(No Model.) 2 Sheets—Sheet 1.

H. C. WOOD.

GLASS FINISHING FURNACE.

No. 452,205. Patented May 12, 1891.

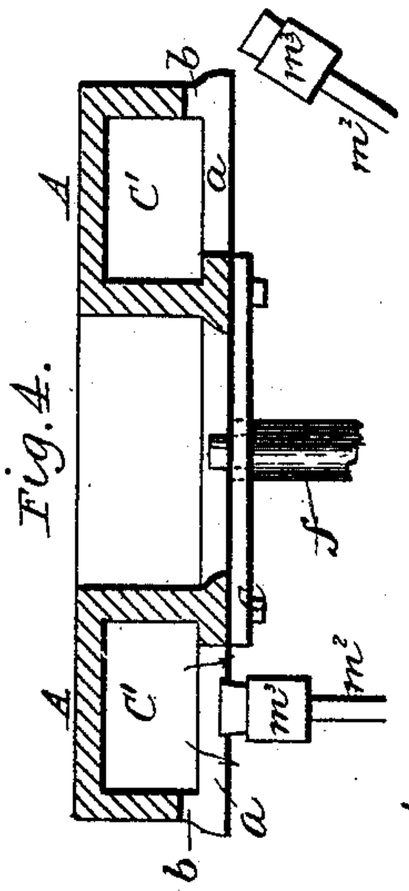

Fig. 4.

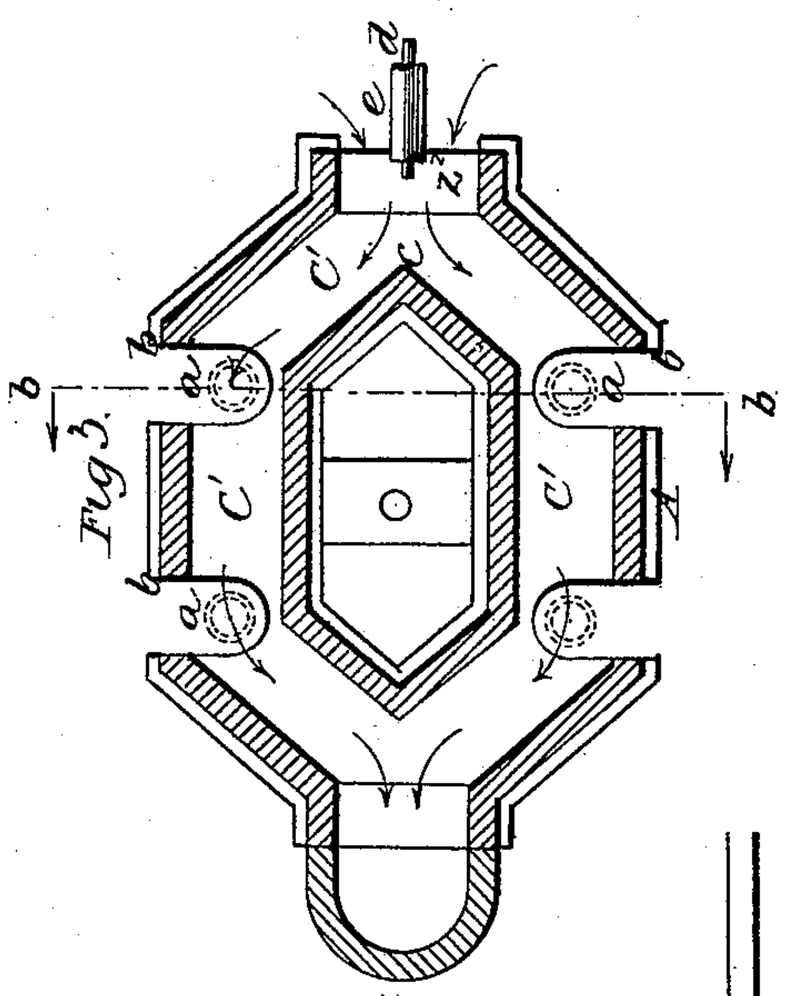

Fig. 3.

