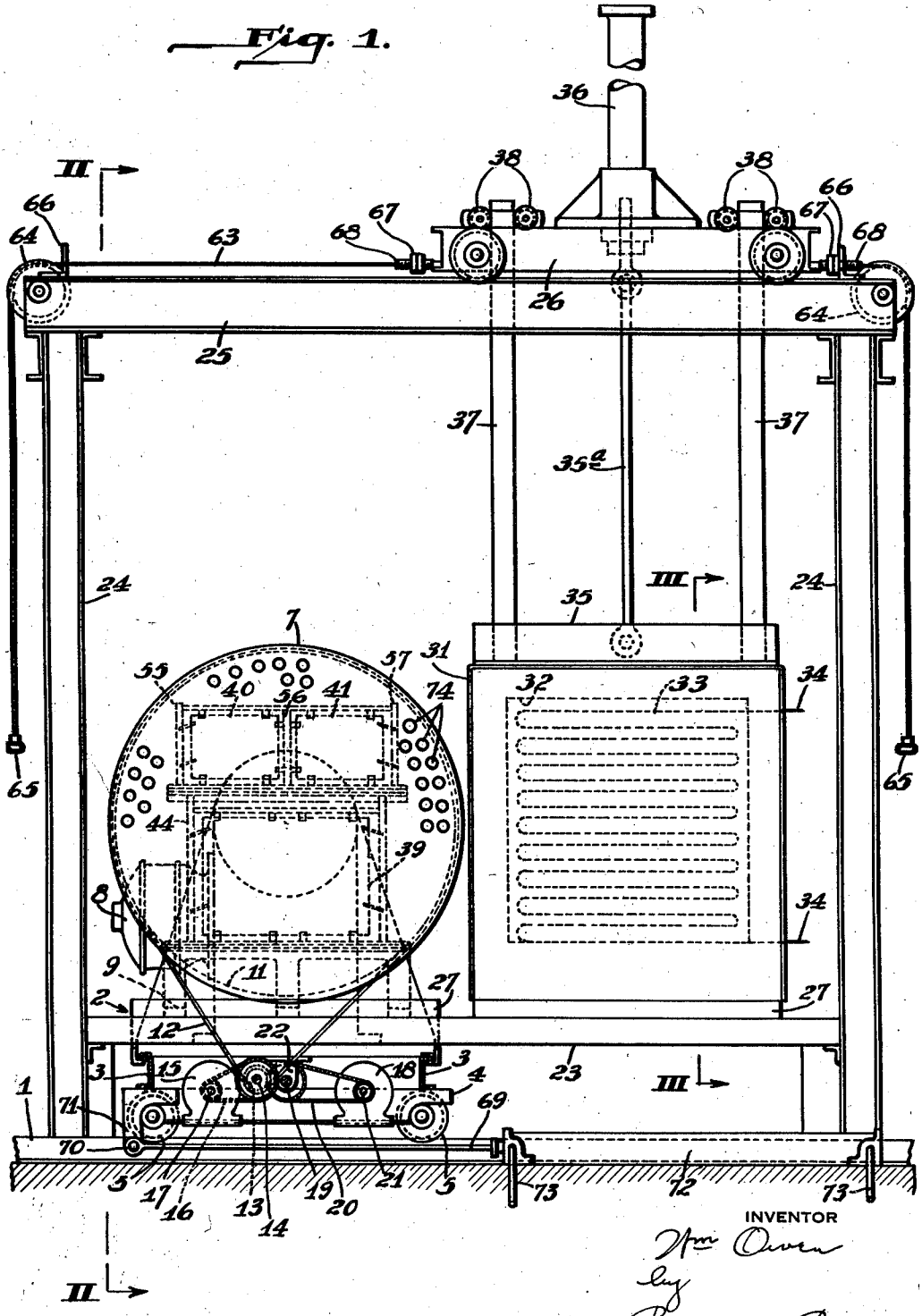
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APPARATUS FOR CASE HARDENING GLASS

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Fig. 1.



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Fig. 9.

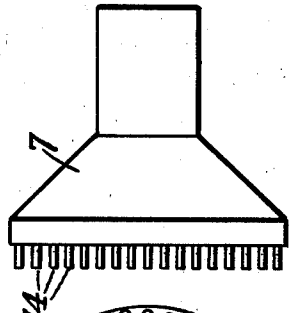


Fig. 8.

