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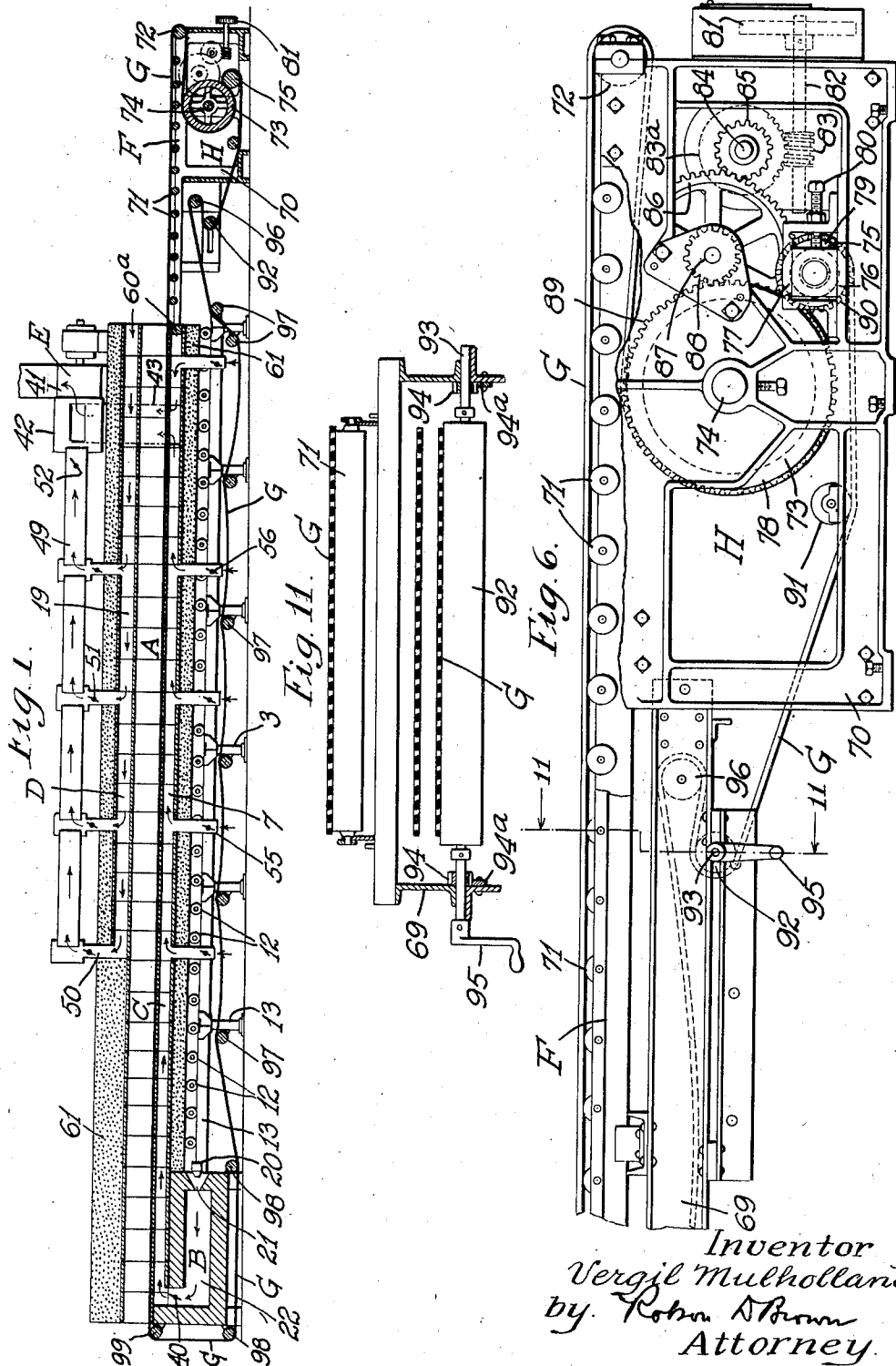
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APPARATUS FOR ANNEALING' GLASSWARE

Filed June 1, 1925

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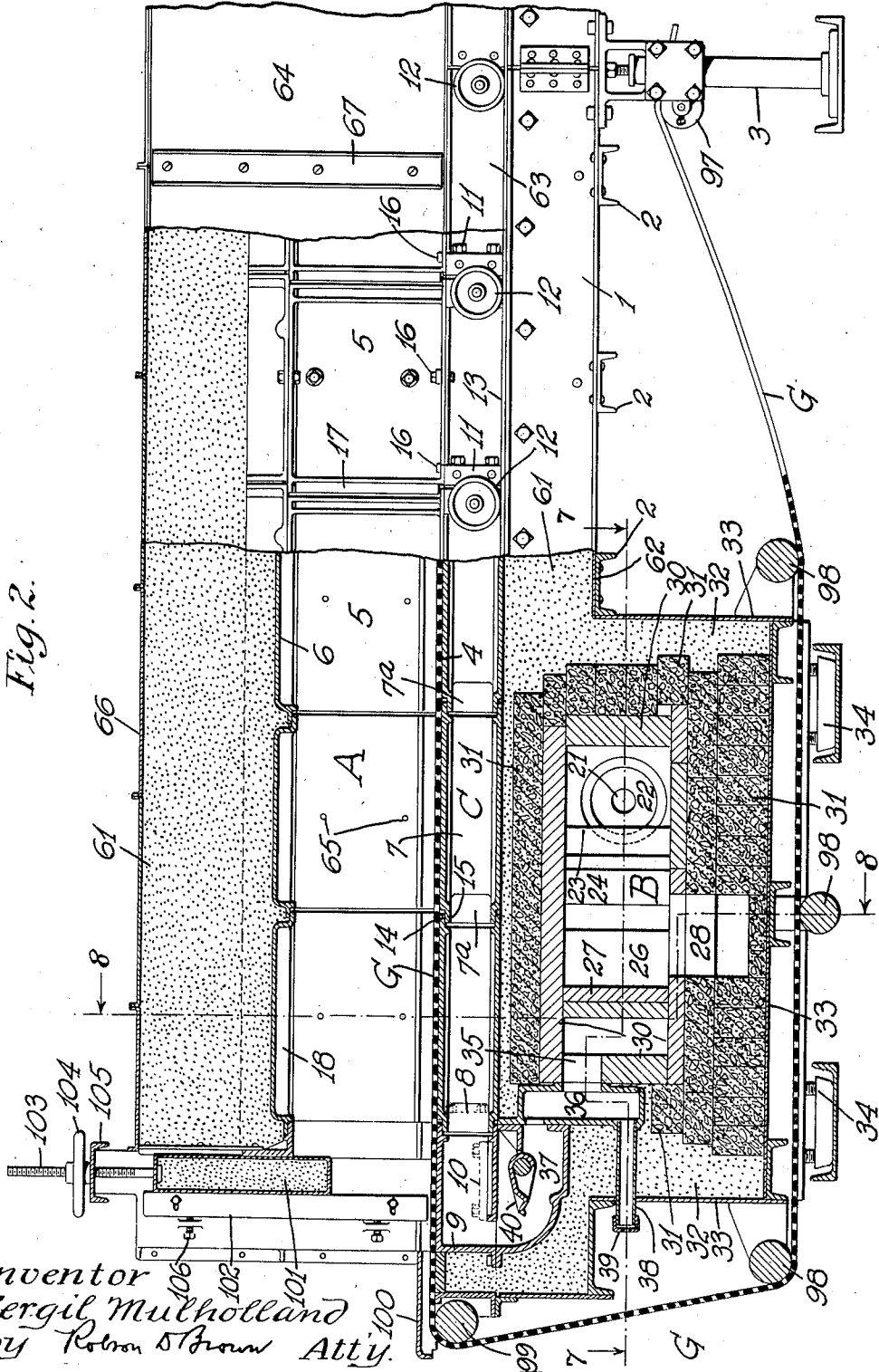
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Fig. 2.