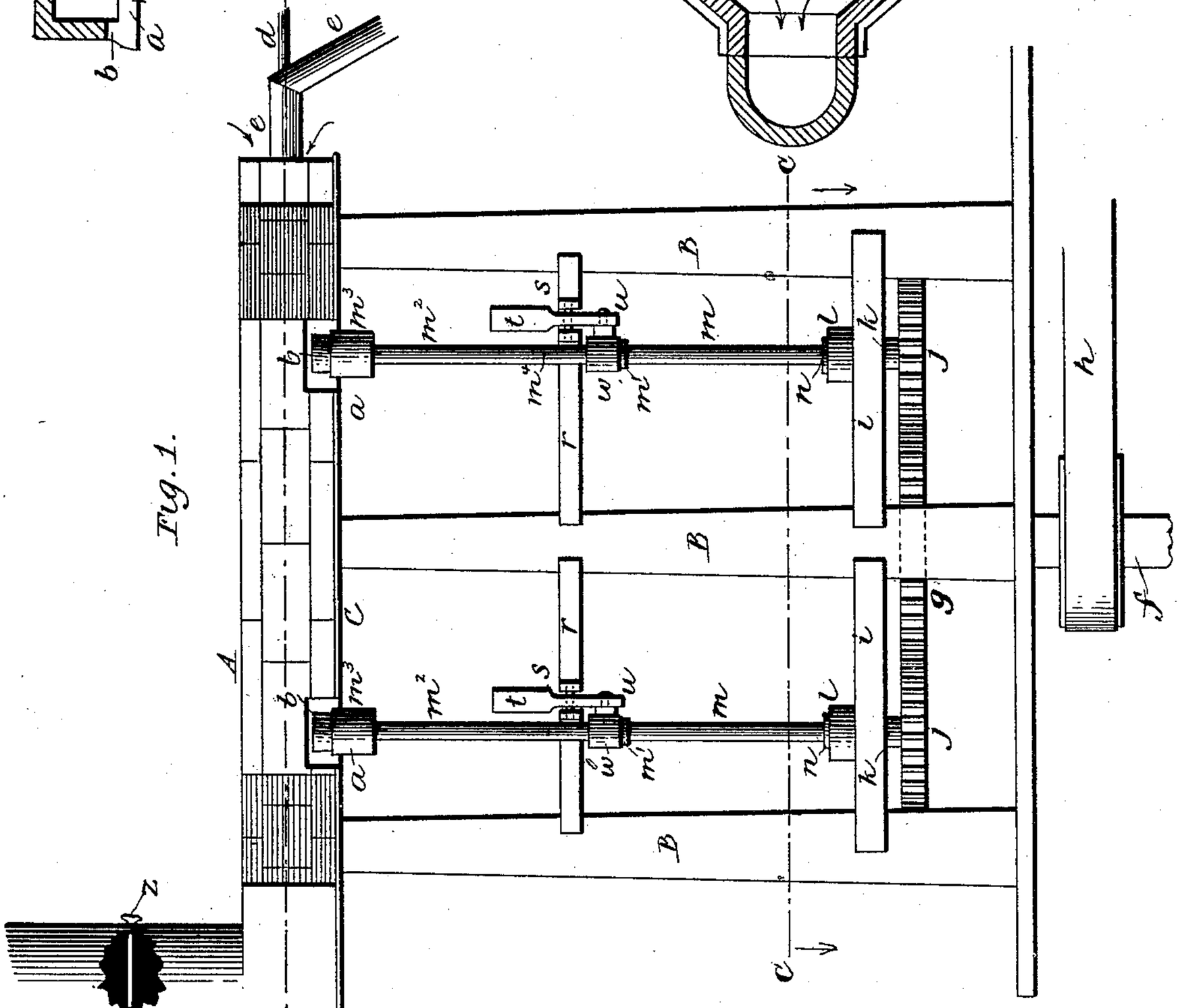

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