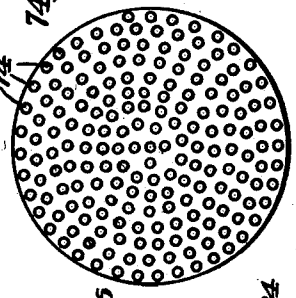


Fig. 2.

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Fig. 3.

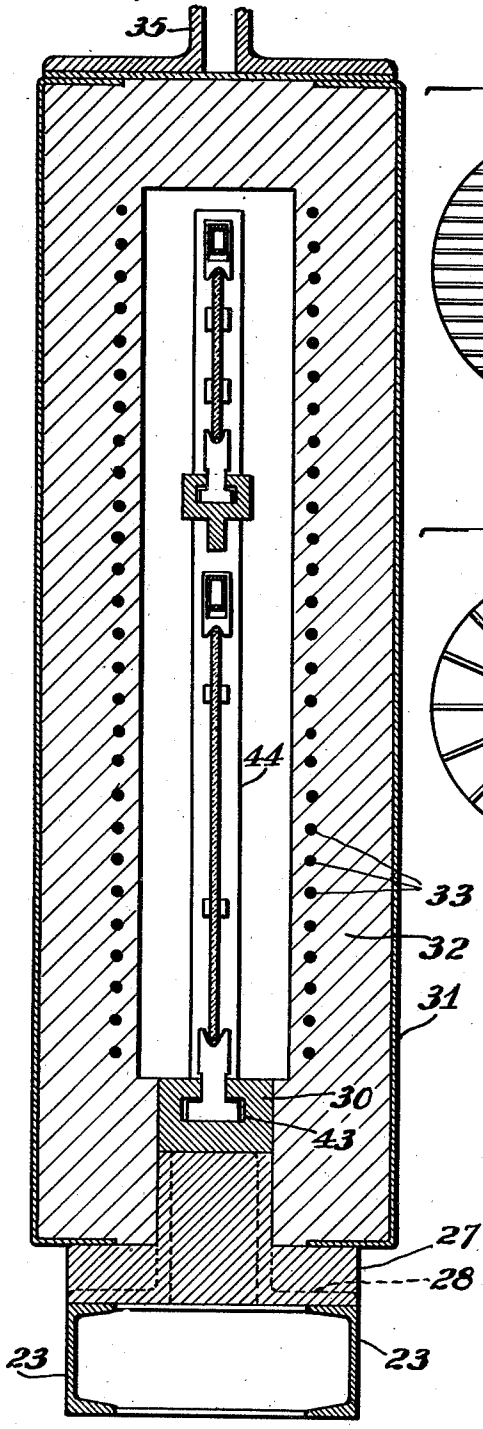


Fig. 10.

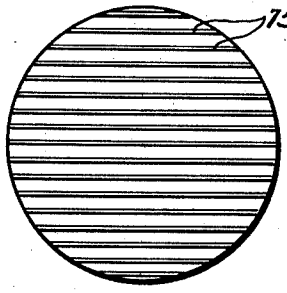


Fig. 11.

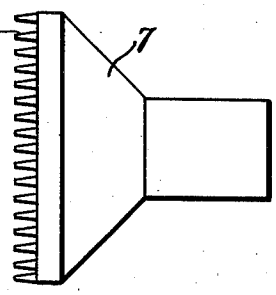


Fig. 12.

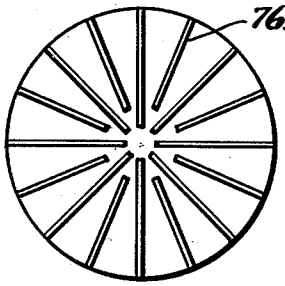


Fig. 13.