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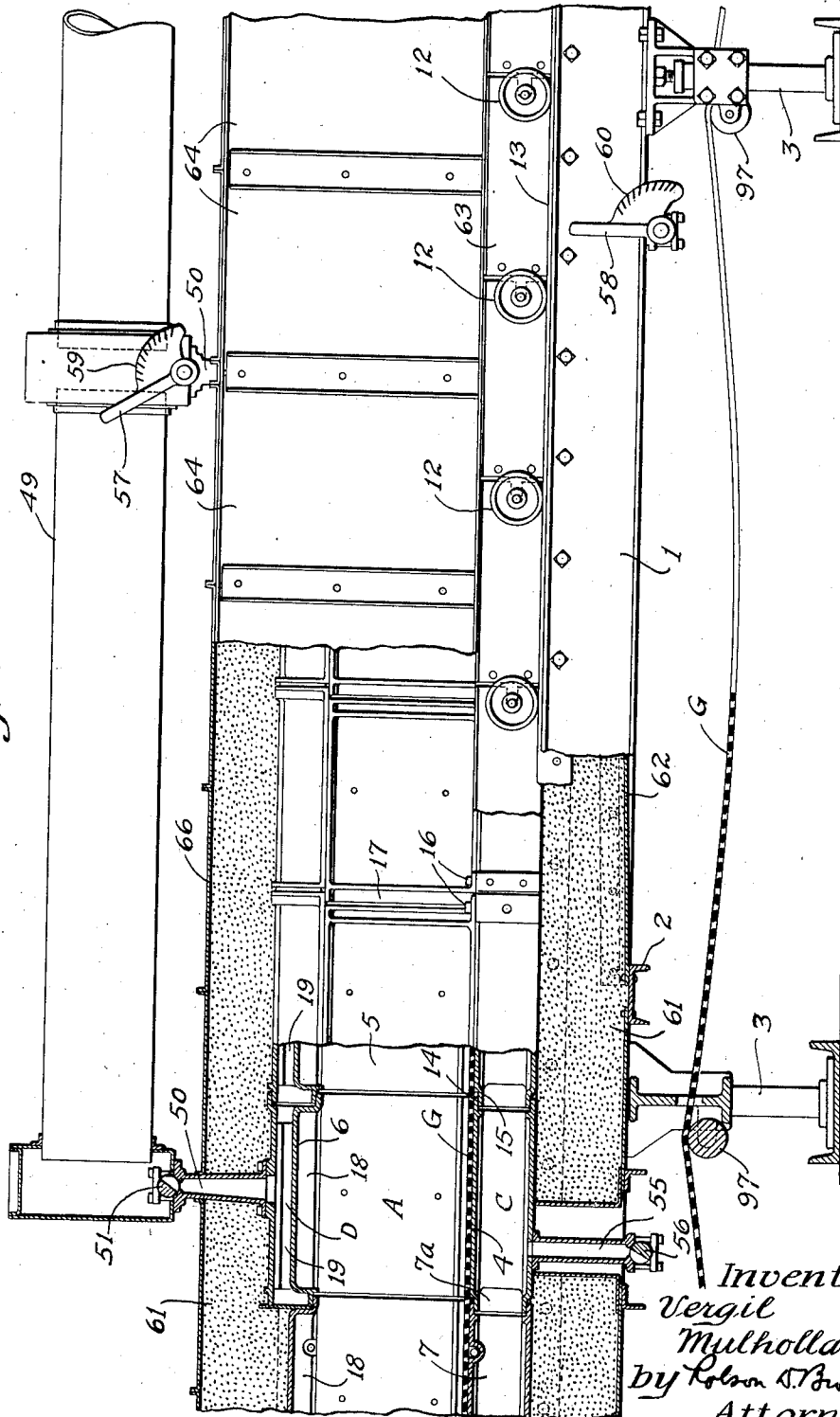
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Fig. 3.