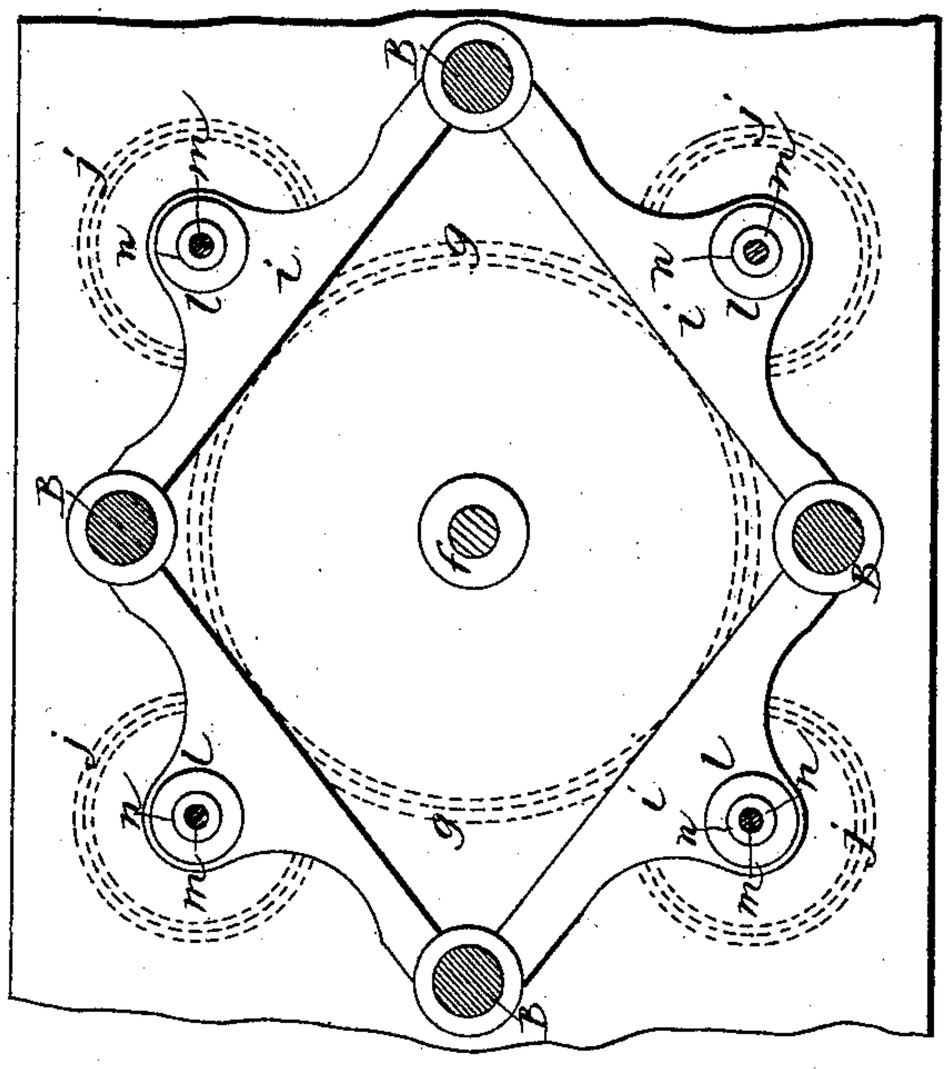


Fig. 6.