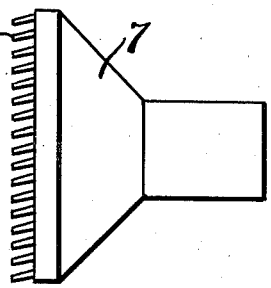
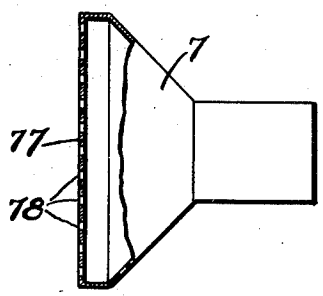


Fig. 14.



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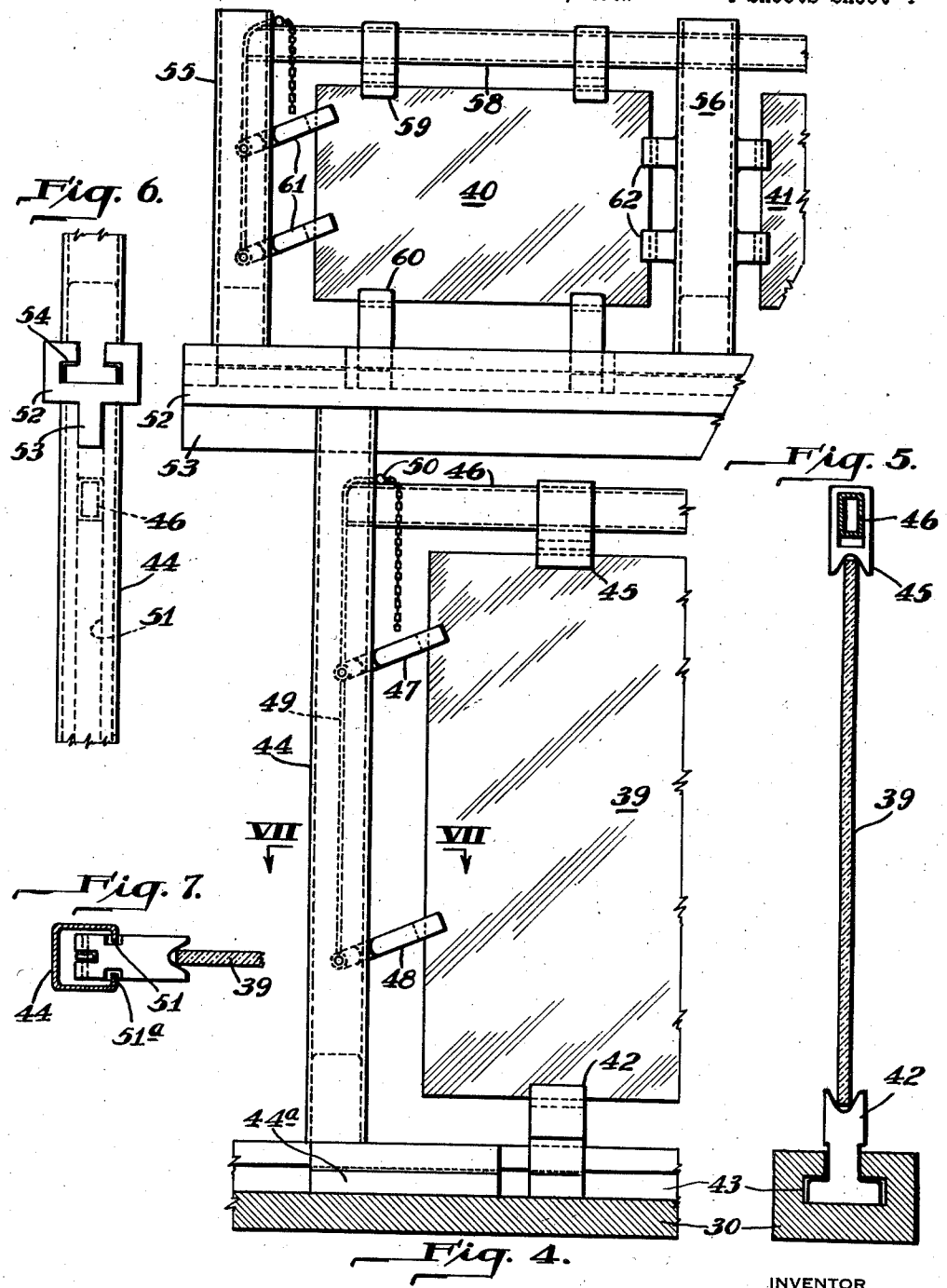


Fig. 6.