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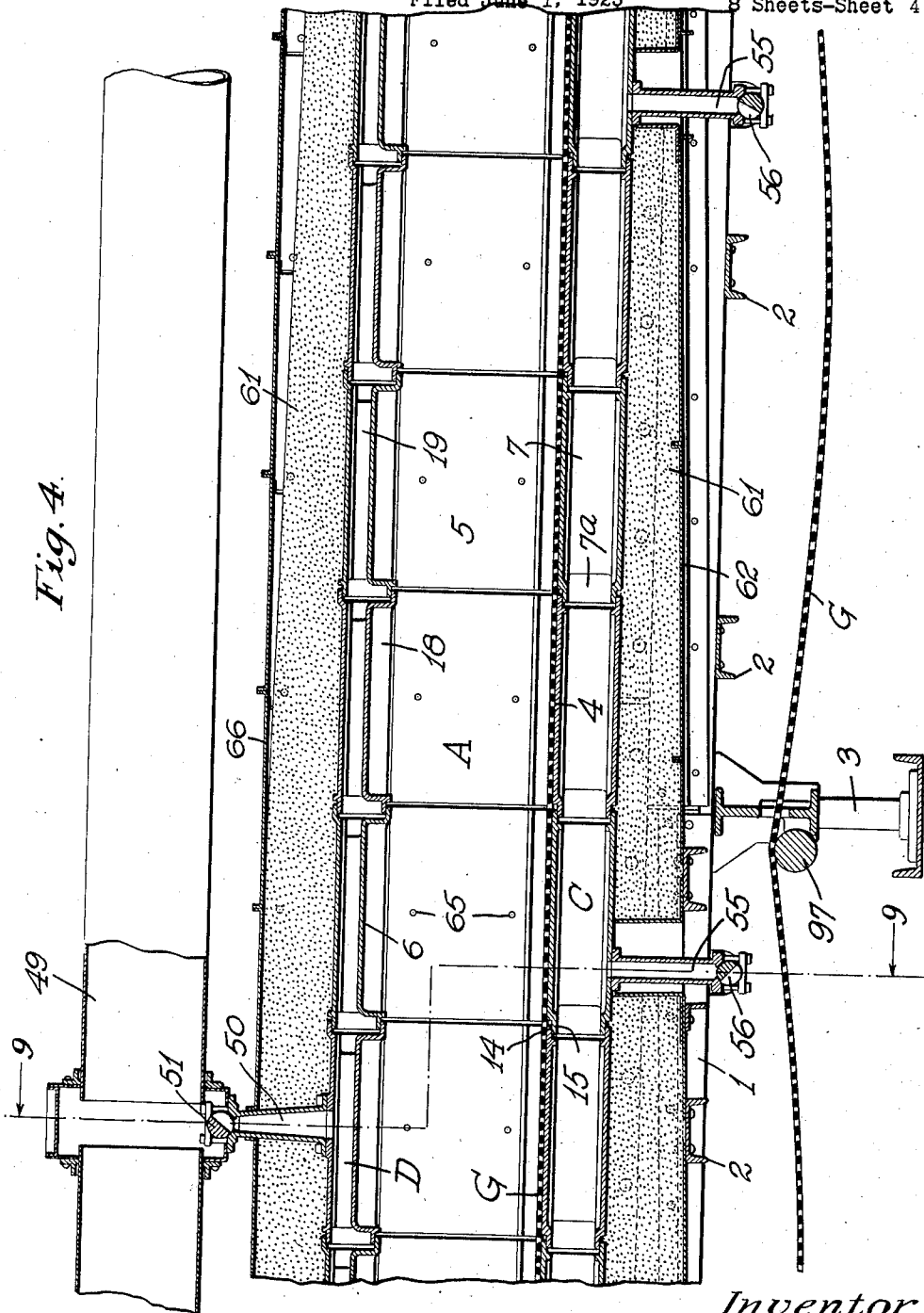
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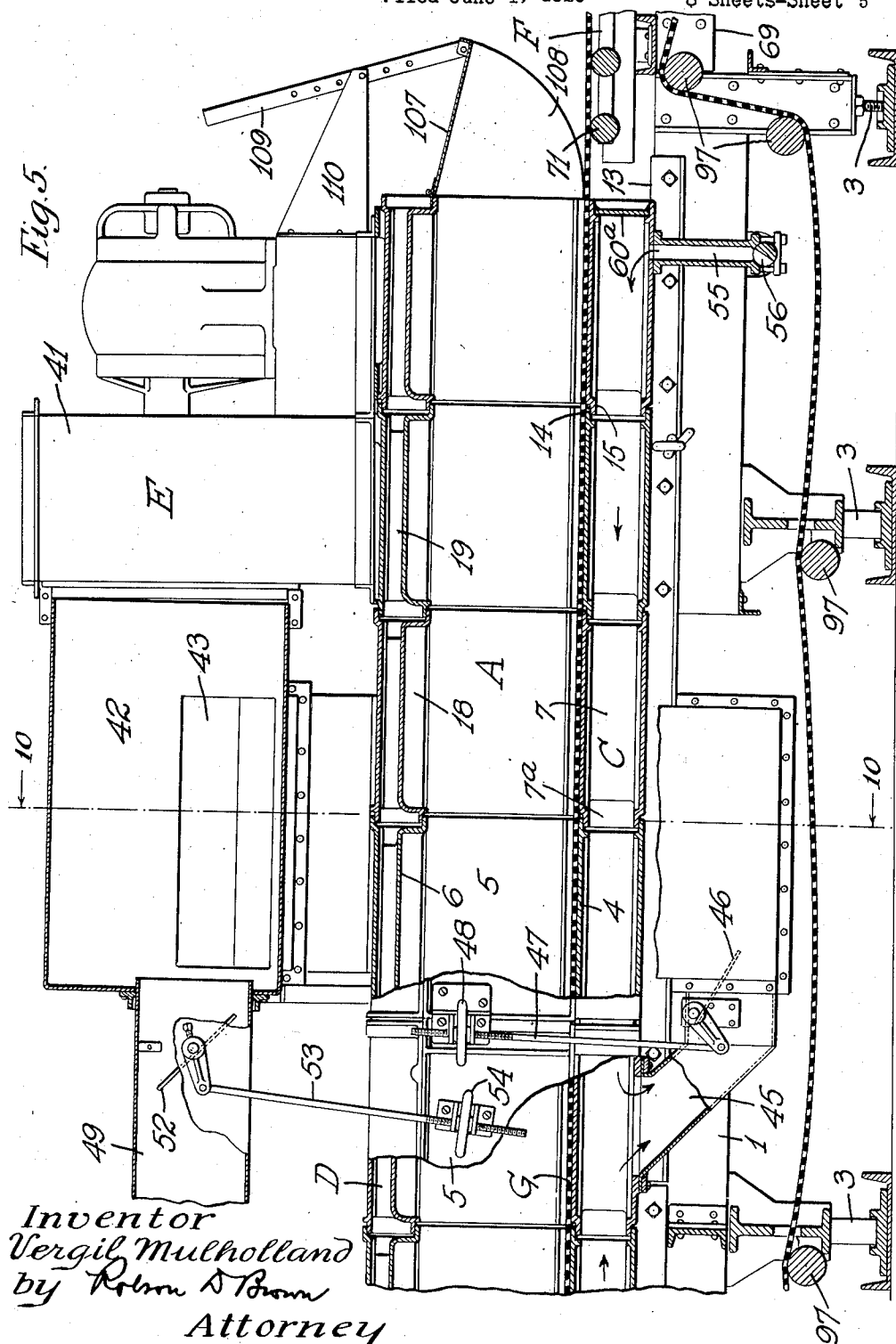
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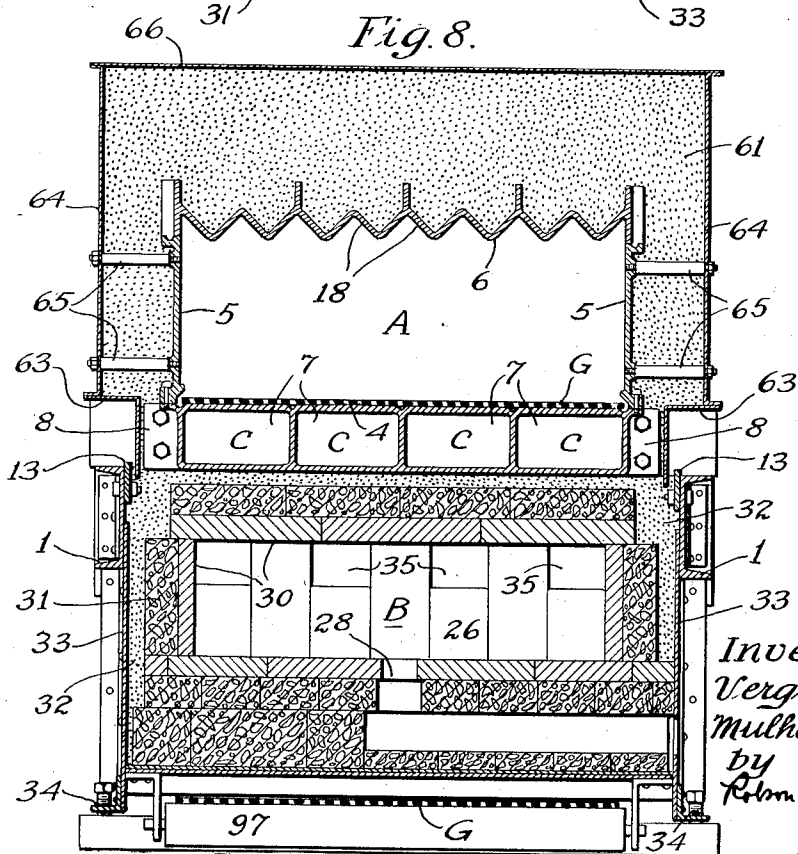
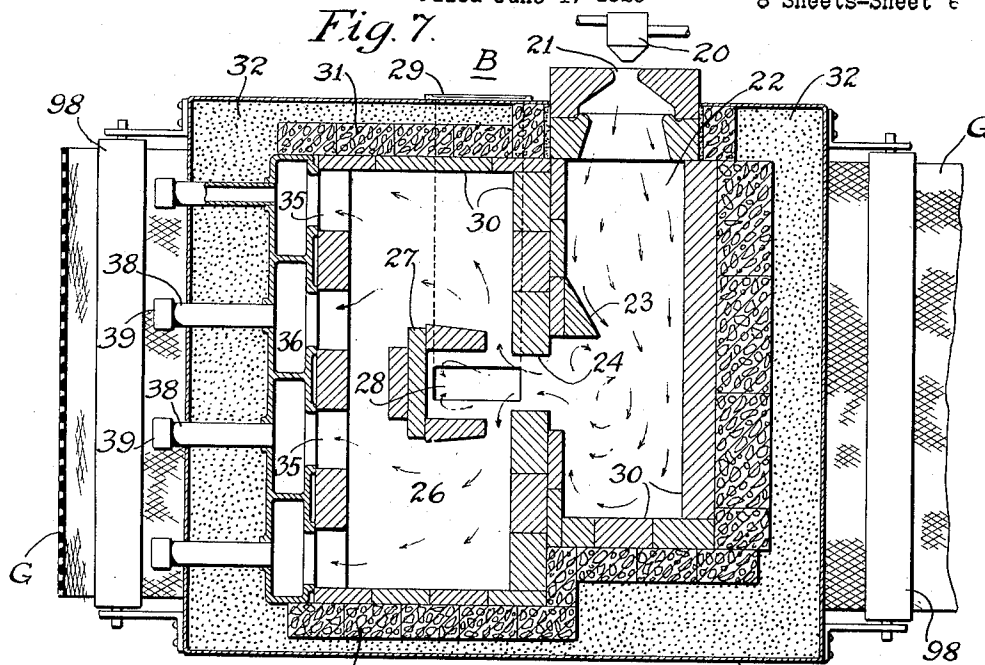
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Fig. 9.