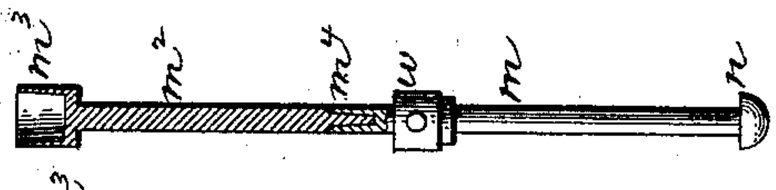
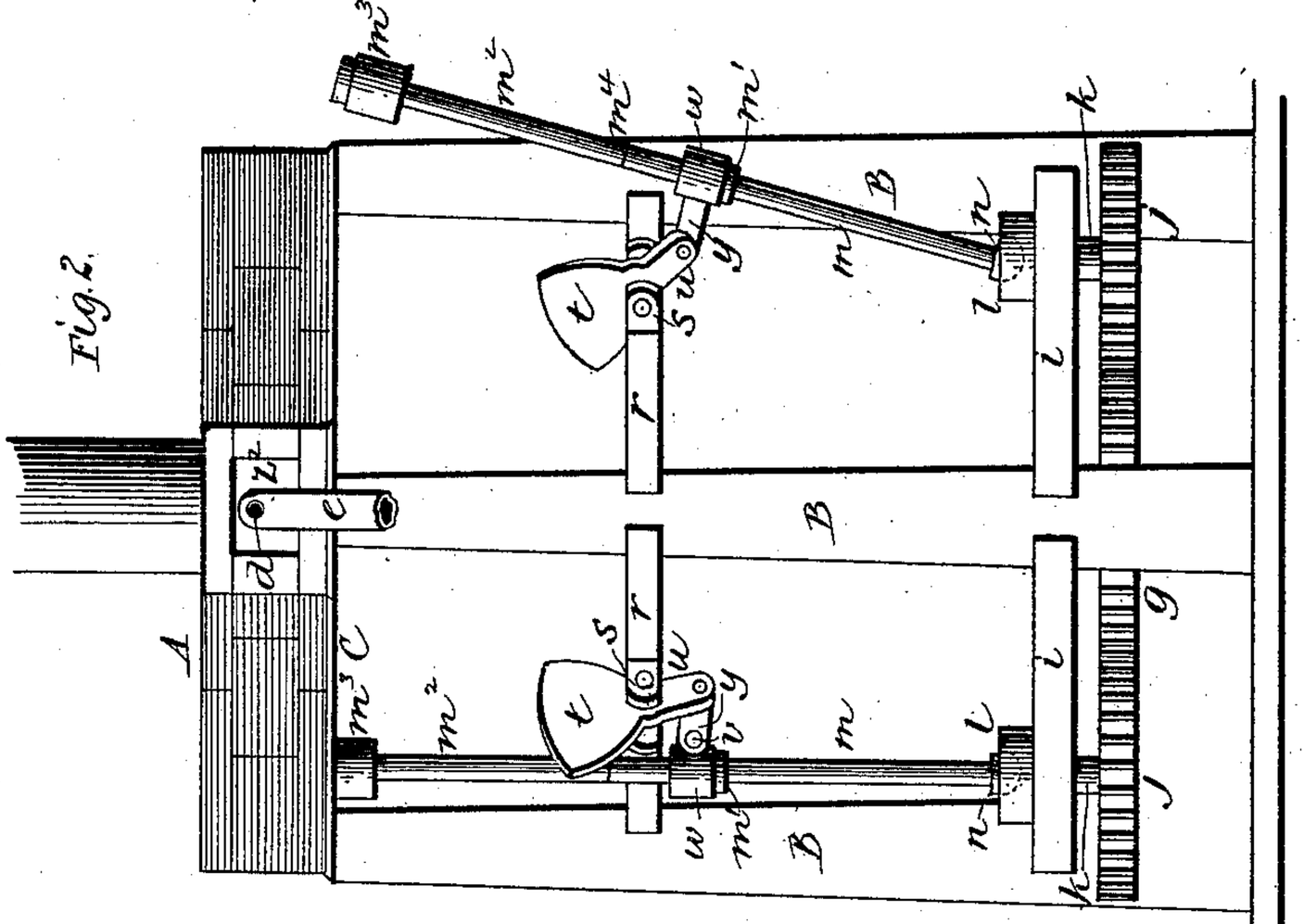


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

HARRY C. WOOD, OF NEW BRIGHTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO JOSEPH MARTIN WOOD, OF BELLAIRE, OHIO.

