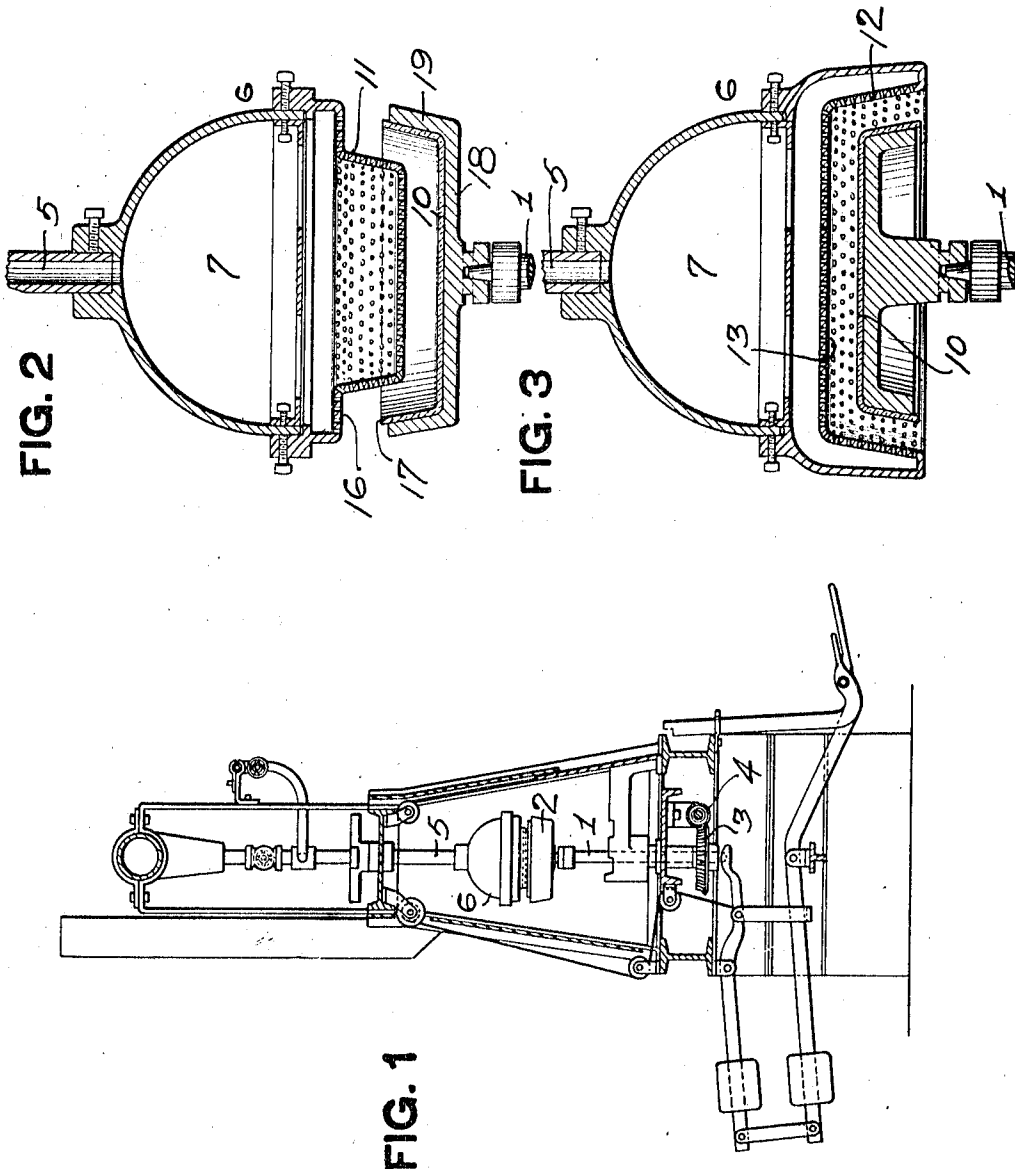


A. J. SANFORD.
METHOD OF FIRE POLISHING GLASSWARE.
APPLICATION FILED JUNE 26, 1909.

993,555.

Patented May 30, 1911.