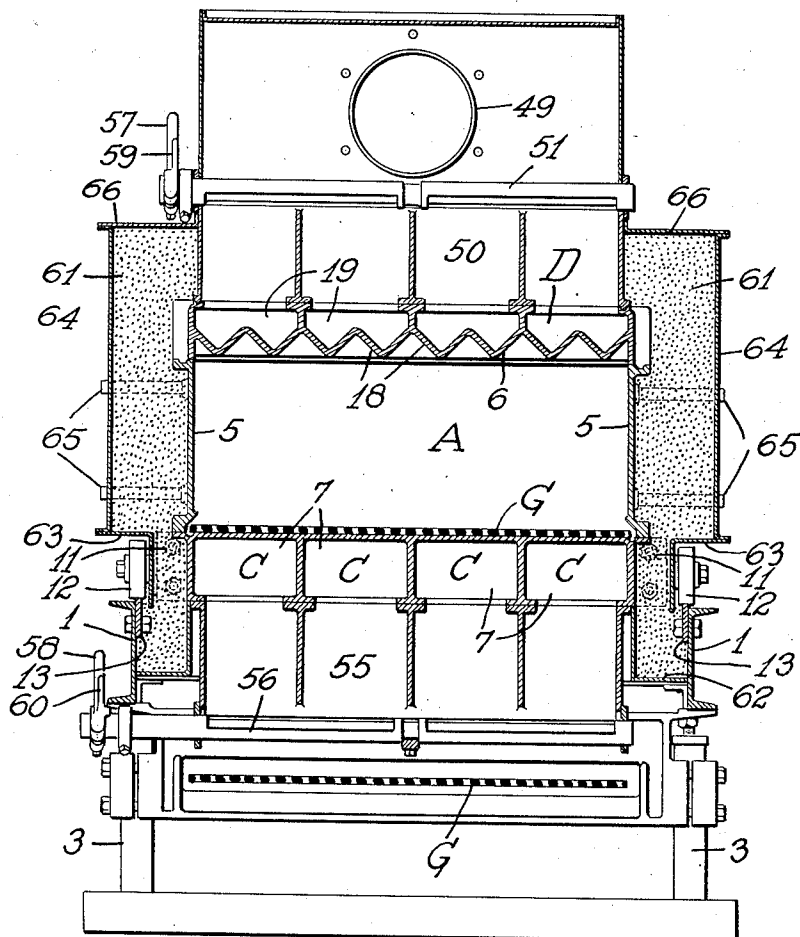


Fig. 12.

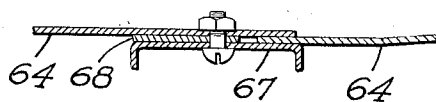
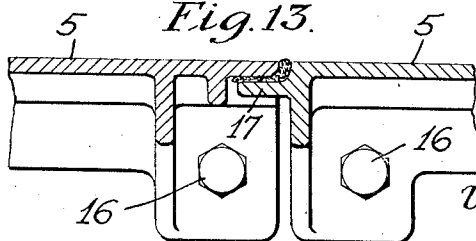


Fig. 13.



