D. L. NEUHAUSER.

METHOD AND APPARATUS FOR SHAPING GLASS.

APPLICATION FILED SEPT. 1, 1910.

1,028,129.

Patented June 4, 1912.

3 SHEETS—SHEET 1.

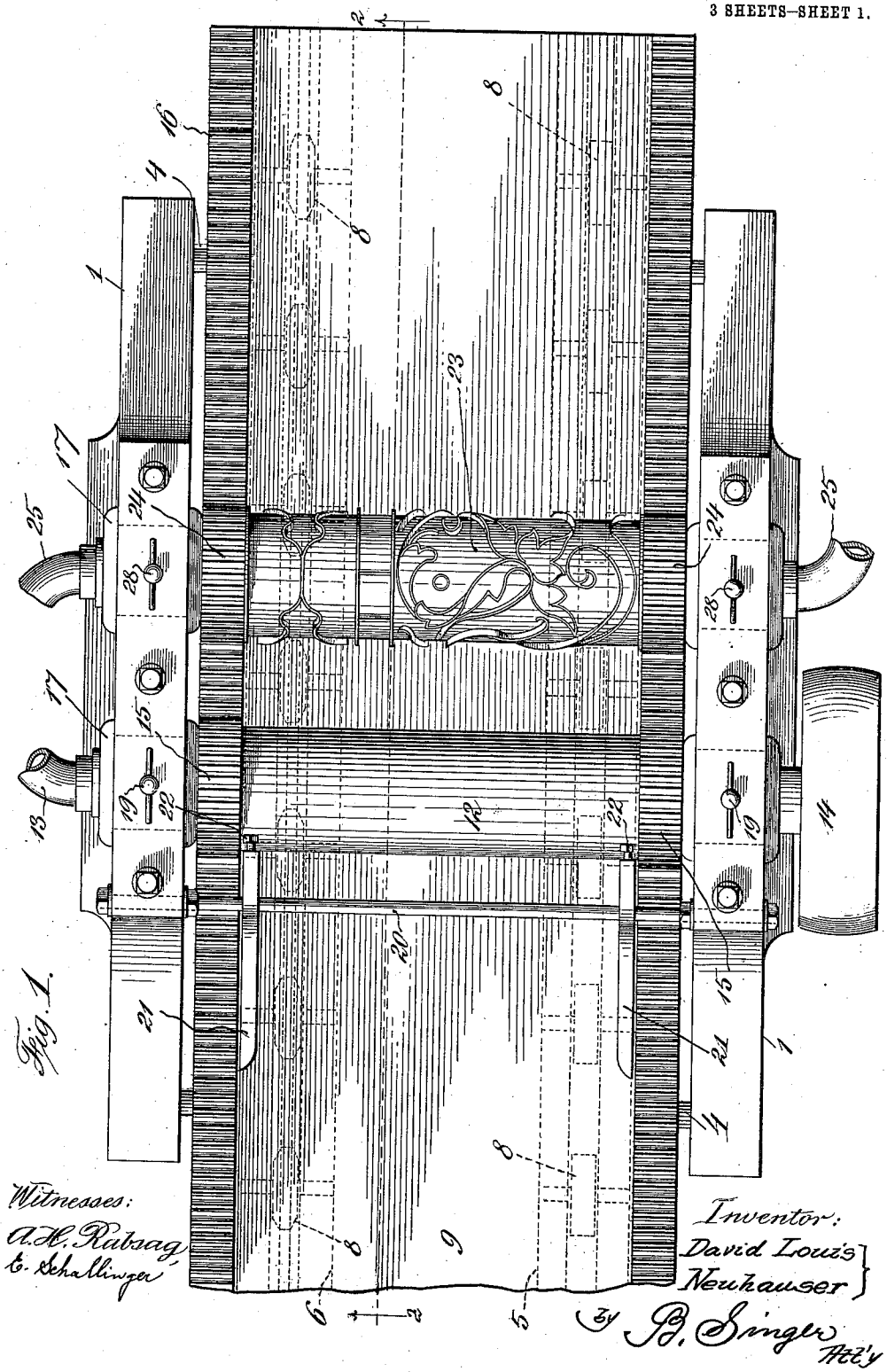

Fig. 1.