Fig. 5.

Fig. 7.

Fig. 4.

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Patented Nov. 1, 1938

2,134,797

UNITED STATES PATENT OFFICE

2,134,797

APPARATUS FOR CASE HARDENING GLASS

William Owen, Pittsburgh, Pa., assignor to Pittsburgh Plate Glass Company, a corporation of Pennsylvania

Application March 12, 1932, Serial No. 598,463

4 Claims. (Cl. 49—45)

The invention relates to apparatus for case hardening glass sheets so that their strength is greatly increased and its tendency to cut when broken is reduced to a minimum, glass of this type being particularly advantageous in automobile lights. The apparatus is of the general type in which the glass after being heated to the proper degree (near the softening point) is exposed to cooling blasts of air. The invention has for its objects (1) the provision of an improved apparatus of the type specified which will apply the cooling air with great uniformity over the glass surfaces thus reducing the tendency to break and avoiding the mottled appearance (when the glass is viewed at an acute angle) which is characteristic of case hardened sheets whose surfaces have been chilled unevenly, (2) and the provision of an apparatus which can be operated rapidly and efficiently, and with a minimum amount of labor. Certain embodiments of the invention are illustrated in the accompanying drawings wherein:

Figure 1 is a section on the line I—I of Fig. 2, but on a larger scale. Fig. 2 is a section on the line II—II of Fig. 1. Fig. 3 is a section on the line III—III of Fig. 2. Figs. 4 to 7 are detail views, Fig. 4 being a front elevation, Fig. 5 a vertical section, Fig. 6 a partial end elevation, and Fig. 7 a section on the line VII—VII of Fig. 4. Figs. 8 and 9 are detail views of the rotatable header, Fig. 8 being a front elevation and Fig. 9 a side elevation. Figs. 10 and 11 are two elevations showing a modification. Figs. 12 and 13 are front and side elevations showing still another modification. And Fig. 14 is a partial side elevation and partial section of still another modification.

Referring to the drawings, 1, 1 are a pair of parallel rails constituting a track, and 2 is a car or truck mounted for movement along the track, such car being made up of the channels 3, 3 (Fig. 1) connecting the frame members 4, 4 in which are mounted the wheels 5, 5. Carried upon the truck are a pair of blowers 6, 6 provided with rotatable blower heads 7, 7. The blowers are of the direct connected type, each driven by a motor 8. Each blower is carried upon a base 9 mounted for sliding movement along the channels 3, 3 so that the blowers may be moved toward and from each other for adjustment purposes, as later described. The blower heads 7, 7 are each mounted for rotation in a pair of standards 10, 10 and provided with belt pulleys 11, 11. Belts 12, 12 pass around these pulleys and around drive pulleys 13, 13 on the shaft 14. The shaft 14 is driven from the motor 15 (Fig. 1) by means of the chain 16 passing around suitable sprockets on the shaft 14 and on the motor shaft 17. The pulleys 13, 13 are splined on the shaft 14 in order to accomodate themselves to the movement of the blowers when such blowers are adjusted toward and from each other. The frames 9, 9 carrying the blowers are adjustable toward and from each other from the motor 18 which drives the shaft 19 through the intermediary of the chain 20 (Fig. 1) passing around suitable sprockets on the shaft 19 and the motor shaft 21. The shaft 21 is provided with screw sections extending through nuts in the depending brackets 22 carried by the front end of each of the frames 9, 9 (Fig. 2).

Extending parallel to the rails 1, 1, but spaced thereabove so as to clear the channels 3, 3 of the truck, is the bridge for carrying the electric oven or furnace, such bridge being made up of the channels 23, 23 (Fig. 2) secured at their ends to the vertical posts 24, 24 (Fig. 1), such posts being in turn connected at their tops by a bridge 25 made up of channels and constituting a track for the carriage 26 which is used to shift the electric furnace, as later described. Carried by the channels 23, 23 is a pair of oven bases 27, 27, such bases consisting of a skelton metal framework 28 embedded in the T-shaped body of clay 28. Secured to the top of each metal framework 28 is a slotted metal bar 30 (Fig. 3) adapted to carry the V-blocks which support the glass sheets to be case hardened and later described more in detail.