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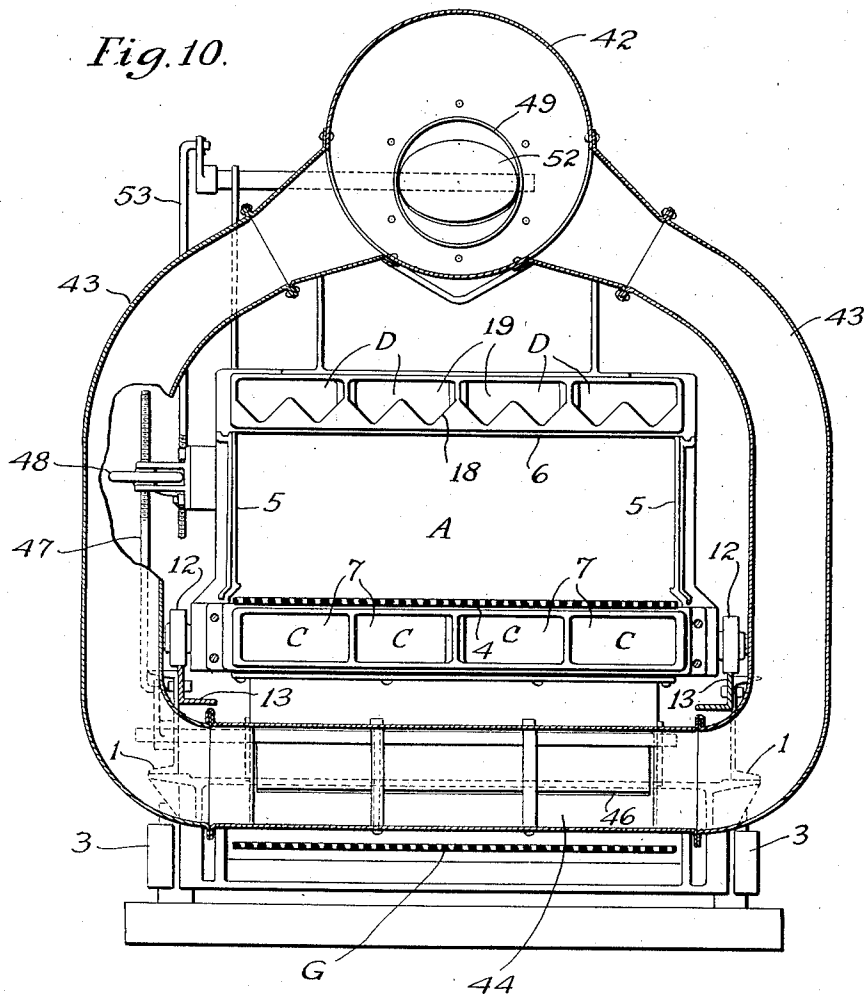
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Fig. 10.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ANNEALING GLASSWARE.

Application filed June 1, 1925. Serial No. 33,977.

To all whom it may concern:

Be it known that I, VERGIL MULHOLLAND, a citizen of the United States, residing at West Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Apparatus for Annealing Glassware, of which the following is a specification.

This invention relates to lehrs for annealing glassware, and it has particular relation to lehrs of the type embodying a tunnel which has heating and cooling flues associated therewith and through which the ware is transported, the ware being subjected therein to varying temperature environments. Such a lehr is disclosed in my copending application for Letters Patent Serial No. 19,615, filed March 31, 1925.

One of the objects of the present invention is to provide a lehr, of the character described, which shall be of relatively light and inexpensive structure, which may be quickly and easily assembled from a plurality of similar cast iron sections, and in which the temperature in the tunnel may be easily and accurately controlled and maintained substantially uniform, so far as the environment of the ware is concerned, throughout any transverse section or zone of the tunnel.

Another object of the invention is to provide a lehr in which the heating and cooling media, flowing in their respective flues, shall be drawn through the flues by suction and shall thus be prevented from obtaining access to the tunnel through leaks or crevices that may exist or develop between the flues and the tunnel, which may not only disturb the temperature therein by establishing hot or cold spots or zones, the locations of which are difficult to determine and which interfere materially with the proper annealing of the ware, but which have a tendency to cause a combustion deposit on the ware.

A further object of the invention is to provide a lehr embodying a substantially unitary tunnel mounted on rollers or other equivalent anti-friction devices in order to permit the tunnel to expand and contract as an entirety in a longitudinal direction with changes in temperature.

In the accompanying drawings,

Figure 1 is a diagrammatic vertical longitudinal sectional view of a lehr constructed according to the invention.

Fig. 2 is an enlarged view of the forward or receiving end of the lehr, partly in vertical longitudinal section and partly in side elevation.

Fig. 3 is a similar view of an intermediate portion of the lehr, illustrating the damper-controlled openings that regulate the temperature in the heating and cooling flues, and also the anti-friction support for the tunnel.

Fig. 4 is a vertical longitudinal sectional view of another intermediate portion of the lehr, illustrating more in detail the sectional construction of the tunnel.

Fig. 5 is a vertical longitudinal sectional view through the rear or exit end of the tunnel, illustrating the draft-producing device and the damper mechanism for controlling the drafts produced thereby.

Fig. 6 is a side elevational view, with parts broken away, of the ware-sorting table and the conveyor-driving mechanism.

Fig. 7 is a horizontal sectional view taken on line 7—7 of Fig. 2, and illustrating the internal construction of the fire box.

Fig. 8 is a vertical transverse sectional view taken on line 8—8 of Fig. 2, and illustrating the cross-sectional arrangement of the tunnel and fire box.

Fig. 9 is a vertical transverse sectional view taken on line 9—9 of Fig. 4, and illustrating the cross-sectional construction of the damper-controlled openings in the heating and cooling flues.

Fig. 10 is a view similar to Fig. 9 taken on the line 10—10 of Fig. 5, and illustrating the flues which establish communication between the heating flues and the draft-producing device.

Fig. 11 is a vertical transverse sectional view taken on line 11—11 of Fig. 6, and illustrating the construction of the mechanism for taking up slack in the endless conveyor belt.

Fig. 12 is a fragmentary horizontal sectional view through one of the expansion joints in the outer casing of the tunnel, and

Fig. 13 is a fragmentary horizontal sec-

tional view through one of the joints between the side walls of the tunnel.

The present invention is an improvement upon the lehr disclosed in my above-mentioned copending application Serial No. 19,615, filed March 31, 1925, and, as diagrammatically illustrated in Fig. 1, briefly comprises a sectional tunnel A; a fire box B located beneath the forward or ware-receiving end of the tunnel; a plurality of heating flues C, communicating with the fire box and extending longitudinally beneath the tunnel; a plurality of cooling flues D, extending longitudinally above the tunnel; a draft-producing device E, specifically a suction fan, communicating with both the heating flues and the cooling flues; a ware-sorting table F, located at the exit end of the tunnel; an endless conveyor G, the ware-bearing strand of which traverses the tunnel and the sorting table F, and the idle strand of which returns to the entrance end of the tunnel beneath the lehr; and a conveyor-driving mechanism H.

The several sections of the tunnel are rigidly secured together in end-to-end relation and are supported by suitable framework which includes a pair of longitudinally extending channel members 1 and transversely extending channel members 2 which are, in turn, supported by vertically adjustable pedestals 3. The tunnel is slightly inclined downward from the hot or receiving end to the cool or delivery end to cause a tendency for air to flow through the tunnel, in a direction opposite to that of the movement of the ware. This flow of air through the tunnel is preferably barely sufficient to prevent an inflow of cold air at the hot end of the tunnel without necessarily exerting a material cooling influence upon the ware.

Each of the sections of the tunnel is preferably constructed of cast iron and comprises a bottom 4, side walls 5, and a top 6. The bottoms 4 of these sections are of shell-like structure, being formed with a plurality of parallel longitudinally extending ports 7 which, when the sections are arranged in end-to-end relation, constitute the heating flues C. The forward edges of the partitions between the ducts 7 are cut away, as indicated at 7^a to insure an equal draft in all of the flues C.

