May 4, 1937. D. G. MERRILL 2,079,559

GLASSWARE LEHR CONSTRUCTION

Filed Feb. 5, 1936 2 Sheets-Sheet 1

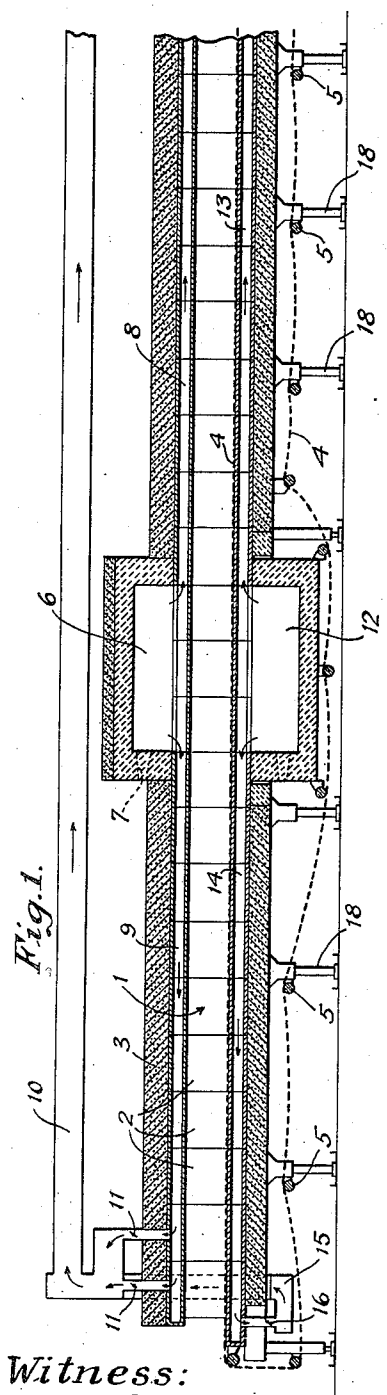


Fig. 1.