The heating furnace comprises a metal casing 31 with a lining 32 of clay or suitable refractory material, in which material are mounted the resistance coils 33, such coils being supplied with current from the leads 34, 34. The furnace is open at its lower side so that it will fit down onto the base, as indicated in Fig. 3, at which time the bar 30 acts as a closure for the slot. Secured to the casing 31 and extending across the top of the furnace are a pair of angles 35 to which is secured the piston rod 35a for lifting the furnace. The piston rod is provided at its upper end with a plunger which works in a cylinder 36 to which air or water may be supplied for moving the rod 35 up and down. The angles 35 also carry a pair of upwardly extending guide bars 37, 37, each working between rollers 38, 38 mounted on the carriage 26, thus preventing any tilting movement of the furnace as it is moved up and down.

The means for supporting the glass sheets 39,

40 and 41 in vertical position is also carried upon the slotted bar 30, as indicated in detail in Figs. 4 to 7. The sheet 39 is supported at its lower edge upon the V-blocks 42 which are slidably mounted in the T-slot 43 of the bar 30. Also mounted on the bar 30 are the posts 44 of the cross section indicated in Fig. 7, such posts having supporting feet 44a at the bottom with lower portions which fit slidably in the slot 43 so that the posts may be adjusted toward and from each other, depending upon the size of the glass sheet 39. The upper edge of the glass sheet 39 is engaged by the blocks 45 carried by a transverse bar 46 whose ends slidably engage the posts 44, 44. For engaging the side edges of the glass sheet, the tilting blocks 47 and 48 are employed, such blocks being carried by chains 49 extending around pins 50 carried by the bar 46. This arrangement permits the vertical adjustment of the blocks 47 and 48, such blocks remaining in any position of vertical adjustment to which they may be moved. The blocks 47 and 48 are provided with slots 51 at their edges, as indicated in Fig. 7, which are engaged by the edges 51a of the post, thus limiting the tilting movement of the blocks in both directions, but permitting a substantial rocking movement. When the blocks are in the position indicated in Fig. 4, they engage and support the edges of the glass sheet and follow the movement of such edge due to expansion and contraction of the sheet as it is heated and cooled. Seated upon the upper ends of the posts 44 is a transverse bar 52 of the cross section indicated in Fig. 6. The flange 53 of this bar fits into slots in the upper ends of the posts 44 so that the bar 52 does not interfere with the adjustment of the posts 44 toward and from each other. The bar 52 is provided with a T-slot 54 similar to the T-slot 43 and in this slot are mounted the vertical posts 55, 56 and 57 which are similar in structure to the posts 44. A top bar 58 extends across the tops of the posts 55, 56 and 57 and corresponds in construction and function to the bar 46, such bar carrying the V-blocks 59 for engaging the upper edge of the two sheets 40 and 41. The bottom edges of these sheets are supported in V-blocks 60 similar to the blocks 42, while the outer edges of the sheets are supported by tilting blocks 61 similar to the blocks 48 heretofore discribed. The inner side edges of the sheets 40 and 41 are engaged by V-blocks 62 carried by the post 56.

In order to move the furnace laterally after it has been moved to its upper position, the cables 63 are employed (Fig. 1), such cables being attached to the sides of the carriage and passing over pulleys 64. The cables are provided at their ends with suitable handles 65 and means is provided for stopping the movement of the carriage in both directions in the form of the brackets 66 bolted to the bridge 25. Adjustable stop members 67 are provided upon the threaded brackets 68, to which the ends of the cables are attached. The truck or carriage 2 which carries the blowers is moved back and forth by means of the piston rod 69 pivoted at 70 to a depending bracket 71 secured at the center of the channels 3. The piston rod 69 is provided with a plunger working in a cylinder 72 and supplied with fluid pressure through the pipes 73. Means is thus provided for reversing the position of the car 2 and the furnace 31.