The forward or entrance end of the bottom 4 of the first section of the tunnel is rigidly bolted, as indicated at 8, Fig. 2, to the rear end of a box 9 which, in turn, is rigidly bolted, as indicated at 10, to the channels 1 of the supporting frame of the lehr and which constitutes the forward end of the heating flues. The forward end of the bottom 4 of each of the succeeding sections of the tunnel is bolted to the rear end of the bottom of the preceding section, as

indicated at 11, Fig. 2. The rear end of each of the bottoms 4 is supported by rollers 12 which ride on rails 13 carried by the channels 1. The rear end of the box 9 and the rear ends of each of the bottoms 4 are provided with seats 14 for telescopic engagement with reduced flanges 15 provided on the forward ends of each of the bottom members 4. The joints thus formed between the several bottom members are sealed with a suitable refractory cement so as to not only prevent the gases traversing the heating flues C from leaking into the tunnel, and causing the hot spots and carbon deposits above referred to, but to also prevent air from the outer atmosphere from leaking into the heating flues and interfering with the control of the temperatures therein.

The side walls 5 of the tunnel sections are bolted to their respective bottom members 4, as indicated at 16, and their forward edges are formed with offset flanges 17 (Fig. 13) for overlapping engagement with the rear edges of the corresponding walls of the preceding section.

The top members 6 of all of the sections of the tunnel are supported by the side walls 5 and are provided with a plurality of longitudinally extending corrugations 18 which provide a roof for the tunnel having a relatively large heat radiating surface in comparison with the width of the tunnel. It will be noted, from an inspection of the drawings, that these tops are of two types. For approximately one-third of the length of the tunnel, commencing at its entrance end, the tops 6 are of open construction, as illustrated in Fig. 8, but for the remainder of the distance along the tunnel, the tops 6 are also of the shell-like structure best shown in Fig. 9, being formed with a plurality of parallel longitudinally extending ports 19, which, when the tops are arranged in end-to-end relation, constitute the cooling flues D.

The lehr is heated by a burner 20 which projects a flame through an opening 21 into a combustion chamber 22 provided in the fire box B (Fig. 7). The frame from the burner, upon entering the chamber 22, first impinges upon an angularly disposed baffle 23 which deflects it in the directions indicated by the arrows in Fig. 7. From the chamber 22, the products of combustion pass forwardly through an opening 24, provided in a wall 25, and into a mixing chamber 26, where they first encounter a baffle 27 which deflects them rearwardly and distributes them in a lateral direction throughout the chamber. A port 28 (Figs. 7 and 8) establishes communication between the outer atmosphere and the chamber 26 directly to the rear of the baffle 27, and supplies diluting air to the products of com-

bustion as they enter the chamber 26. The amount of air passing through the port 28 may be controlled by a damper 29 provided on the side of the fire box.

5 The combustion chamber 22 and the mixing chamber 26 are both provided with inner linings 30 of refractory material and with outer linings 31 of heat-insulating brick, which is surrounded by a powdered-insulating material 32, such as kieselguhr, or the like. This structure is contained within a metallic casing 33, which is mounted upon adjustable legs or pedestals 34 and which constitutes the forward support for the channel members 1.

10 From the chamber 26 the products of combustion pass through spaced openings 35, provided in the front wall thereof, and into a draft-equalizing box 36, thence upwardly into a draft-regulating box 37, and thence into the box 9 which forms the forward end of the heating flues C. Pipes 38 are provided for admitting air from the outer atmosphere into the box 36. These pipes 25 are provided with caps 39, having air-inlet openings formed therein, and may be individually exchanged for caps having larger or smaller openings to admit varying quantities of air into the box 36 in order to distribute the draft equally transversely of the tunnel. The openings in these caps may also be employed to observe the character of the combustion in the fire box. A damper 40 is provided in the box 37 in order to regulate the amount of the draft in the fire box B and in the heating flues C.

35 Both the heated gases and the cooling air are drawn through their respective flues C and D at sub-atmospheric pressure by a common draft-producing device E comprising a motor driven suction fan 41 which is mounted on the top of the tunnel adjacent to the exit end thereof. This fan communicates with a drum 42 which in turn communicates with a pair of vertical flues 43 disposed one on each side of the lehr. These flues 45 communicate at their lower ends with a transverse flue 44 located beneath the lehr and which in turn communicates with all of the heating flues C through a longitudinally extending upwardly inclined flue 45 (Fig. 5). The flue 45 is provided with a damper 46 which may be operated to control the draft in the heating flues by means of a rod 47 which is threaded into the hand wheel 48.

50 The drum 42 of the draft-producing device also communicates with the cooling flues D in the top of the tunnel through the medium of a longitudinally extending conduit 49 disposed above the lehr, and which communicates at intervals with all of the cooling flues D through stacks 50 (Figs. 3 and 4). These stacks are provided with dampers 51 which may be selectively operated to regulate the

amount and location that the cooling air is drawn out of the cooling flues. It will be noticed from an inspection of Fig. 1 that the cooling air is drawn through the flues D in a direction opposite to that of the flow of the heating gases in the flues C.

A damper 52 is also provided in the conduit 49, as shown in Fig. 5, and may be operated to control the draft in all of the cooling flues by means of a rod 53 which is threaded into a hand wheel 54.

70 The temperatures in the flues C may be regulated by admitting diluting air from the outer atmosphere into these flues through a plurality of stacks 55 which are arranged at intervals lengthwise of these flues. Dampers 56 are provided in the stacks 55 to enable the operator to regulate the amount and the location where such diluting air is admitted into the heating flues, whereby the desired temperature drop or curve in these flues and in the tunnel may be obtained. The dampers 51 and 56 are provided with operating handles 57 and 58 respectively, having calibrated segments 59 and 60 formed integrally therewith by means of which the distances that these dampers are opened may be accurately determined.

80 The rear ends of the heating flues C are closed to the outer atmosphere, as indicated at 60° in Fig. 5, and inasmuch as the flues 43 communicate with the flues C forward of the last stack 55 in these flues, cooling air will flow in the flues C in a forward direction for a short distance adjacent to the exit end of the tunnel where it is desired to hasten the cooling of the ware.

85 By properly adjusting both the dampers 51 and 56 in the stacks 50 and 55 respectively, the desired temperature gradients may be obtained in the flues C and D, and in the portions of the tunnel adjacent thereto. That is to say, the character of the temperature curves obtained by plotting temperatures as ordinates against distances along the lehr as abscissæ, in both the heating flues and in the cooling flues is determined by the number and location of the dampers that are opened to the outside atmosphere, and the degree to which such dampers are opened. For example, the less the amount of cooling air from the outer atmosphere that is permitted to enter the forward or hotter portions of the heating flues C, the greater distance will the heat in these flues influence the temperatures therein; and the less the amount of cooling air that is allowed to escape from the rear or cooler ends of the cooling flues D, the greater distance will the cooling air traverse these flues. It, therefore, follows that by regulating the amount that the gases in the heating flues are diluted and cooled by outside air, and by regulating the amount of cooling air escaping through the

stacks 50 from the cooling flues D and by also determining the locating of the dampers that are adjusted, the resultant temperature gradients of the top and bottom portions of the tunnel may not only be controlled at will, but the point or zone of maximum drop in the temperature curves may be shifted longitudinally of the tunnel.