GLASS-FINISHING FURNACE.

SPECIFICATION forming part of Letters Patent No. 452,205, dated May 12, 1891.

Application filed July 17, 1890. Serial No. 359,033. (No model.)

To all whom it may concern:

Be it known that I, HARRY C. WOOD, a citizen of the United States, residing at New Brighton, in the county of Beaver and State of Pennsylvania, have invented new and useful Improvements in Glass-Finishing Furnaces, of which the following is a specification.

My invention relates to that class of furnaces in which articles of glassware, such as tumblers, goblets, and similar articles having their open edges cut to size, are afterward fire-heated sufficiently to cause such cut edges to be melted and become rounded, smooth, and perfectly finished under a revolving action within the flame. Such articles have been fire-finished by reheating and melting them under a revolving action in a flame in a furnace known as the "glory-hole" type, wherein the articles are introduced through side openings in the walls of the blast-chamber by means of a carrying-socket or "snap" upon the end of a rod and rotated by hand, so that the rough cut edge shall be exposed to the flame to cause the edge to be melted and thereby rounded and finished. To produce uniformly perfect work it is essential that the flame shall be directed down upon and uniformly distributed over the entire edge and into the article, and this is the primary object of my invention. In effecting this result provision is made for a comparatively small and compact blast-chamber, within which a sheet-flame is produced and preferably divided in separated communicating shallow passages, so as to pass directly over and down into the tops of the articles interposed in the passage. Provision is also made for effecting the independent rotation of the articles within the bottom of the flame-passage.

To facilitate the work and the handling of the articles in placing them within and withdrawing them from the blast chamber, I provide a swinging or tilting snap rod or staff for the article adapted to be swung vertically into position in the bottom of the flame-passage and automatically held, carrying the article from the outside of the furnace to its interior and within the path of the flame and having a free outward tilting movement within certain limits for permitting the removal of the finished article and the placing of another thereon to be swung into the blast-chamber. This provision gives the advantage of quick inspection of the article, of placing it so that the flame will impinge upon its edge, and of quickly removing and replacing it by a separable snap-staff section. It gives the advantage of an elevated blast-chamber, the arrangement of the operating mechanism centrally with and below said chamber, and of connecting the several swinging or tilting snap-rods for constant rotation by a single gear at the bottom of the structure operated by a central shaft without interfering with the removal and replacement of the snap-carrying stems.

The drawings hereto annexed illustrate my invention, and the several separate and special matters of novelty in construction in devices and in combinations of elements will be set out in connection with the drawings in separate and distinct claims concluding this specification.

Referring to the drawings, Figure 1 is a side elevation of a glass-finishing furnace embodying my invention. Fig. 2 is a front elevation of the same, showing one of the swinging or tilting snap rods or staffs tilted out from the blast-chamber. Fig. 3 is a horizontal section through the elevated divided blast-chamber on the line *a a* of Fig. 1, showing the opposite relation of the inlet and outlet thereof and the bottom openings therein. Fig. 4 is a vertical section of the blast-chamber, taken through two of the bottom openings of the chamber, showing one of the tilting snap rods or staffs in the position it occupies when holding the article in the path of the flame, said section being on the line *b b* of Fig. 3. Fig. 5 is a horizontal section on the line *c c* of Fig. 1, showing the gearing for simultaneously revolving the snap rods or staffs which bear the articles into the blast-flame; and Fig. 6 shows one of the tilting separable snap-rods in vertical section to show its removable "snap" or cup-section.