In operating the apparatus, the glass sheets are positioned as indicated in Figs. 3 and 4 and the furnace is lowered to the position shown, current being now supplied through the resistance coils 33. The heating is continued until the glass approaches the softening point. During this heating operation, the cylinder 72 is brought into play to move the car 2 to the right so that the headers 7, 7 lie on opposite sides of the furnace, as indicated in Fig. 2. The blowers 6, 6 are now started as is also the motor 15 so that the headers 7, 7 are revolved. Fluid is now admitted to the cylinders 36 to cause the lifting of the furnace so that the glass carried by the supporting posts is exposed to the air blasts from the nozzles 74 distributed over the faces of the headers. At the same time the motor 18 is operated to rotate the shaft 19 to cause the headers to approach so that the nozzles lie in close proximity to the faces of the glass sheets, thus securing a maximum cooling effect upon the glass. A very rapid cooling effect is secured due in part to the rotation of the headers which by centrifugal force tends to throw the air lying between the headers and the glass outward. The rotation of the headers also gives a more uniform distribution of the cooling air over the glass surfaces, thus avoiding any tendency to produce a spotty appearance, such as is often seen in case hardened glass when viewed at an acute angle and due to the fact that the cooling air is supplied more effectively at certain spots upon the glass than at others. As soon as the car 2 is moved to the left from the position indicated in Fig. 1 to secure the cooling function as above described, the slotted bar 30 on the base 28 at the right hand end of the bridge 23 is loaded with glass preparatory to another heating operation and the furnace is moved on its carriage 26 to the left to a position over the glass and lowered until it fits down over the base 28. The glass is then heated as heretofore described and the car moved back to the position of Fig. 1 ready to cool the glass as soon as the furnace is again raised. The cycle as above described is then continued, the car and furnace being alternately shifted so that while one set of glass sheets is being cooled, another set is being heated preparatory to cooling.

Figs. 10 and 11 illustrate a modification in which the rotary headers 7 are provided with elongated nozzles 75 which extend across the face of the headers. This type of header when rotated gives a very effective distribution of air over the surfaces of the glass sheets. The elongated nozzles act as vanes and due to their rotation throw the air outward so that the cool air as supplied from the nozzles is removed very rapidly from the vicinity of the glass after it has exercised its first chilling effect.

Figs. 12 and 13 illustrate a further modification in which the header 7 is provided with radial nozzles 76 and as indicated in Fig. 13, these nozzles may be inclined so that the air is supplied at a slight angle to the surface of the glass.

Fig. 14 illustrates a further modification in which the header 7 is provided with a flat face 77 having a plurality of slots or openings therethrough, thus doing away with the requirement for nozzles. This is a simpler construction, but calls for the use of higher pressure of air than the other forms heretofore described and is much less efficient in operation.

What I claim is:

1. In combination in apparatus for case hardening glass, means for supporting a glass sheet in a vertical plane, a pair of headers mounted for rotation on opposite sides of the plane of support of the glass sheet and each provided with

a plurality of outlet passages distributed over the area thereof, arranged in the form of a spiral, means for supplying a fluid under pressure to the headers, and means for rotating the headers.

2. In combination in apparatus for case hardening glass, means for supporting a glass sheet in a vertical plane, a pair of headers mounted for rotation on opposite sides of the plane of support of the glass sheet and each provided with a plurality of outlet passages in the form of slots extending across the face of the header, means for supplying a fluid under pressure to the headers, and means for rotating the headers.

3. In combination in apparatus for case hardening glass, means for supporting a glass sheet in a vertical plane, a pair of headers mounted for rotation on opposite sides of the plane of support of the glass sheet and each provided with a plurality of outlet nozzles of elongated shape extending across the face of the header, means for supplying a fluid under pressure to the headers, and means for rotating the headers.

4. In combination in apparatus for case hardening glass, a base member provided with two sets of means spaced along its length for engaging the edges of a pair of glass sheets and holding them in a vertical plane, a heating furnace open at its bottom adapted in its two positions of adjustment to fit over said sheets and have its bottom closed by the base member, means above the furnace for lifting it to expose the glass sheet, a carriage upon which said last means is mounted movable longitudinally of the base member so that the furnace may be positioned over either of the sheet supporting means, a pair of headers mounted on opposite sides of the plane of support of the glass sheet provided with outlet openings distributed over their faces, and movable toward and from each other and also longitudinally of the base member, and means for supplying a cooling fluid under pressure to the headers.

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