By thus heating the floor of the tunnel to cause upwardly moving convection currents and by cooling the top of the tunnel to cause downwardly moving convection currents and by independently regulating the degree of heating and cooling, the rate of movement of the convection currents in the tunnel may be controlled at will, thereby rendering it possible to obtain a substantially uniform temperature, so far as its effect upon the ware is concerned, in a vertical direction in any transverse section or zone in the tunnel.

Dissipation of heat from the tunnel and the heating flues is minimized by surrounding the tunnel with heat-insulating material 61 in the form of powdered kieselguhr or the like. This material is contained within an outer casing comprising the following parts: horizontally extending plates 62, which are supported beneath the tunnel by the channels 1 and 2; angle plates 63, which are secured to the sides of the bottoms 4 and which overhang the rollers 12 (Fig. 9); side plates 64 which are secured at their lower edges to the angle plates 63 and which are maintained in spaced relation with the sides of the tunnel by spacer bolts 65; and top plates 66, which extend horizontally above the tunnel in spaced relation thereto and which are secured at their outer edges to the side plates 64. Expansion joints are provided between the vertical edges of the side plates 64 and each comprises a channel 67 and a spacer 68 which are secured to one of the plates 64 and which slidably retain the overlapping edge of the adjacent side plate (Fig. 12).

The thickness of the insulation 61 may be reduced toward the rear end of the lehr, as shown in Fig. 4, and may be entirely dispensed with adjacent to the exit end of the tunnel, as shown in Fig. 5.

The sorting table F consists of a plurality of spaced parallel longitudinal bars 69 (Figs. 6 and 11) which are supported at their forward ends by the frame of the lehr, and at their rear ends by a frame 70 of the belt driving mechanism H. Rollers 71 are carried at spaced intervals by the bars 69, and provide a support for the conveyor as it emerges from the tunnel bearing the annealed ware. The table F is of sufficient length to permit several persons to stand side by side on each side of the table to inspect and remove the ware from the conveyor G for packing. The conveyor G and

the table F are sufficiently narrow to permit easy access, from either side of the table, to ware located in the central portion of the conveyor.

The conveyor G comprises an endless belt of flexible open structure, the ware-bearing strand of which lies flat upon the cast iron bottom members 4, which constitute the bottom of the lehr tunnel, and upon the rollers 71 of the receiving table F.

As best shown in Fig. 6, the conveyor, as it advances over the end of the receiving table F, passes over a roller 72 journaled in the frame 70 and thence forwardly and around a driving drum 73 which is mounted on a shaft 74 journaled in the frame 70. At the point where the belt leaves the drum 73, it passes over and rearwardly around a roller 75 which is journaled at its ends in side blocks 76, mounted in ways 77. The drum 73 and the roller 75 are provided with resilient anti-slipping coverings 78 and 79 respectively composed of rubber or the like, so as to present a tractive surface to the belt and insure a positive driving contact therewith. The roller 75 is maintained in gripping contact with the belt G by jack screws 80 which are threaded in the ways 77 and which bear against the side blocks 76.

The drum 73 and the roller 75 are rotated by a sprocket wheel 81 which is driven in any preferred manner. The sprocket wheel 81 is mounted on a shaft 82 which carries a worm 83 meshing with a worm wheel 83^a carried by a shaft 84. A pinion 85 is also keyed to the shaft 84, and meshes with a gear wheel 86 mounted on a shaft 87. A pinion 88 is also keyed to the shaft 87 and meshes with a gear wheel 89 carried by the drum 73. The gear wheel 89 meshes with a gear wheel 90 on the roller 75, whereby both the drum and roller are driven at the same peripheral speed.

The conveyor belt G, after passing around the roller 75, passes forwardly and beneath a roller 91 and thence upwardly and rearwardly over an idler roller 92. The idler roller 92 is mounted on a shaft 93, provided with gear wheels 94 at each end which are mounted on rack bars 94^a carried by the bars 69. By rotating the shaft 93 by means of a handle 95, the roller 92 may be shifted longitudinally of the table F to take up any slack in the conveyor. After leaving the roller 92, the belt G passes upwardly and forwardly over a roller 96 carried by the bars 69, and thence forwardly beneath the lehr where it is supported at intervals by rollers 97 which are mounted on the pedestal 3. At the forward or receiving end of the lehr, the lower strand of the conveyor G is supported between rollers 98 mounted beneath the fire box B (Fig. 2). As the belt leaves these rollers, it passes upwardly and

parallel to the front end of the fire box and thence over a roller 99 disposed adjacent to the entrance of the tunnel. From the roller 99 the belt passes over the box 9 and beneath a guard plate 100 and into the front end of the lehr tunnel.

The entrance end of the tunnel is provided with a door 101 which is mounted in ways 102 for vertical sliding movement.

10 This door may be raised or lowered, to close the upper portion of the tunnel but permitting sufficient clearance for ware to pass therebeneath by means of rods 103 which are threaded into hand wheels 104 mounted
15 on a frame 105. When the door has been adjusted to the desired height, it may be clamped in position by screws 106 provided in the ways 102.

The exit end of the tunnel is provided
20 with a door 107 which is hinged at its upper edge to the top 6 of the last section of the tunnel and which is provided with arcuate side flanges 108 to prevent an influx of excess air from the outer atmosphere into
25 the tunnel. The door may be opened sufficiently to permit ware to pass therebeneath and maintained at such height by a bar 109 which is adapted to be adjustably secured to a bracket 110 carried by the base of the
30 draft-producing device E.

From the foregoing it will be apparent that I have provided a lehr of very rugged and durable structure and one that may be assembled very quickly and easily from a
35 plurality of similar and interchangeable sections. Also, it will be apparent that by my construction and method of drawing the heating gases and the cooling air through the several flues at subatmospheric pressure,
40 the injurious effects of leakage of these media into the tunnel is reduced to a minimum. Furthermore, supporting the tunnel throughout its entire length by anti-friction devices renders it possible to eliminate expansion joints or other joints between the
45 sections of the tunnel through which leaks may exist or may develop, and permits the tunnel to expand lengthwise as a unit on its support.

50 Certain structural features herein shown and described are not claimed herein, but are specifically claimed in certain of my co-pending applications. For example, no claim is made herein to the feature of drawing heated gases through a portion of the
55 flues beneath the tunnel to heat a portion of the tunnel and causing cold air to flow in the opposite direction through another portion of the same flues to cool the exit
60 end of the tunnel, inasmuch as this matter is claimed in my co-pending application filed August 27th, 1925, Sr. No. 52,751.

The various features of the invention herein described as incorporated in a single organized apparatus may be used separately

or in other combinations, and various modifications may be made in the arrangement and construction of the parts, and in the method of cooling the article to be annealed. For some uses, as for example, for the
70 handling of only one kind of ware, some of the adjustments and other provisions for handling varied kinds of ware may be dispensed with. Again, by mounting the tunnel on anti-friction devices, the tunnel may
75 be made integral throughout its length. In this and in other ways the method and apparatus herein described and shown may be modified within the scope of the appended claims.

I claim as my invention.