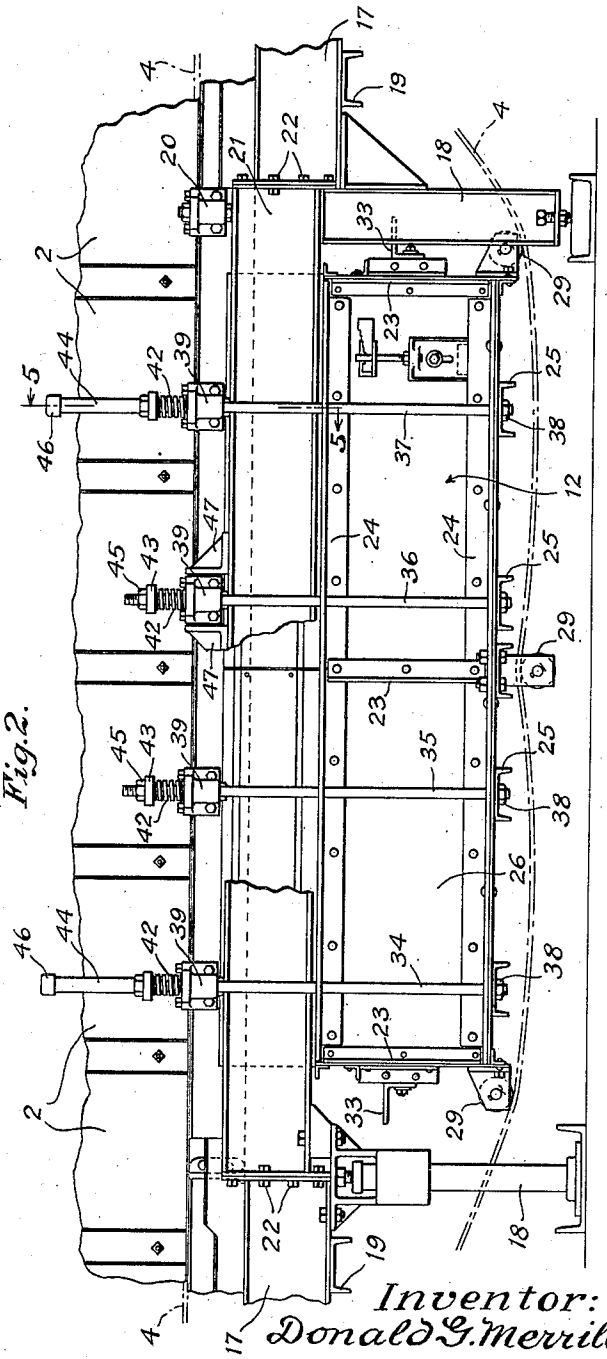


Fig. 2.

Witness:
A. A. Horn

Inventor:
Donald G. Merrill
by Brown Packard
Attorneys.

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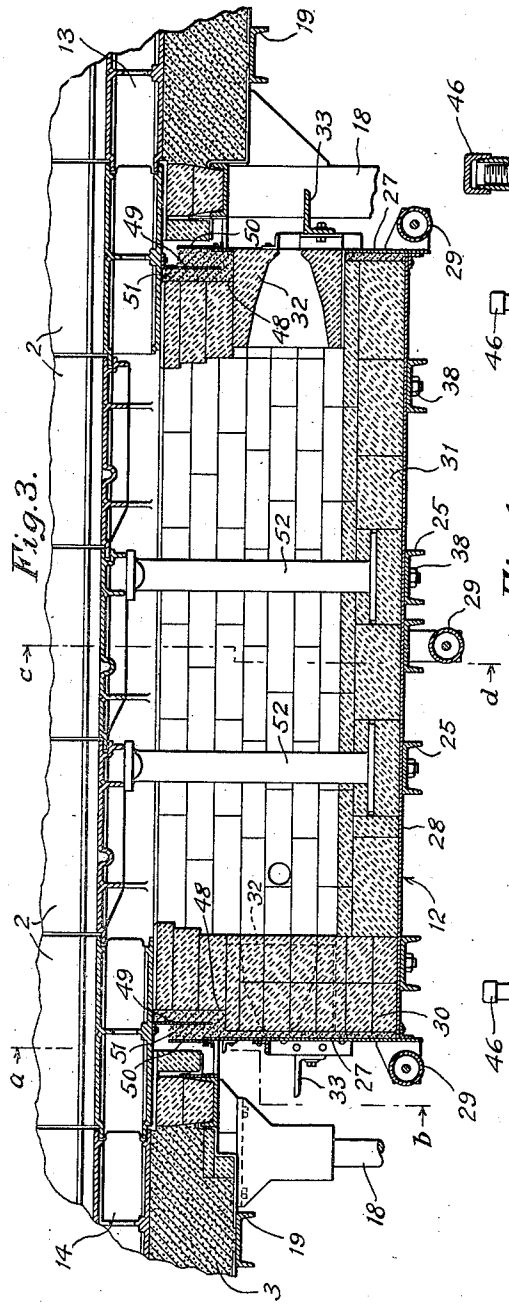


Fig. 3.