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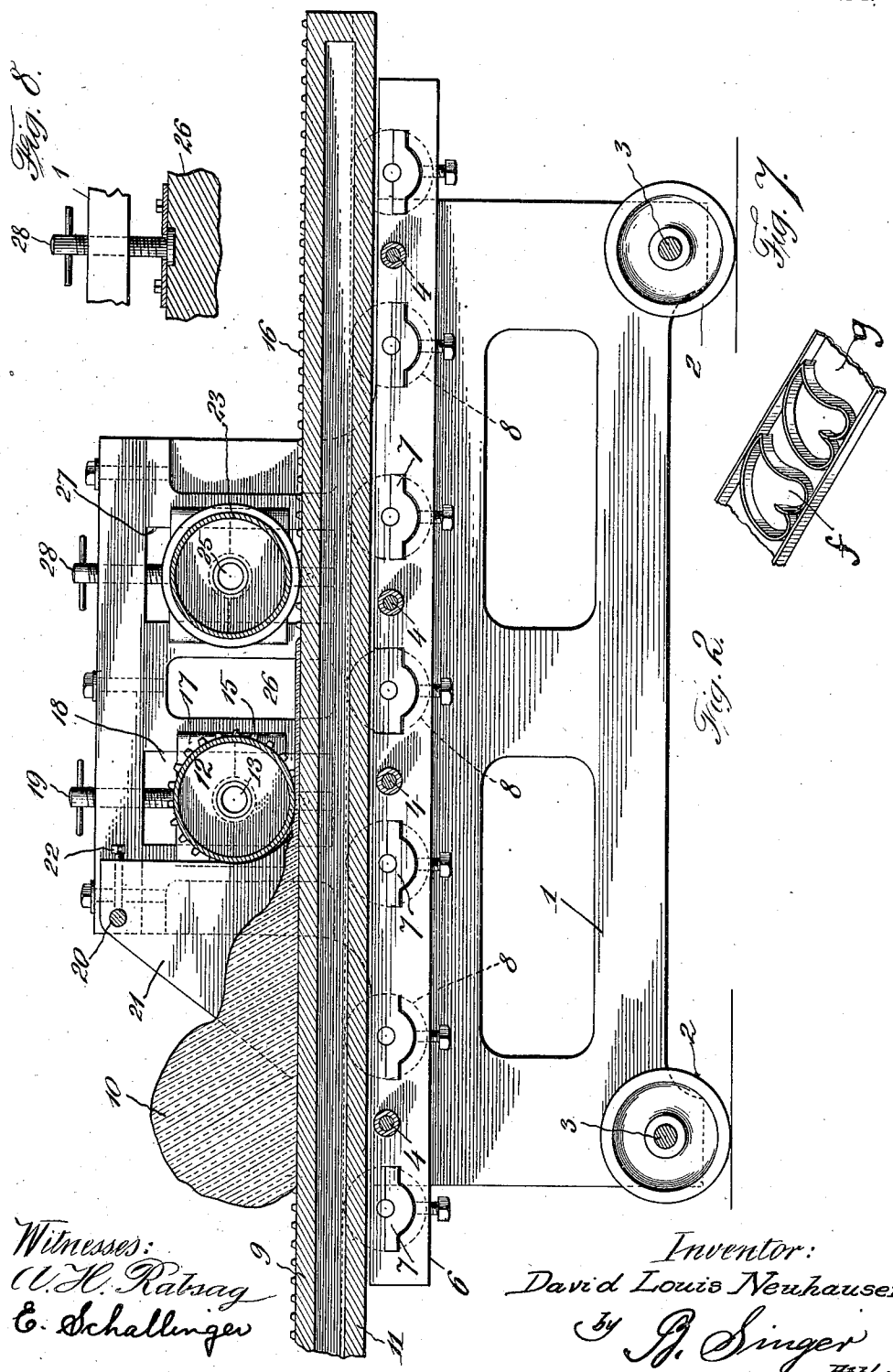

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3 SHEETS—SHEET 3.

Fig. 4.

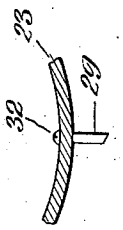


Fig. 5.

Fig. 6.

