purpose, as illustrated in Fig. 4, the blank projects below the lower edge 68 of the blank holder so exposing such lower edge to the action of the flame. As, however, the flame naturally rises as it escapes from the hollow burner and it is important that the lower edge 69 of the bowl shall be raised to specially high heat to melt therefrom the square edges or fin marks on the edge of the bowl, I prefer to employ a separate burner 71 in the form of about a half a ring, said burner being supported around the back edge of the main burner and having jet orifices on its inner face so as to project the flame jets against the exposed edge 69 of the blank and melt such edge sufficiently to at least remove the fin, and if necessary melt off the square edge thereof. For this purpose I carry from the air main 9 the branch pipe 74 leading down to the lower part of the apparatus and carry from the gas main 12 the pipe 75 communicating with said air pipe which forms a mixing chamber, from the lower end of which the pipe 76 leads upwardly to the edge finishing burner 71, the supply of gas and air through said pipe 76 being controlled by the valve 77. As illustrated this said pipe 76 is carried below the back wall 39 and through the longitudinal beam 8 and thence upwardly to the burner 71.

In the use of the apparatus as above described, the supply of gas and air to the several burners is properly regulated to obtain the proper fire polishing flames through the ignition of the air and gas jets on the outer face of the burner, and after the pressing of the article to be fire polished, for example, the bowl as illustrated in Figs. 4 and 5, and while the article is still hot it is received by the operator upon the blank holder 19 supported on the carrier bar 56 and is carried to the machine, the carrier bar slip-



ping over the feeding casting 17 through the guide-ways and being centered over the shaft 16 and deposited thereon, the centering pin 18 entering within the seat 52 in the bottom of the blank holder. During this operation the lever mechanism is in the position illustrated in Fig. 2, the shield or door 42 being raised and the shaft 16 being in lowered position as also illustrated in Figs. 2 and 5. The operator then places his foot on the treadle 38 of the tripping lever 35 when the weight on such lever mechanism raises the shaft 16 carrying the blank with its support up into and within the hollow burner 11 and at the same time bringing the worm wheel 20 into mesh with the worm 22, providing for the rotation of the blank and the fire polishing action above described. At the same time through the rope and pulley connections the door or shield 42 is dropped so that the blank is inclosed in a chamber protected from the outside air and the workmen protected from the heat of fire polishing. When the blank is fire polished the workman places his foot upon the treadle 34 and draws the blank out of the burner into position to be withdrawn, and raises the projecting shield, the tripping arm 35 holding the mechanism in such position, and the carrier bar is slipped under the flanges of the feed casting and its fork takes within the annular seat 54 of the blank holder, and he draws back the blank and inverts it into the hollow blank holder 85 in position for fire polishing the inside of the bowl. This particular operation will be described in another application filed of even date herewith. For the purposes of this case it is only necessary to state that the hollow blank holder is fed to another burner such as the burner 86 in the same way as above described and, after the withdrawal of the carrier bar, by the operation of the lever mechanism of that particular set the blank holder with its blank is raised into position for inside fire polishing, the burner entering within the blank, and the flame jets from the burner being projected against the inner walls of the blank, properly fire polishing the same, the blank holder as illustrated being brought close up to the burner and the flame being projected not only against the inner face of the bowl but against the edge thereof; the apparatus thus providing for the fire polishing of both the inner and outer faces of the bowl and the inner and outer edges thereof. In some cases it is desirable to spread the blank or re-form the mouth thereof, and for that purpose the hollow blank holder 85 is made to conform to the desired final shape of the blank and during the inside fire polishing by means of the greater size of the worm 23 operating on the smaller worm wheel 21, the blank holder can be rotated at a high speed so that while

the blank is in a plastic condition it will be thrown by centrifugal force against the walls of the hollow blank holder and properly shaped. This completes the fire polishing operation, and the blank can be lowered and withdrawn, and requires only annealing to produce the finished ware. In these operations, as the gas and air are mixed within the mixing chamber and combustion takes place only on the lower or outer face of the burner, and the flame is directed by innumerable jets against the surface of the article to be fire polished, which is held in close proximity thereto, I am enabled to obtain a very even and smooth fire polishing action which is under complete control by the regulation of the gas and air supply. This is the case whether the blanks to be polished are of bowl form or flat or substantially flat form. In the latter case as set forth in application of even date herewith, and as illustrated by the burner 49 and blank holders 50 and 51, in Fig. 1, a practically perfect fire polishing action over the entire surface of the bowl or other article is obtained. In order to insure proper heat to melt the edges of the bowls as illustrated in Figs. 4 and 5, I may also employ the semi-circular burner 71 operating on the edge of the blank as above fully described.

What I claim is:

1. In fire polishing apparatus, the combination of a plurality of separate burners, a vertically moving blank-supporting shaft for each burner, a blank holder carried by each burner, a common driving shaft carrying gearing connections stationary on the vertically moving shafts adapted to engage with the driving shaft as said vertical shafts are raised.

2. In fire polishing apparatus, the combination of a plurality of separate burners, a vertically moving blank-supporting shaft for each burner, a blank holder carried by each shaft, a horizontal shaft carrying worms of varying diameter, and worm-wheels stationary on the vertical shafts adapted to engage therewith, worm-wheels on the shaft of corresponding diameter, and adapted to drive said shafts at different speeds.