The furnace or blast-chamber A is supported upon columns B, suitably arranged and secured in a foundation. The furnace is constructed upon a base-plate C, so as to form a comparatively shallow flat passage or cham-

ber C′, preferably in the oblong form of two continuous side passages, as seen in Fig. 3, although it may be of annular or elliptical form, the essential matter being to provide for a sheet-like flame of comparatively small body, preferably divided at the starting or inlet point of the combustible fuel, and sweeping around under draft in two directions, over and down into the ware on each side of the center of the furnace and meeting at the valved exit at the opposite end or side of the furnace.

In the base-plate are formed openings *a*, which extend from the edge thereof and preferably disposed two on each side and extending into and across the flame-passage C′, the bottom of which is formed by or upon said plate. The base-plate has openings *b*, which extend into the flame-passage C′ for the admission of the ware into the blast-chamber in a direction across the path of the flame, as seen in Figs. 1 and 3.

The fuel used is a combustible mixture of gas and air admitted into the blast-chamber at one end thereof, at which point the chamber-wall is preferably formed with an annular abutment *c*, Fig. 3, against which the gas and air entering under pressure impinge in a body, so as to be divided and directed in equal volumes into the two side passages C′ and around to the valved outlet-flue. I prefer to introduce the gas by a pipe *d*, which passes into and is surrounded by the air-pipe *e*, so that the gas will be enveloped by, and therefore the better mixed with the air. An important feature of this form of blast-chamber is its flat base-plate, and the relation thereto of the article to receive the melting and finishing action of the ignited combusible blast upon its edges and upper portion as it is revolved in the base-plate opening, and within which opening it extends, and is supported below the base-plate only sufficient to expose to the flame that portion which is to be melted and rounded. As the openings *b* in the base-plate extend beyond the middle of the blast-passage C′, the flame is distributed evenly over that part of the ware exposed therein, and the blast will freely pass down into the ware and around it, so that its edges will be melted more uniformly and with less exposure to heat and less tendency to distortion in the ware than in the way now practiced. The valve *z* in the outlet-pipe serves to regulate the draft of the blast and thereby regulate the melting intensity of the flame by retarding or increasing its flow over the tops of the ware.

For igniting the combustible mixture and supplying air at the point of ignition by induction I provide an opening Z^2 in the end of the furnace, through which the fuel-supply pipes pass, as seen in Figs. 2 and 3. This form of elevated blast-chamber permits the provision of simple and convenient mechanism for placing, holding, and rotating all the ware within the hearth-openings within the path of the flame and removing it therefrom, as I shall now describe. I use a snap staff or rod for holding and carrying the ware, and while I provide for rotating them simultaneously I also provide for operating them independently for placing them within and removing them from the blast-chamber. Centrally with the furnace-supporting columns a vertical shaft *f* is mounted in suitable bearings in the foundation and in the base-plate *c* of the furnace, and is fitted with a gear-wheel *g* near its lower end, and is driven by a pulley-belt *h* from any suitable power. Just above this gear-wheel the columns are connected by bracket-bars *i*, within which are mounted pinions *j*, which engage with the central gear-wheel *g*, and are thereby all rotated in the same direction, as seen in Fig. 6. The short shafts *k* of these pinions are mounted vertically coincident with the middle of the blast-chamber openings *a*, and each is provided with a concave step or socket *l* in its upper end above their supporting-brackets, and within these sockets the snap-shafts *m* are stepped by convex fitting-knobs *n*, so as to form a ball-and-socket joint, upon which the staff is free to be tilted from its vertical position, as seen in Fig. 2. At a suitable distance above the bracket-bars *i* the columns B are connected by other bracket-bars *r*, which are provided with lugs or ears *s*, to which are pivoted weighted levers arranged with their weighted ends *t* standing upward above the bracket-bars *r* and with their short arms *u* standing downward below said brackets for connection by pivot-joint *v* with a collar or sleeve *w*, fitted loosely upon the snap-staff *m* and supported thereon by a shoulder *m′*, so that the snap-staff is free to be rotated within said sleeve and to be swung or tilted from a vertical to an outward-inclined position. Above the sleeve *w* the staff is made with a separable section m^2, which is the snap-rod proper and has the usual cup m^3 for holding the article, and is connected with the staff by a socket-joint m^4, which I prefer to make tapering with a shouldered seat, as seen in Fig. 6, for the easy removal and insertion of the snap-section m^2 from its tilting-staff part to remove the finished article.