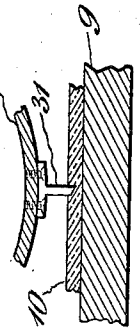
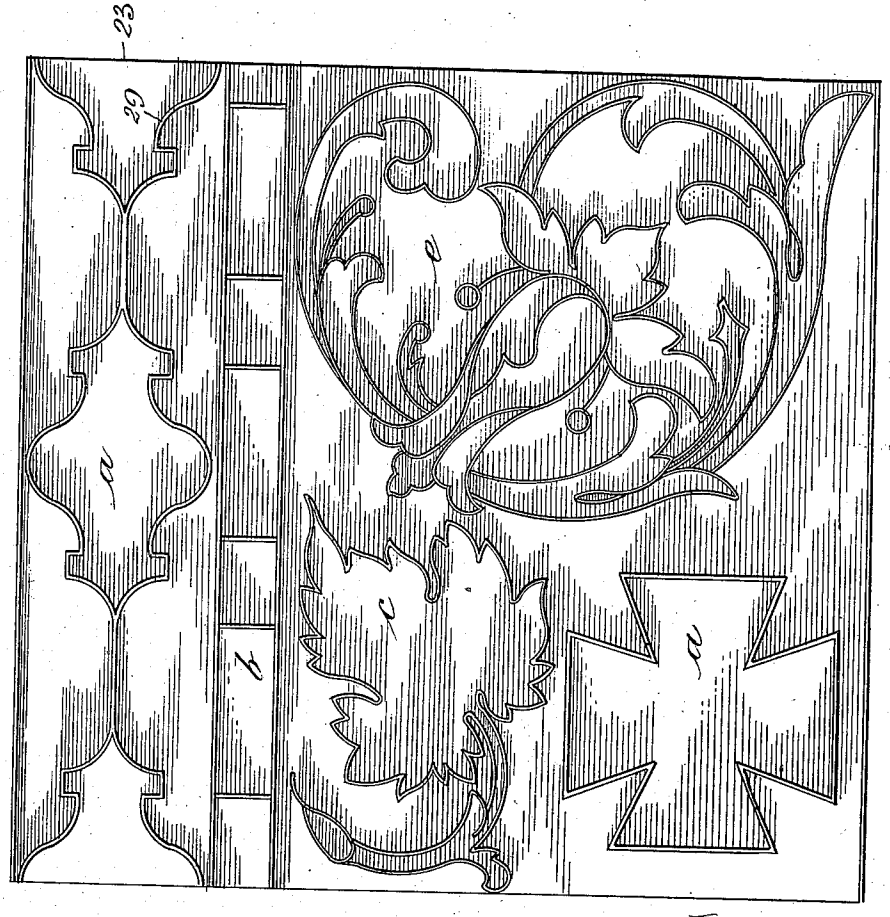


Fig. 3.



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METHOD AND APPARATUS FOR SHAPING GLASS.

1,028,129. Specification of Letters Patent. Patented June 4, 1912.

Application filed September 1, 1910. Serial No. 580,070.

To all whom it may concern:

Be it known that I, DAVID L. NEUHAUSER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Method and Apparatus for Shaping Glass, of which the following is a specification.

This invention relates to improvements in method and apparatus for shaping glass, and one of its principal objects is to reduce molten glass in bulk to a predetermined form, as a sheet, next to subdivide this formed glass into various configurations during the original heat, and finally to anneal such configurations before said heat is lost so far as to make reheating necessary.

A further object of the invention is to subject the subdivided configurations of the glass to an additional forming operation, during the original heat and prior to the annealing operation.

Other objects and features of the invention will be more fully described in connection with the accompanying drawings and will be more particularly pointed out and ascertained in and by the appended claims.

In the drawings:—Figure 1 is a plan view of one form of my invention adapted to carry out my improved process. Fig. 2 is a longitudinal central section thereof. Fig. 3 is a developed plan view of the cutting means for one of the rollers. Fig. 4 is a sectional view of the cutting roller with a portion of the cutting means secured thereto. Fig. 5 is a similar view showing a different form. Fig. 6 is a similar view showing a still different form. Fig. 7 is a perspective view of a gang of forms for forming subdivided portions of the glass during the original heat. Fig. 8 is a detail view of a modified form of construction.