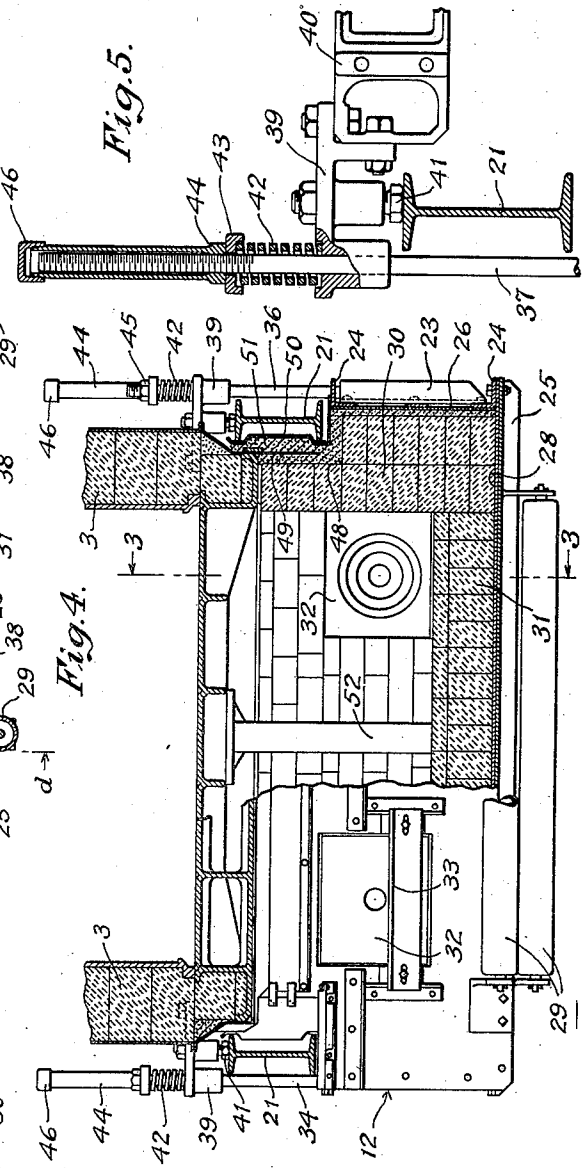


Fig. 4.

Fig. 5.

Witness:
A. A. Horn

Inventor:
Donald G. Merrill
by Brown & Parkhurst
Attorneys.

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UNITED STATES PATENT OFFICE

2,079,559

GLASSWARE LEHR CONSTRUCTION

Donald G. Merrill, West Hartford, Conn., assignor to Hartford-Empire Company, Hartford, Conn., a corporation of Delaware

Application February 5, 1936, Serial No. 62,453

5 Claims. (Cl. 49—47)

My present invention relates to glassware lehr construction and more particularly to the construction of a continuous glassware annealing and/or decorating lehr wherein there is a firebox removably associated with the remainder of the lehr structure.

Many glassware annealing lehrs of the prior art employ fireboxes associated therewith and below the tunnel portion of the lehrs in which the firebox is directly supported upon the floor or base of the lehr as a whole and wherein the lehr tunnel is supported in turn by the firebox. When the firebox of such a structure expands when it is heated, it will tend to push upwardly the portion of the lehr tunnel thereabove and result in a certain amount of displacement of the level of the lehr. The mounting of a firebox so that it will be free from the floor or base on which the lehr is mounted and will preferably be suspended from the main structural framework or structural members of the lehr is one of the objects of the present invention.

A further object of the present invention is to provide a removable fire box in association with a glassware lehr in such manner that the removal and replacement of the firebox either after repair or by another similar firebox is facilitated.

A further object of the invention is to provide a substantially air-tight seal between a removable firebox and the contiguous part of the lehr structure, preferably a sand seal.

A further object of the present invention is to provide in a construction of the type generally above set forth for the supporting of some one or more central portions of the floor of the tunnel above the firebox by pillars or equivalent supporting means extending upward from the removable firebox, so as to offset the tendency of the tunnel floor to sag or collapse under the influence of the relatively high heat to which this part of the structure is subjected.

Further and more detailed objects of the present invention will become apparent from the following specification and appended claims when taken in connection with the accompanying drawings, in which:

Figure 1 is a view substantially in longitudinal vertical section and generally diagrammatic showing a portion of a decorating and annealing lehr embodying my invention;

Fig. 2 is a fragmentary view principally in side elevation, but with some parts broken away, illustrating the manner of supporting the removable firebox;

Fig. 3 is a fragmentary view substantially in vertical longitudinal section on the line 3—3 of Fig. 4 showing the firebox in its operative position and the supports for the center portion of the tunnel floor from the firebox;

Fig. 4 is a composite view in transverse vertical section, the left hand portion being taken substantially on the line *a*—*b* on Fig. 3 and the right hand portion substantially on the line *c*—*d* of that figure; and

Fig. 5 is a fragmentary detailed view of certain portions of the supporting means for the removable firebox taken substantially on the line 5—5 of Fig. 2 and on an enlarged scale.