1. A lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, means for causing heating and cooling media to
85 flow through said flues at subatmospheric pressure, and means located at intervals along said flues for controlling the temperatures therein.

2. A lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, single means for causing heating and cooling media to flow through both of said flues at
90 subatmospheric pressure, and means located at intervals along said flues for controlling the temperatures therein.

3. A lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, a suction fan communicating with both of said
100 flues for causing heating and cooling media to flow in said flues at subatmospheric pressure, and means located at intervals in said flues for controlling the temperatures therein.

4. A lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue extending longitudinally of said tunnel, means for causing heating and cooling media to flow through said flues at subatmospheric pressure, and means located at intervals longitudinally of said flues for
110 controlling the temperatures therein.

5. A lehr for annealing glassware, comprising a tunnel, a heating flue extending longitudinally beneath said tunnel, a cooling flue extending longitudinally above said tunnel, means for causing heating and cooling media to flow through said flues at subatmospheric pressure, and means located at intervals longitudinally of both of said flues for controlling the temperature gradient in
120 said tunnel.

6. A lehr for annealing glassware, comprising a tunnel, a heating flue extending longitudinally beneath said tunnel, a cooling flue extending longitudinally above said tunnel, suction means communicating with both of said flues for causing heating and
130

- cooling media to flow through said flues at subatmospheric pressure, and a plurality of damper-controlled openings arranged at intervals longitudinally of both of said flues and communicating with the outer atmosphere for controlling the temperature gradient in said tunnel.
7. A Lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, means for causing heating and cooling media to flow in opposite directions through said flues at subatmospheric pressure, and means located at intervals in said flues for controlling the temperature gradient in said tunnel.
8. A Lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, means for causing heating and cooling media to flow in opposite directions through said flues at subatmospheric pressure, and a plurality of damper-controlled openings arranged at intervals in said flues for controlling the temperature gradient in said tunnel.
9. A Lehr for annealing glassware, comprising a tunnel, a heating flue and a cooling flue extending longitudinally below and above said tunnel respectively, suction means communicating with both of said flues for causing heating and cooling media to flow in opposite directions through said flues at subatmospheric pressure, and a plurality of damper-controlled openings arranged at intervals longitudinally of each of said flues for controlling the temperature gradient in said tunnel.
10. A Lehr for annealing glassware, comprising a tunnel, a conduit associated therewith, a heating flue extending longitudinally beneath said tunnel and having openings therein arranged at intervals longitudinally thereof and communicating with the outer atmosphere, a cooling flue extending longitudinally above said tunnel and having openings therein arranged at intervals longitudinally thereof and communicating with said conduit, a suction device associated with both said heating flue and said conduit for causing heating and cooling media to flow in opposite directions through said flues at subatmospheric pressure, and dampers in said openings for permitting regulable quantities of said cooling medium to escape from said cooling flue into said conduit, and to admit regulable quantities of air from the outer atmosphere into said heating flues, to control at will the temperature gradient in said tunnel.
11. A Lehr for annealing glassware, comprising a support, and a tunnel carried by said support and having a portion thereof fixed to said support and having other portions thereof movable relative to said support.
12. A Lehr for annealing glassware, comprising a support, a tunnel carried by said support and having one end thereof fixed to said support and mounted to move relative to said support throughout the remainder of its length.
13. A Lehr for annealing glassware, comprising a support, a tunnel carried by said support and having the receiving end thereof fixed relative to said support and mounted to move relative to said support throughout the remainder of its length.
14. A Lehr for annealing glassware, comprising a support, a tunnel carried by said support and having the receiving end thereof fixed relative to said support and mounted to expand as a unit toward its delivery end on said support.
15. A Lehr for annealing glassware, comprising a support and a tunnel carried by said support and fixed adjacent to the receiving end of the tunnel and free to expand on said support toward the delivery end of said tunnel.
16. A Lehr for annealing glassware, comprising a support and a tunnel mounted on anti-friction devices carried by said support for longitudinal movement caused by expansion and contraction.
17. A Lehr for annealing glassware, comprising a support, a tunnel carried thereby and anti-friction devices interposed between said support and said tunnel to permit longitudinal movement of said tunnel relative to said support caused by expansion and contraction.
18. A Lehr for annealing glassware, comprising a support, a tunnel carried thereby and fixed thereto adjacent to one end, and anti-friction devices interposed between said tunnel and said support to permit said tunnel to expand as a unit on said support and in a direction away from its point of attachment thereto.
19. A Lehr for annealing glassware, comprising a support, a tunnel composed of a plurality of sections rigidly secured together carried by said support and secured thereto at its receiving end, a casing for said tunnel composed of a plurality of sections having extension joints therebetween, a heating flue and a cooling flue located adjacent to said tunnel, means for causing heating and cooling media to flow through said flues at subatmospheric pressure, and means for permitting said tunnel to move with respect to said support to accommodate the expansion and contraction thereof with changes in temperature.
20. A Lehr for annealing glassware, comprising a tunnel composed of a plurality of sections arranged in end-to-end relation,

each of said sections consisting of a unitary floor member having flues extending therethrough, side members carried by said floor member and a unitary top member carried by said sides and having flues extending therethrough.

22. A Lehr for annealing glassware, comprising a tunnel composed of a plurality of sections arranged in end to end relation, each of said sections consisting of an integral metallic floor having flues extending therethrough, side members carried by said floor, and an integral top member carried by said sides and having flues extending therethrough, said floor, sides and top of one section having overlapping engagement with the corresponding members of an adjacent section.

23. A Lehr for annealing glassware, comprising a tunnel composed of a plurality of sections rigidly secured together in end-to-end relation, each of said sections consisting of a floor, sides carried thereby and a top carried by said sides and having a flue extending therethrough with the sides thereof extending into said tunnel, and an outer casing for said tunnel consisting of a plurality of sections having expansion joints therebetween.

24. A Lehr for annealing glassware, comprising a support, a tunnel consisting of a plurality of sections arranged in end-to-end relation on said support, each section being supported at one end by anti-friction devices movable relative to said support,

and at the other end being supported by the adjacent section.

25. A Lehr for annealing glassware, comprising a track, a tunnel consisting of a plurality of sections rigidly secured together and provided with rollers for movable supporting engagement with said track.

26. A Lehr for annealing glassware, comprising a tunnel composed of a plurality of cast iron sections arranged in end-to-end relation, each of said sections consisting of a floor having flues extending therethrough, side members carried by said floor, and a top member carried by said sides and having flues extending therethrough, said floor, sides and top of one section having overlapping engagement with the corresponding members of an adjacent section.

27. A Lehr for annealing glassware, comprising a support, a tunnel composed of a plurality of sections rigidly secured together carried by said support, a casing for said tunnel composed of a plurality of sections having expansion joints therebetween, a heating flue and a cooling flue located adjacent to said tunnel, means for causing heating and cooling media to flow through said flues, and means for permitting said tunnel to move with respect to said support to accommodate the expansion and contraction thereof with changes in temperature.

Signed at Hartford, Conn., this 29th day of May, 1925.

VERGIL MULHOLLAND.