2 SHEETS-SHEET 1.



WITNESSES.
J. R. Keller
Robert C. Fother

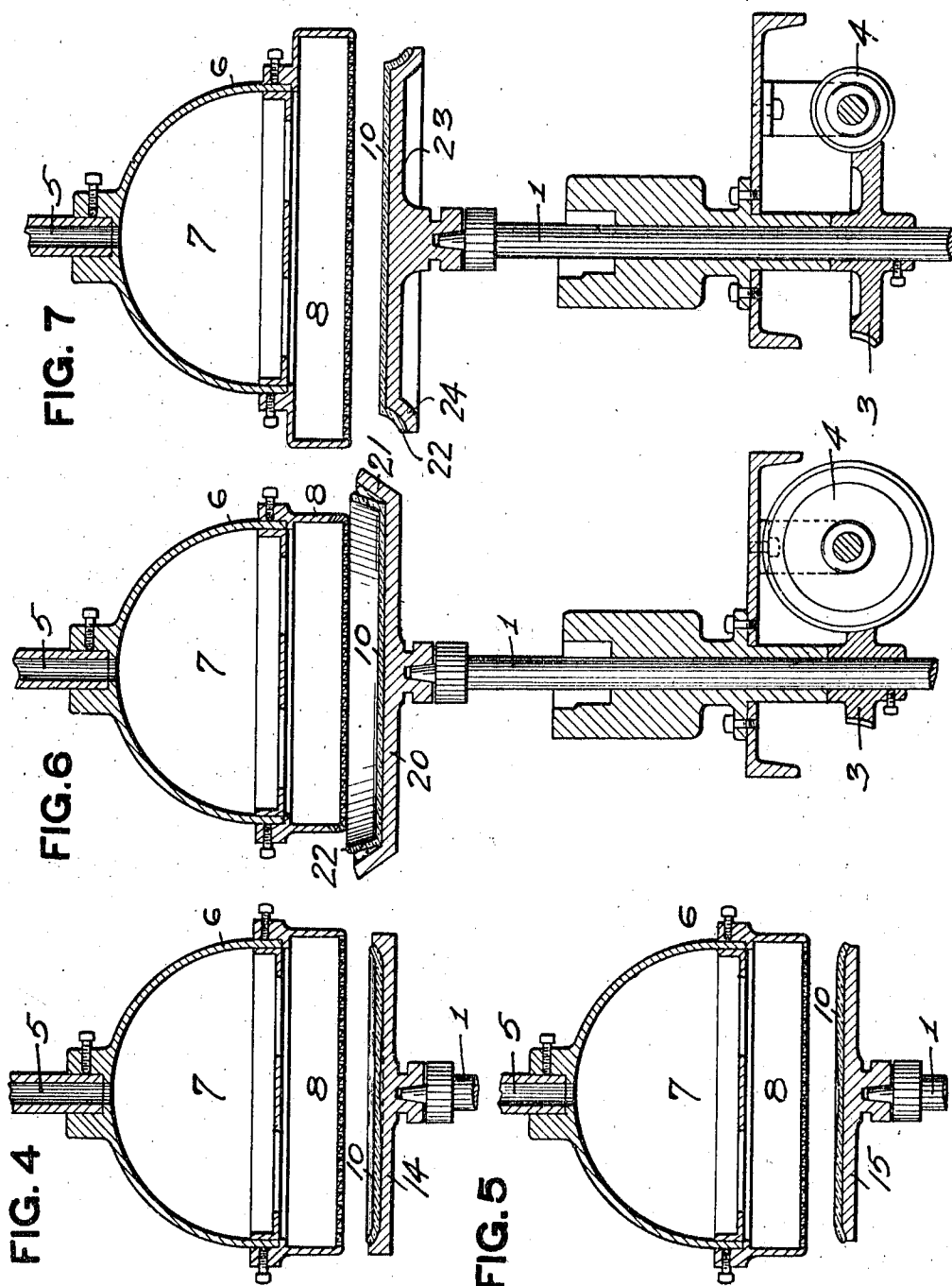
INVENTOR.
A. J. Sanford
By Ray & Fother
Attorneys

A. J. SANFORD.
METHOD OF FIRE POLISHING GLASSWARE.
APPLICATION FILED JUNE 26, 1909.

993,555.

Patented May 30, 1911.

2 SHEETS-SHEET 2.



WITNESSES.
J. R. Keller
Robert C. Fottan

INVENTOR.
Andrew J. Sanford
By Kay & Fottan
Attorneys

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.

METHOD OF FIRE-POLISHING GLASSWARE.

993,555.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed June 28, 1909. Serial No. 504,553.

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 Methods of Fire-Polishing Glassware; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the fire polishing of glassware and more particularly to the fire polishing of flat articles or articles having flat body portions with shallow upwardly projecting rims or sides, its object being to provide for the fire polishing of both the top and bottom faces of these articles, the invention being of the same general nature as that described in an application filed by me of even date herewith, Serial No. 504,552.

It consists, generally stated, in supporting the article upon a suitable former and first exposing the top surface thereof to a downwardly projecting fire polishing flame, and then reversing the article and fire polishing the bottom face thereof.

It also consists in fire polishing such articles having flat body portions while so supporting the entire flat body portion and thereby preventing the sagging or stretching of the mid-portion of the flat body.