While I have chosen for purposes of illustration to disclose a lehr of the type used for decorating and annealing glassware, it will be understood that the invention is not limited in its application to this type of lehr, but may be applied to any type of lehr susceptible of such application, whether the lehr is to be direct fired or muffled, as is the one shown in the accompanying drawings, and whether it is to be used in both decorating and annealing or merely in the annealing of glassware.

I have chosen for purposes of illustration a lehr which is similar to but a slight modification of the decorating lehr shown and described in the patent to Mulholland, No. 1,798,552, granted March 31, 1931. It will be understood that any portions of the lehr not specifically illustrated and described herein may be constructed as disclosed in the Mulholland patent, or in any other usual or desired manner.

Referring first to Fig. 1 of the accompanying drawings, I have illustrated the forward portion of a decorating and annealing lehr, comprising a tunnel generally indicated at 1, which may be made up of a plurality of similar sections 2 suitably formed and connected in end-to-end relation, the tunnel as thus formed being surrounded for a major portion of its length by suitable insulating material generally indicated at 3. The glassware is conveyed through the tunnel upon an endless conveyor 4 of open work material, which as shown slides directly on the floor of the tunnel to move the glassware therethrough and returns to the forward end of the tunnel beneath the same as shown, being supported in its return course by a plurality of spaced rollers 5. The conveyor may be drawn through the tunnel by any desired means as those now common in glassware annealing lehrs.

Above the tunnel and intermediate the ends

thereof, there is illustrated a firebox 6 having burner openings 7 therein, preferably one at each end, and laterally offset from one another so that the flame in the firebox 6 is a swirling one with the burners directed tangentially thereof. Communicating with the firebox 6 are upper heating flues 8 extending toward the rear of the tunnel and flues 9 extending to the forward or ware-receiving end of the tunnel. The exhaust means for the flues 8 are not shown in the drawings, but may be substantially the same as those of the Mulholland patent above referred to, while the gases passing forwardly through the flues 9 may be exhausted through the conduit 10 under control of the dampers 11.

Beneath the tunnel and in this instance directly below the firebox 6, there is a firebox generally indicated at 12, this firebox being only diagrammatically illustrated in Fig. 1 and communicating with the lower flue system, including flues 13 leading toward the rear or exit end of the tunnel and flues 14 leading to the forward end of the tunnel. The exhaust from the flues 13 is not illustrated in the present drawings, but may be the same as that disclosed in the Mulholland patent above referred to, while the flues 14 are shown as exhausted through the passages 15 and exhaust conduit 10 under control of the damper 16.

The structure shown in Fig. 1 is a portion of a muffle lehr arranged for decorating and annealing glassware by providing a zone of increasing temperature between the forward end of the lehr and the fireboxes 6 and 12, a zone of maintained high temperature at these fireboxes due to both fireboxes being open to the tunnel walls, and a zone of decreasing temperature from the fireboxes to the exit end of the tunnel, which latter zone is preferably controlled as to temperature gradient in a manner not here illustrated.

The remainder of the lehr may be conventional and/or may be constructed as disclosed in the Mulholland patent above referred to, but inasmuch as it has no bearing upon the present invention, it is not disclosed herein. The present invention has to do particularly with the arrangement and support for the lower firebox generally indicated in Fig. 1 at 12, this construction being shown in detail in Figs. 2 to 5 in the accompanying drawings.