Like numerals of reference designate similar parts throughout the different figures of the drawings.

In the form shown a supporting frame is indicated at 1, and is supported on rollers 2, so that it may be readily transported to any convenient location for manufacturing purposes. The frame 1 consists of two side structures which may be connected by axles 3, and also by connecting rods 4. On the connecting rods 4 there is supported two bearing structures, 5 and 6, and in these structures is disposed a plurality of adjustable bearings 7 for rollers 8.

The rollers 8 serve as a mounting or support for a bed plate which is indicated as a whole at 9, and on which rollers the bed plate may be advanced parallel with the longitudinal axis of the machine. The bed plate 9 forms a support for the bulk of molten glass indicated at 10. As illustrated the bed plate may be of hollow construction to permit the application thereto of a cooling medium. When the bed plate is so constructed the lower wall 11 engages and is supported by the rollers 8 and the bed plate may be grooved to provide a run-way adapted to travel on said rollers and retain the bed plate in a predetermined line of travel.

Mounted upon the bed plate and in the frame structure 1, is a forming or reducing roller 12. This roller may be of hollow construction, as illustrated, to permit the application thereto of a cooling medium through pipe 13. At its other end said roller 12 is provided with a pulley 14 whereto power may be applied to operate the machine. In the present construction the roller 12 and bed plate 9 are operatively connected by a gearing, and the roller 12 is provided with peripherally disposed gear teeth 15, and the bed plate is provided with racks 16. The roller 12 is mounted in split bearings 17 which are vertically slidable on ways 18. The roller 12 may be adjustably held against movement up or down and to the desired working position by means of a threaded adjusting member 19, one of these members being provided for each end of the roller.

Guiding means is provided for the molten glass and as shown said means consists of a rod 20 supported on the frame 1 and guiding members 21 mounted on said rod. If desired, set screws 22 may be provided to prevent movement of said members 21 on said rod. Said guiding members 21 extend downwardly to the upper face of the bed plate, and preferably in engagement therewith, and guide the molten glass so as to prevent it from over-running the racks 16. The front margins of the guides 21 are rounded off, as shown, and the rear margins are curved to conform with the periphery of the roller 12 so as to form a guiding means for the glass until the same has been engaged between the roller 12 and the bed plate 9.

In advance of the roller 12, and of equal diameter therewith, there is provided a subdividing roller 23, which is preferably provided with gear teeth 24 arranged to mesh with racks 16 and be operated simultane-

ously and synchronously with the operation of the roller 12 and plate 9. In order to prevent the high temperature to which the roller 23 is subjected from injuriously effecting the same said roller may be subjected to the action of a cooling medium through pipes 25, and may be of hollow construction as shown. The roller 23 is mounted in split bearings 26 slidable in ways 27, similar to the arrangement shown in connection with roller 12. An adjusting member 28 serves to maintain the roller 23 in any desired working proximity to the plate 9 and prevents movement of said roller, upwardly or downwardly, from its adjusted position.

If desired the adjusting members 19 and 28 may be connected to the bearings as shown in Fig. 8 so as to be able to exercise compression or tension action on the roller. In this form the lower end of the threaded member is provided with a flange rotatively mounted in the bearing 26. The roller 23 is provided on its periphery with cutting or sub-dividing means which as shown is in the form of ornamental configurations, and as illustrated in Fig. 3, each configuration is complete and distinct from the others. The separate designs are designated by reference letters *a*, *b*, *c*, *d*, and *e*. As shown in Figs. 4, 5, and 6 said cutting or sub-dividing means may consist of strips of steel formed in the desired shape and indicated at 29, 30 and 31. The strip indicated at 29 is of the simplest form and is merely secured by a screw 32 to the roller 23. In the form shown in Fig. 5, the strip 30 is provided with a single flange and in the form shown in Fig. 6 the strip is provided with a double flange. The various constructions can be used in accordance with the conditions under which the machine is operated.

Fig. 7 designates one form of mold in which the severed portions may be shaped during the initial heat. Fig. 7 is clearly a conventional showing of a mold and is not intended to correspond with any of the figures or configurations shown in Fig. 3, as it will be understood that special shaped molds will have to be made for different designs.