It also consists in so fire polishing the top face of articles having upwardly projecting rims and at the same time rotating the articles so as to flare the rim portion outwardly, and then supporting the blank with its bottom face upward upon a former corresponding to the exact shape of the interior of the finished article and by the heat of the flame causing the rim portion of the article to conform to such outer portion of the former and produce an article of the exact shape desired.

It also consists in certain other improvements as hereinafter set forth.

In the accompanying drawings Figure 1 is a view of fire polishing apparatus suitable for the practice of the invention; Fig. 2 shows the article in position for fire polishing the top face of a deep rimmed article; Fig. 3 is a like view showing the same article in position for fire polishing the bottom face thereof; Figs. 4 and 5 are views illustrating the polishing of flat articles; and Figs. 6 and 7 illustrate the fire polishing of flat articles

with low rims to be changed in form during fire polishing.

The invention may be employed with any suitable apparatus, that illustrated in connection with the invention being described in a companion application of even date herewith, Serial No. 504,554, the necessary parts of said apparatus for the practice of the invention being illustrated in the drawings. Said apparatus has the supporting rotating shaft 1, on which the support or former 2 is centered and supported, suitable means for rotating the same being illustrated, such for example as the worm wheel 3 which in the raised position of the shaft engages with the worm 4. Worms and worm wheels of suitable size to give the desired speed of rotation may be employed, for example, in Figs. 1 and 7, where a relatively low speed of rotation is desired the worm is of small diameter and being employed with a worm wheel of relatively larger diameter, while in Fig. 6 the supporting shaft 2 carries a worm wheel 3 of larger diameter meshing with a worm of smaller diameter.

Any suitable burner for fire polishing may be employed, the apparatus showing a gas and air supply pipe 5 which supports the burner 6, said burner having the mixing chamber 7 and below the same the burner 8 which may be a flat faced burner having multitudinous perforations or orifices extending through the jet face thereof so as to provide multitudinous small flame jets on the outer faces of the burner, projecting downward from the same and directly upon the article 10 to be polished as shown in Figs. 4, 5 and 7, or may have a central flat faced projection as in Figs. 2 and 6, or such burner with a surrounding apron as in Fig. 3.

In Figs. 1, 2, 3, 6 and 7 I have illustrated burners and apparatus suitable for the fire polishing of flat articles with rim portions or sides, while in Figs. 4 and 5 I have illustrated the fire polishing of flat articles. The gas and air entering within the mixing chamber is thoroughly mixed and forced under pressure through the perforations of the burner and plays over the surface of the articles as above stated. The burners may either have a flat jet face, as shown in Figs. 4 and 5, or may conform to the shape of the article having the central projection 11 entering within the article as in Fig. 2, or

an annular projection or apron 12 having the jet orifices on the inner face of the same in addition to the jet orifices on the inner flat portion 13, as illustrated in Fig. 3.

In the fire polishing of articles having flat body portions as heretofore practiced, difficulty has been experienced on account of the sagging of the flat body either in the center portion if that is overheated, or of the outer portion if that is overheated, when such flat body is not supported during reheating. This results in the formation of a wavy body in the portion where the metal has stretched in sagging, and no way to overcome such stretching of the body while preserving the rim portion in proper position is known. I therefore employ a supporting former 14 corresponding to the under face of the flat article so as to give support to the entire flat body of the same in connection with the first fire polishing step, as shown in Fig. 4, and for the subsequent fire polishing of the under face I employ a like former 15 corresponding to the desired shape of the finished article, as shown in Fig. 5, so that the whole body of the flat article is supported and prevented from stretching or sagging during the fire polishing operation. In such fire polishing the flame jets play over the flat top surface of the article while it is fully supported and polish it, no mold marks or like imperfections remaining. The article is withdrawn and its top face permitted to set and it is then transferred to a support conforming to said top face, and the bottom face of the same is fire polished. In this operation all liability of the stretching or sagging of the metal during the fire polishing or the marring of such top face is prevented and it is fire polished while held in practically perfect shape.

In the fire polishing of blanks or articles having flat bodies and upwardly projecting rim portions, it is preferred that the jet orifices shall extend out on the apron 16 of the burner above the rim portion 17 of the blank, such as beyond the central projection illustrated in Fig. 2. Where the rim of the article is to be maintained in the same shape as originally pressed the supporting former is made corresponding in shape, having the flat body portion 18 and the upwardly projecting lip 19 to support the rim 17 of the article, it being preferred that the rim of the blank shall project slightly above the lip 18 of the former so as to be fully exposed to the melting influence of the flame to remove mold marks and round off the corners of such edge portion. After such fire polishing the blank is inverted and placed upon a former conforming to the inside of the blank and in this position is exposed to the fire polishing operation, as in Fig. 3.