Referring now to Figs. 2 to 5 of the accompanying drawings, the lehr is mounted upon a structural framework comprising side members shown as I-beams 17 extending longitudinally along each side of the lehr and at a level adjacent to that of the floor of the tunnel 1, these I-beams being supported at intervals upon suitable pedestals 18 and being connected together at intervals longitudinally of the lehr by transverse structural members 19. The tunnel forming sections 2 are provided with suitable means such as brackets 20 which rest upon the structural members 17 and support the tunnel sections therefrom. Alternatively these tunnel forming sections may be provided with wheels rolling upon rails, which in turn are secured to the structural members 17 as shown in the Mulholland Patent No. 1,560,481, granted Nov. 3, 1925 (see Figs. 9 and 10 of that patent). In any event, provision is preferably made to allow for the normal expansion of the tunnel in respect to its structural support during the operation thereof. In the lehr construction shown in the accompanying drawings, the expansion is taken up by permitting a bodily movement of the tunnel in respect to the structural support in both directions from a position adjacent to the firebox 12, as hereinafter to be described.

At the position of the firebox 12 the longitudinal structural members comprise I-beams 21 at each side of the lehr, which are positioned at a slightly higher level than the members 17, as shown best in Fig. 2, in order to permit of the removal of the firebox laterally thereunder as hereinafter set forth. These members are, however, rigidly connected to the remainder of the structural framework of the lehr, as by bolts 22.

The firebox 12 is built inside its own structural framework, including vertical angle members 23 and horizontal angle members 24 at each side thereof, and transverse channels 25 below the firebox. These members are connected to form a boxlike frame structure which is completed by plates, preferably of sheet metal including side plates 26, end plates 27, and a bottom plate 28. Suitably connected to the structural framework of the firebox 12 are a plurality of rollers 29 mounted for free rotation for supporting and guiding the return strand of the conveyor belt 4 as best shown in Figs. 2, 3 and 4.

Within the metallic box-like frame constructed as aforesaid is built up the refractory brick work of the firebox, including side and end walls 30 and a bottom wall 31. In each of the end walls, there is located a suitable burner block 32, these burner blocks being arranged as generally described for the burners in the upper firebox 6, that is so that the flames of the burners will be directed tangentially of the center portion of the firebox where there will be a swirling type of flame, so as to get uniformity of temperature and good mixing of the fuel and air and complete combustion of the fuel. Adjacent to the outside of each of the burner blocks 32 is a suitable bracket 33 upon which any desired type of burners may be mounted for directing flames into the firebox.

Means are provided according to my present invention for suspending the firebox 12 from the framework of the lehr, that is, from the structural members 21 in the present instance. For this purpose, there are provided a plurality of bolts 34, 35, 36 and 37 on each side of the firebox, these bolts being suitably secured to the framework thereof as by nuts 38 and extending upwardly above the level of the top of the members 21. As shown, bolts 34 to 37 extend freely through vertical bores in brackets 39, which are secured to floor plates 40 of certain of the tunnel sections 2 above the firebox, the brackets 39 being supported upon the structural members 21, as best seen in Fig. 5 through adjustable bolts 41. Surrounding the bolts 34 to 37 above the brackets 39 are compression springs 42, which extend between recesses formed in the brackets and suitable cup washers 43, which are held in place by elongated nuts 44 for bolts 34 and 37 and ordinary nuts 45 for bolts 35 and 36. It will be noted that bolts 34 and 37 are considerably longer than are bolts 35 and 36 and that the nuts 44 associated with these long bolts have long sleeve-like members surrounding the elongated upper ends of the bolts and capped at the top by suitable cap-members 46, which is for a purpose hereinafter to be described in detail.

As seen in Fig. 2, the bracket members 39 through which the bolts 36 pass are located between pairs of angle members 47, which are rigidly secured to the structural members 21. A slight clearance is provided between the bracket members 39 and the associated angle members for convenience in assembly. Due to the fact that the remainder of the brackets 39 are free to slide on

the structural members 17 and 21, as are also the remaining portions of the lehr, the expansion of the lehr will take place longitudinally in both directions from the point where bracket members 47 are located.