To give a free tilting movement to the snap-staff, I connect its sleeve with the arm *u* of the lever by a link *y*, which is pivoted to a lug on the sleeve *w*, and the tilting movement of the staff is limited by the inward movement of the weight past the center of gravity, striking upon the bracket *r*, as seen in Fig. 2, while the movement of the snap-staff to a vertical position is limited by its lever-arm *u* striking the said bracket. In this position the snap-staff is retained by the weight being thrown obliquely outward past the center of gravity in relation to its pivot-connection with the bracket *r*.

To remove the ware when finished the snap-staff is seized by the hand and drawn out to a tilted position, and the snap-stem m^2 is

removed from its staff-socket m^4 and replaced by another containing the ware to be finished, and the staff swung back into vertical position, carrying the ware within the hearth-opening and in the path of the flame, where it is held in the way stated. In this way each snap-staff is adapted for independent operation to place and to remove the ware within and from the blast-chamber and to place and remove the snap-carrying stem m^2 from the snap-carrying staff m, and this, too, without interrupting the rotation of said staff or of either of them.

The simultaneous rotation of all the snap-staffs is effected by the frictional contact of the staff in its socket seat or step l of the pinion-shaft k, and is a simple way of providing for such rotation with freedom for tilting the staffs in their socket-steps in the way described.

While I have shown and described the furnace as having a divided blast-chamber to produce a divided flame and prefer such construction for compactness with increased capacity for work, yet it is obvious that the blast-passage may be formed in a single line, curved or straight, for an undivided flame, and the glory-holes formed on one or both of its sides and the snap-staffs disposed in proper relation thereto. It is also obvious that provision may be made for using a combustible fuel of oil and air for the flame, and it is evident that immaterial departures may be permitted from the general construction and arrangement of parts contributing toward my invention, and for this reason I do not wish to be understood as limiting myself thereto in precise details.

In the use of a combustible mixture of gas and air there is a constant temperature in the heat, and its sheet-like flame is made most effective and enables the workman to do better work, and there is no dust, cinders, or smoke.

Referring to the flame-passage, it is shown in Figs. 1 and 2 as being formed by the base-plate C and refractory brick or tile built upon said base-plate; but it may be formed of an iron casting, which may be lined with refractory material, as shown in Figs. 3 and 4.

I claim as my invention—

1. In a glass-finishing furnace, the combination of a blast-chamber having a flame-passage open at one end and having a valved outlet at its opposite end, side glory-holes extending into the bottom of said passage at right angles to the course of the flame, suitable means for introducing a combustible mixture under pressure at the open end of said flame-passage, and suitable means for laterally tilting, supporting, and revolving the articles vertically within the bottom openings.

2. In a glass-finishing furnace, a blast-chamber having a flame-passage open at one end, a valved outlet at its opposite end and divided into two communicating side blast-passages, each passage having side glory-holes extending into the bottom thereof at right angles to the course of the flames therein, an abutment within said passage for dividing the flame at the open end of said chamber, and means for introducing a combustible mixture at the dividing-abutment, in combination with suitable means for laterally tilting, supporting, and revolving the articles vertically within the bottom openings.