Where it is desired to change the shape of the rim portion of the article, such as to transfer a rim pressed practically straight in the mold to a greater flare I prefer to proceed as illustrated in Figs. 6 and 7. The supporting former 20 of Fig. 6 conforms to the bottom of the flat article so as to give proper support thereto and has extending out therefrom a flaring lip portion, as at 21, and the article is placed therein with its top side upward and so exposed to the fire polishing flame jets, which in addition to removing the imperfections of the flat portion of the blank and melting the corner edges of the upwardly projecting rim portion 22, reheat that rim portion by a downwardly directed heating flame sufficiently to render it flexible so that by rotating the former such lip portion is thrown out by centrifugal action against the flaring lip portion 21 of the former. It may not, however, properly conform thereto and in fire polishing the bottom of the blank I employ a former such as shown in Fig. 7, having the flat body portion 23 to support the flat portion of the blank and having an outwardly extending annular face portion 24 corresponding to the exact inner shape of the rim portion when finished, and the blank is exposed to the downwardly projected heating flame of the burner, in which case the rim portion 22 of the blank is heated to a sufficient degree of plasticity to settle down and conform exactly to the former on which it is supported. In carrying out this operation I prefer to rotate the blank at a relatively high speed in fire polishing the top face thereof to obtain the centrifugal action to throw out the rim portion of the blank, and to rotate the blank at a relatively slow speed in fire polishing the bottom face so that the blank will naturally settle down upon the former and be brought exactly to the desired shape. In any of the fire polishing treatments above described the flat portion of the blank is properly supported so that there is no possibility of its sagging out of shape and the article produced has an absolutely flat body portion conforming exactly to the supporting former.

The above advantages are obtained where the articles fire polished are either plain or ornamented. Where their surfaces are ornamented, such as indicated in Figs. 4 and 5, the further advantages are obtained in the fact that by first fire polishing the upper surface which is usually smooth in this class of articles and then fire polishing the lower surface, all liability of the metal sagging in the depressions formed in the ornamentation and so marring the ornamentation is overcome. The upper surface being first polished is properly supported in the holder even though the projections forming the ornamentation on the bottom surface of the

article may be over-heated in the fire polishing operation or the thin portions of the metal be more quickly heated than the thicker portions, making the article liable to sag, the continuous support of the plain upper surface of the article prevents change in form of the same on account of the softness of the metal while under fire polishing, and holds the previously fire polished upper face in perfect condition. It may be so supported until it is cooled and set. If the ornamented bottom face were first fire polished and the plain upper face subsequently fire polished both would be liable to injury or spoiling by the sagging of the metal within the depressions between the projecting portions of the ornamentation.

What I claim is:

1. The herein described method of fire polishing glassware having flat body portions provided with ornamented bottom faces, consisting in first supporting the blank with its top face upward and fire polishing the same by a downwardly directed flame, and then supporting the blank with its ornamented bottom face upward and fire polishing said surface with a downwardly projecting flame.

2. The herein described method of fire polishing glassware having flat body portions with upwardly projecting rims, consisting in holding the blank on a support conforming to the flat portion of the blank and with its rim portion projecting upward, and fire polishing the top face thereof by a downwardly projecting flame, and then reversing the blank and holding it on a support conforming to the interior thereof and fire polishing the bowl thereof by a downwardly projecting flame.

3. The herein described method of fire polishing glassware having a flat body portion and upwardly projecting rim, consisting in holding the blank on a support conforming to the flat bottom portion thereof

and with its rim extending upwardly and with its edge portion exposed, and fire polishing the blank by a downward projecting flame while rotating the blank to expand the rim portion by centrifugal action, and then holding the blank on a support conforming to the shape of the interior of the finished article and fire polishing the bottom portion of the blank and shaping the rim portion thereof.

4. The herein described method of fire polishing glassware having a flat body portion and an upwardly projecting rim, consisting in holding the blank on a support conforming to the flat bottom portion thereof and with its rim extending upwardly and with its edge portion exposed, fire polishing the blank by a downwardly projecting flame while rotating the blank at a relatively high speed to expand the rim portion by centrifugal action, and then holding the blank on a support conforming to the shape of the interior of the finished article and fire polishing the bottom portion of the blank and shaping the rim portion thereof while rotating the same at a relatively slow speed.

5. The herein described method of fire polishing glassware having flat body portions with upwardly projecting rims, consisting in holding the blank on its support conforming to the flat body portion and with its top edges exposed, and fire polishing the top faces of the blank by projecting multitudinous jet flames downwardly against the flat body portion and outwardly against the rim portion and downwardly upon the edge portions thereof.

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

ANDREW J. SANFORD.

Witnesses:

E. J. MORATH,
J. E. SNEELING.