I preferably provide between the removable firebox 12 and the contiguous portions of the lehr structure, a means for maintaining this joint substantially air-tight, so as to prevent the uncontrolled infiltration of atmospheric air into the flue system beneath the tunnel and the consequent defeat of accurate temperature regulation. For this purpose, the upper edge portion of the periphery of the firebox is recessed, as shown at 48, Figs. 3 and 4, and extending downward into this recess is a flange member 49, which may be of sheet metal and which is secured to the framework of the lehr and unattached to the removable firebox. Attached to the firebox outside the periphery of the flange member 49 is an upstanding flange portion generally indicated at 50, which is preferably removably secured to the firebox 12 in any suitable manner, this member or portion 50 being also preferably of sheet metal. In the recess 48 and confined by the member 50 and around both sides of the depending flange 49 is arranged a suitable filling material, such as sand, indicated at 51 for maintaining a tight joint at this point.

The firebox 12 is normally resiliently held in a desired operative position by the bolts 34 to 37 inclusive and under the control of the compression of springs 42, which in turn is controlled by the adjustment of the nuts 44 and 45. This resilient connection permits the expansion of the firebox without over-straining or breakage of any of the parts. Also, due to the fact that the firebox is suspended from the structural members 21, the expansion will be downward from these members and there will be no upward displacement of the lehr proper upon the expansion of the firebox portions, as would be the case should the firebox be mounted upon a solid base and the lehr structure supported thereon.

When it is desired to remove the firebox 12 for repair or replacement, or for any other purpose, the nuts 45 are first removed leaving the firebox supported, preferably adjacent to its four corners, by bolts 34 and 37 and the nuts and spring associated therewith. At some time, either before or after this initial step, the conveyor 4 is parted below the firebox or adjacent thereto and the ends moved from position beneath the firebox. Also, it may be desired that some or all the members 50 confining the sand of the seal be detached from the remainder of the firebox, as the configuration of certain at least of these members as shown in Fig. 4 may require such detachment. It is contemplated, however, that these members could be so shaped and arranged in respect to the rigid portions of the lehr that their detachment is not required. It may further be necessary prior to removing the firebox that the burners (not shown) associated therewith be disconnected from their supply pipes or removed altogether.

The parts are now in the position for the removal of the firebox proper, which is done first by lowering the firebox gradually from its position down to a subjacent support, which in the usual case will be removable rollers (not shown) upon which the firebox may be rolled laterally away from the lehr. This gradual lowering is done by gradually backing off the nuts 44 on bolts 34 and 37, the elongation of these bolts serving to permit the lowering of the firebox down onto a suitable subjacent support. When the firebox has been completely lowered and is supported from beneath, the bolts 34 and 37 may be completely removed as may also the bolts 35 and 36 on the side of the firebox which is to pass under the lehr. For this purpose, all these bolts are removably connected to the firebox as hereinabove disclosed. The firebox may then be moved laterally in any suitable manner from beneath the lehr. It may also be necessary as shown in Fig. 2 to move the firebox slightly to the left in order that the roll 29 and bracket 33 at the right may clear the standard or pedestal 18 at this end of the firebox. This, however, may not be required in the event that the firebox is differently located in respect to these standards or pedestals, or vice versa. When it is desired to place either the same firebox subsequent to its repair, or some new firebox in place, the reverse series of operations may be carried out and the firebox may be elevated to its normal or operative position by the elongated bolts 34 and 37 and the nuts 44. The sleeves associated with these nuts and the caps 46 thereon keep the threads of the long bolts 34 and 37 clear of any dirt which might otherwise get on them.