In operating the machine the molten glass is deposited on the bed plate 9, in bulk, and if it is desired that the product should have any of the various opalescent, irridescent or shimmering effects the bulk of glass is composed of a combination of differently colored glass ladled from the coloring pots and combined into a single mass. If it is desired to reduce the bulk to a flat sheet of glass, means in the form of the roller 12 is provided and is adjusted and held at the required spaced distance above the bed plate 9. It will be understood that the gear teeth may be long enough to permit of adjustment of the roller, or like means, and still be retained in mesh. In the form of the invention shown, power is applied to the roller 12 to rotate the same in the bearings and the gear connection serves to advance the table to bring the glass in bulk between the guides and toward the roller 12. The molten glass in bulk is reduced to a flat sheet, as shown in Fig. 2, and before the glass cools and while it is in its original heat the hot molten glass formed by the roller 12, and the table 9, is advanced beneath the subdividing means which as shown is in the form of the roller 23, and after the subdivision, and any further shaping, has been accomplished, immediately submitting the configurations, while still in their original heat and without reheating, to the annealing operation.

As will be seen by reference to Fig. 6, the roller 23 is adjusted, with respect to the bed plate 9, so that the sharp lower margin of the cutting strip 31 will not come in contact with the bed plate 9. In practice it has been found that a space of one sixty-fourth of an inch provides sufficient clearance between the cutting edge of the strip and the bed plate 9. One of the reasons for such clearance is to protect the bed plate 9 from being marred or scratched by the cutting strip. A further reason is that it is desired to not completely, in all cases, sub-divide or actually separate, at the time, the configurations from the sheet formed. This clearance provides a connecting web which under most conditions will unite the several configurations with sufficient tenacity to permit the entire sheet to be transferred to the pan intact and delivered to the annealing mechanism. When the glass has been cooled in the annealing mechanism the thin connecting web uniting the several configurations will, by reason of the fact that they are much thinner than the other portions of the glass, be very brittle and some of them will crack and cause separation of the configuration during the annealing process. This is not objectionable because it merely saves the time of the operator in manually separating these different configurations of the plate from one another. The space above the traveling bed-plate 9, after it has passed beneath subdividing roller 23, is absolutely open and unobstructed, except by the configurations of glass delivered by said roller, so that the configurations may be hurried therefrom, even up to the roller itself, to the annealing oven or leer without delay or chance to set. This is of importance, since, if they once set or chill, even on the surface only, they must be again raised to a uniform temperature before the actual annealing operation can be instituted. This combination of positively driven rollers and traveling bed-plate, unobstructed beyond said rollers, saves time and conserves heat in another

particular, since the bed-plate and its length of travel may be made sufficient to practically bridge the space between a melting kiln and an annealing oven, so that the mass of molten glass may be received at one end of the transverse and the subdivided configurations delivered, upon their emergence from the subdividing roller, almost instantaneously to the oven or leer at the other end thereof.

It will be readily understood, however, so far as the mechanism is concerned, that my invention is not necessarily limited to a subdividing means, as subdividing means may be readily adjusted by the members 28 to any form of design or configuration, not deep enough to cause the resulting connecting web to become so thin as to be frangible and break under a change of temperature.

It is a well known fact that great advantages accrue when all treatments or operations on glass are performed or effected during the original or initial heat thereof. If a part of the treatment or process to which the glass is subjected is performed during the original heat and it is necessary to reheat the glass to perform another set of operations it is found that reheating greatly reduces the tenacity and toughness of the glass and renders the same very brittle and frangible. It is therefore one of the primary objects of this invention to perform all of the necessary operations upon the glass during the original or initial heat so that when the glass is annealed it is turned out a finished product from the annealing apparatus and does not have to be reheated for the performance of any other treatment.