3. In a glass-finishing furnace, a blast-chamber formed of two flame-passages meeting at their opposite ends, each having glory-holes extending into the bottom of said passages at right angles to the paths of the flames therein, an opening z^2 at one of their meeting ends, an interior wall abutment c opposite said opening, and a valved outlet at the opposite meeting ends of said flame-passages, and the pipes for introducing air and gas under pressure into said passages at the said end opening, in combination with revoluble means for vertically supporting the articles and tilting them laterally into and out of the said bottom openings.

4. The combination of a blast-chamber formed of two separated horizontal shallow flame-passages meeting at their opposite ends having openings in the outer side of each passage extending within the bottom of the latter, a flame-inlet at one of the meeting ends, and a valved outlet at the other of said meeting ends, the columns supporting said blast-chamber, vertical snap-staffs supported by universal joint-bearings or seats, jointed pivotal connections for said staffs, upon which they are free to be tilted or swung vertically into and out of said flame-passage openings, and suitable means for rotating said staffs.

5. In a glass-finishing furnace, the combination, with the furnace having glory-holes, of several revoluble laterally-tilting staffs, each formed of two separable sections, one of which is stepped in a revoluble universal joint bearing or seat, and the other is provided with a holder for the glass article.

6. In a glass-finishing furnace, supporting-staffs, each provided with a removable snap-holding section for the glass article, a pivotally-jointed weighted lever movably connecting said staff to the furnace-flame, and a revoluble universal joint-bearing, upon which said staff can be tilted laterally and rotated.

7. In a glory-hole furnace, the combination of a blast-chamber having glory-holes piercing its sides and bottom, snap-staffs for the ware mounted to be tilted or swung to carry the ware into and out of said glory-holes, suitable means for holding said snap-staffs therein, and suitable means for rotating said snap-staffs within said glory-holes.

8. In a glory-hole furnace, the combination of a blast-chamber having glory-holes piercing its sides and bottom, snap-staffs for the ware, rotating socket seats or steps for said staffs, and a jointed device loosely connecting the staff with a fixed part of the furnace-sup-

ports for permitting a limited tilting or swinging movement of said snap-staff to carry the ware into and remove it from said glory-hole.

9. In a glory-hole furnace, the combination of a blast-chamber having glory-holes piercing its sides and bottom, snap-staffs for the ware, each mounted at its lower end in a concave step or seat, a weighted lever pivoted to a fixed part of the frame, a sleeve or collar loosely fitted and supported upon said staff and suitably jointed to the arm of said lever, and suitable means for rotating the supporting step or staff seat, whereby to rotate said staff and permit it to be tilted or swung into and from the glory-holes.

10. In a glory-hole furnace, the combination of an elevated blast-chamber having glory-holes in its sides and bottom, snap-staffs for the ware, and rotating socket seats or steps for said staffs, a weighted lever pivoted to a fixed part of the frame, a sleeve or collar loosely fitted and supported upon said staff and suitably jointed to the arm of said lever for permitting a limited tilting or swinging movement of said staff into and from the glory-holes, and a snap or cup-holding section adapted to be removed from and replaced upon said staff.

11. In a glory-hole furnace, the combination of a blast-chamber having glory-holes in its sides and bottom, snap-staffs for the ware mounted to be tilted or swung to carry the ware into and out of the glory-holes, suitable means for holding said snap-staffs therein, concave socket seats or steps for said staffs, and means for rotating said socket seats or steps to revolve the staffs, consisting of short shafts containing said seats or steps, pinions upon said shafts, and a central gear engaging said pinions.

12. In a glory-hole furnace, the combination of an elevated blast-chamber having a flat bottom and glory-holes piercing its sides and bottom, a snap consisting of a staff having a separable snap-section for the ware, and a tilting or swinging section having a convex foot or support, a jointed device having a sleeve-connection with the supporting-staff section, and means for revolving said staff by a friction-joint or chuck connection with its convex end.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARRY C. WOOD.

Witnesses:
F. W. FALLON,
L. C. BARNES.