In constructions of this character, particularly where the floor of the lehr above the firebox is subject to the direct heat of the flame of the firebox and wherein this floor is, as in the present lehr here disclosed, of metallic material, it may be desired or necessary to support one or more portions at the center of the floor plates from below in order to prevent sagging thereof. For this purpose, I have illustrated pillars 52 which are preferably mounted in the base or floor 31 of the firebox as shown, and which extend upward to support the middle portion or portions of the floor plates as may be necessary in order to provide a relatively permanent structure. In view of the fact that the firebox is resiliently supported at its operative position, the support for the center portions of the floor plates above the firebox will also be resilient.

It may be in certain cases at least, that the firebox cannot be lowered sufficiently so that upon its lateral removal from beneath the lehr, the pillars 52 will clear the I-beams or structural members 21. If this be the case, the firebox can be moved far enough out so that access may be had for removing these pillars from one side, whereupon the removal of the firebox may proceed. The installation of a new firebox is accomplished in the reverse order of steps, the pillars being inserted in this event subsequent to the firebox being moved somewhat over half way below the lehr.

While I have shown and described but one embodiment of my invention, it will be understood that various changes may be made therein and equivalents substituted for individual portions thereof, as will occur to those skilled in the art. I do not wish to be limited, therefore, except by the scope of the appended claims, which are to be construed as broadly as the state of the prior art permits.

I claim:

1. Apparatus for annealing glassware, comprising an elongate tunnel, structural supporting members therefor, a firebox for supplying heat for said tunnel, and resilient means for removably supporting said firebox from said structural supporting members, whereby to accommodate expansion and contraction of the firebox upon

the heating or cooling thereof during the operation of the annealing apparatus.

2. Apparatus for annealing glassware, comprising an elongate tunnel, structural supporting members therefor, a firebox for supplying heat for said tunnel, means for removably supporting said firebox from said structural supporting members including a plurality of threaded bolts extending between said firebox and said supporting members, resilient means interposed between said bolts and said structural supporting members to support said firebox resiliently from said supporting members and thus to permit of expansion and contraction of the firebox in respect to said members, and a sand seal extending entirely around the periphery of the connection between said firebox and the annealing apparatus.

3. Apparatus for annealing glassware, comprising an elongate tunnel, structural supporting members therefor, a firebox for supplying heat for said tunnel, means for removably suspending said firebox from said structural supporting members including a plurality of threaded bolts extending between said firebox and said structural supporting members, some at least of said bolts extending a material distance beyond their respective connections with the firebox and said structural members in at least one direction, nuts on said bolts, compression springs interposed between said nuts and said structural supporting members and so arranged that the firebox will be resiliently supported from said members, and a sand seal extending around the periphery of the upper walls of the firebox to effect a substantially air-tight seal between the firebox and the under portions of the annealing apparatus contiguous therewith.

4. Apparatus for annealing glassware, comprising an elongate tunnel, structural supporting members therefor, a firebox for supplying heat for said tunnel, means for resiliently and removably suspending said firebox from said structural supporting members, and a pillar mounted in said firebox and extending upward to support a central portion of the floor of said tunnel above the firebox in the operative position of the latter, whereby said floor portion will be resiliently supported due to the resilient support of said firebox from said structural supporting members.

5. Apparatus for annealing glassware, comprising an elongate tunnel, a muffle flue extending longitudinally of and beneath said tunnel, said flue having a common metallic wall with the floor of said tunnel, a firebox associated with said flue and located below said tunnel for supplying products of combustion to said flue, means for removably suspending said firebox from said structural supporting members including a plurality of threaded bolts extending between said firebox and said structural supporting members, some at least of said bolts extending a material distance above said structural supporting members, compression springs on said bolts above said structural members, nuts on said bolts above said springs, a sand seal extending around the periphery of the connection between said firebox and the contiguous portion of the annealing apparatus to provide an air-tight seal between said firebox and said flue, pillars mounted in the bottom of said firebox and extending upward to support central portions of the metallic tunnel bottom above said firebox and to prevent sagging thereof when said firebox is at its operative position.

DONALD G. MERRILL.