Supposing that the figure indicated at *d*, Fig. 3 is to be used in a flat form, then the process will consist of reducing the glass in bulk and forming or subdividing the figure in or from the sheet and placing the sheet with the other figures into the annealing oven. All of the treatments to the glass being performed in the initial heat of the glass. It may be stated for practical information that the connecting web which prevents the different figures from being detached from the sheet as a body, is so much thinner than the rest of the sheet that immediately after it leaves the roller 23 this thin connecting web cools much more rapidly than the body of the sheet and its juncture with the body of the sheet is therefore very frangible. Now, should it be desired to give any one of the ornamental figures, for instance one corresponding in outline with a mold *f* in the gang of molds represented in Fig. 7, a particular formation, *inter alia* as arched or curvilinear, the said figure can readily be detached or separated from the body of the sheet and dropped into such mold and, being still in a measure plastic, will automatically conform to its floor or bottom *g*, assuming an arched shape, or may be manipulated to fit itself thereto by means of any suitable glass-worker's tool. It will still have been wholly treated in the initial heat of the glass and may now be transferred to the annealing oven and cooled. It will therefore be seen that my invention not only contemplates reducing the molten glass in bulk to a predetermined form, during the original heat, but my invention also embraces the further step of shaping the formed glass in addition to the operation performed in the machine and doing such additional shaping during the original heat of the glass and before the glass is put into the annealing oven.

While I have shown a bed plate and rollers for carrying out the operation hereinbefore described it will be understood that I do not wish to be limited to a flat bed plate and the specific form of rollers shown except for such limitations as the claims may import, or to a bladed roller as the subdividing means.

It will be seen by reference to Fig. 2 that the threaded adjusting members extend through the split bearings so that the latter can be adjusted and held from movement in either direction from their adjusted position.

It will be noted that the word "subdivide" or subdividing wherever used in the specifications or claims, is limited in sense either to an absolute separation of one glass figure from another prior to annealing, or to a separation so far completed that the figures are left united only by a web so thin as only to hold them together for the annealing operation, and thereafter so frangible that the figures can readily be separated by hand.

I claim:—

1. A method of shaping glass into ornamental figures, consisting in reducing molten glass from the bulk into a predetermined form, immediately forming and subdividing individual figures therein during the original heat, and directly annealing while said heat continues without reheating.

2. A method of shaping glass into ornamental figures, consisting in reducing hot glass from the bulk into a predetermined form, immediately forming and subdividing the individual figures therein during the original heat, detaching the subdivided figures and forming them into a modified shape during said continuing heat, and directly annealing while said heat continues, without reheating.

3. A machine for shaping glass into ornamental figures, comprising in combination, means for supporting molten glass in bulk, means coöperating therewith for reducing the bulk to a sheet, and means for forming

and subdividing the predetermined figures in said sheet, so arranged as to act while the glass retains its original heat, and to permit the immediate delivery of the subdivided figures to the annealing oven as soon as formed.

4. A machine for shaping glass into ornamental figures, comprising, in combination, a movable bed-plate for supporting molten glass in bulk, a roller under which said bed-plate is passed, acting to reduce the bulk to a sheet, a second roller of equal diameter provided with means for subdividing the predetermined figures in said sheet as the bed-plate brings it beneath, the space beyond said latter roller, above the bed-plate, being open and unobstructed, and means for driving said rollers and bed-plate synchronously and coördinately.

5. A machine for shaping glass into ornamental figures, comprising, in combination, a movable bed-plate for supporting molten glass in bulk, a driven roller geared to advance the bed-plate coördinately with its own peripheral motion and acting to reduce the bulk to a sheet, a second roller, of like diameter with the foregoing, geared to said bed-plate and driven thereby, synchronously and coördinately with the motion of the first roller, and means carried by said second roller for forming and subdividing the predetermined figures in the sheet as it is carried past this latter roller, the bed-plate being open and unobstructed.

6. A machine for shaping glass into ornamental figures, comprising, in combination, a suitable supporting frame, a movable bed-plate mounted therein and adapted to receive molten glass in bulk, carrying rollers whereon said plate is reciprocated, racks fixed to said plate, a driven roller journaled in the frame and provided with gears engaging said racks, to drive the plate coördinately with the peripheral movement of said roller, the roller thereby serving to reduce the bulk to a sheet as it is borne beneath, a second roller of like diameter and equal gears, engaging said racks and driven thereby as the plate passes, and means carried by this latter roller for forming and subdividing the predetermined figures in the sheet as it is carried beneath.

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

DAVID LOUIS NEUHAUSER.

Witnesses:

CARL H. CRAWFORD,

FRANCES STAPEL.