3. In glass polishing apparatus, the combination of a burner, a vertically moving blank supporting shaft, the treadle lever 27 and the lever 31 linked together, the lever 31 engaging with the blank supporting shaft, said lever mechanism being weighted to hold the shaft in raised position, and the stop arm 35 to hold the shaft in lowered position.

4. In glass polishing apparatus, the combination of a burner, a vertically moving blank supporting shaft, treadle lever mechanism for engaging with the said shaft for operating the same, and a stop arm carried



by such treadle lever mechanism to hold the shaft in lowered position, said stop arm having a separate treadle.

5 5. In glass polishing apparatus, the combination of a burner, a vertically moving blank supporting shaft, means for rotating said shaft when in raised position, and treadle lever mechanism engaging with the base of said shaft for operating the same.

10 6. In fire polishing apparatus, the combination of a burner, an inclosing chamber therefor having a sliding shield, an operating lever, and a chain connection between the shield and lever passing over pulleys, one of said pulleys having winding faces of different diameters to provide for the full  
15 lifting of the shield on a shorter movement of the operating lever.

20 7. In glass polishing apparatus, the combination of a burner, a vertically moving blank supporting shaft, and lever mechanism for raising and lowering the same, an inclosing chamber for the burner having a movable shield and connections therefrom to lever mechanism to operate the shield.

25 8. In glass polishing apparatus, the combination of a burner, a vertically moving blank supporting shaft, lever mechanism for operating the same, an inclosing chamber for the burner having a sliding shield and a chain connection passing over pulleys and connected to the lever mechanism operating the blank supporting shaft.

30 9. In glass polishing apparatus, the combination of a blank support having a recess at the base thereof, a forked carrier bar engaging with said recess, and a feeding casting supporting the carrier bar in position to engage with the recess of the blank support.

40 10. In glass polishing apparatus, the combination of a blank support having a recess, a feeding casting having a guide-way and a carrier bar traveling on said guide-way and engaging with the blank support.

45 11. In glass polishing apparatus, the combination of a blank support having a seat at the base thereof, a feeding casting having a guide-way provided with a central longitudinal slot and a carrier bar adapted to travel in said guide-way provided with supporting  
50 lugs resting on the feeding casting, its body portion fitting within the recess in the feeding casting.

55 12. In glass polishing apparatus, the combination of a blank support having a seat at the base thereof, a feeding casting having a guide-way provided with flange guides with a longitudinal slot between them, and a carrier bar adapted to travel in said guide-way provided with supporting lugs resting on the flange guides, and adapted to travel over the flange guides in one direction and under the same in the other.

60 13. In glass polishing apparatus, the combination of a blank support and a feeding

casting having a guide-way, and a carrier bar adapted to travel in said guide-way and engage with said blank support, the feeding casting having a shoulder beyond the blank support to stop the inward movement  
70 thereof.

14. In glass polishing apparatus, the combination of a blank support having a seat at the base thereof, a feeding casting having a flaring guide-way and a carrier bar adapted  
75 to travel over said flaring guide-way to engage with the blank support.

15. In glass polishing apparatus, the combination of a blank support, a vertically moving blank supporting shaft with which  
80 said blank support engages, a feeding casting in line with such shaft in its lowered position, and a carrier bar adapted to travel over said feeding casting and engage with the blank support when in that position. 85

16. In glass polishing apparatus, the combination of a mixing chamber, a burner having a hollow face provided with multitudinous jet orifices, a blank support corresponding generally in shape to the hollow  
90 jet face and means for raising the blank support and holding it within the hollow jet face or body of the burner.

17. In glass polishing apparatus, a burner having a hollow jet face conforming substantially to the shape of the article to be polished and having multitudinous jet orifices to provide multitudinous flame jets on the outer face thereof. 95

18. In glass polishing apparatus, the combination of a burner having a hollow jet face, and a blank support conforming substantially to the shape of the article to be polished and adapted to be raised within the jet face of the burner. 100 105

19. In glass polishing apparatus, the combination of a burner having a hollow jet face, and a blank support conforming substantially to the shape of the article to be polished and adapted to be raised within the  
110 jet face of the burner, and a separate burner below the main burner in position to project jet flames against the edge of the article to be polished.

20. In glass polishing apparatus, the combination of a burner having a hollow jet face conforming substantially to the shape of the article to be polished, and a blank support conforming substantially to the interior of the article and adapted to raise the  
115 same within the hollow jet face of the burner, the blank support being of less depth than the interior of the article to expose the edge of the article during fire polishing. 120

21. In glass polishing apparatus, the combination of a burner having a hollow jet face conforming substantially to the shape of the article to be polished, a blank support conforming substantially to the interior of the article and adapted to raise the same  
125 130



within the hollow jet face of the burner, the blank support being of less depth than the interior of the article to expose the edge of the article during fire polishing, and a separate burner below the main burner in position to play upon the edge of the article being polished.

22. In glass polishing apparatus, the combination of a burner having a hollow jet face conforming substantially to the shape of the article to be polished, a blank support adapted to support the article within the hollow jet face of the burner, and a separate burner supported below the main burner, said separate burner being in the form of about a half ring and being sup-

ported below the main burner and adapted to play upon the edge of the article being fire polished.

23. In glass polishing apparatus, the combination of a burner, an inclosing chamber therefor, a support for the article to be polished and a separate burner entering within said inclosing chamber and supported below the main burner.

In testimony whereof, I the said ANDREW J. SANFORD have hereunto set my hand.

ANDREW J. SANFORD.

Witnesses:

E. J. MORATH,

J. E. SNELLING.