R. S. PEASE.

MANUFACTURE OF PLATE GLASS.

APPLICATION FILED JUNE 5, 1915.

1,217,340.

Patented Feb. 27, 1917.

6 SHEETS—SHEET 1.

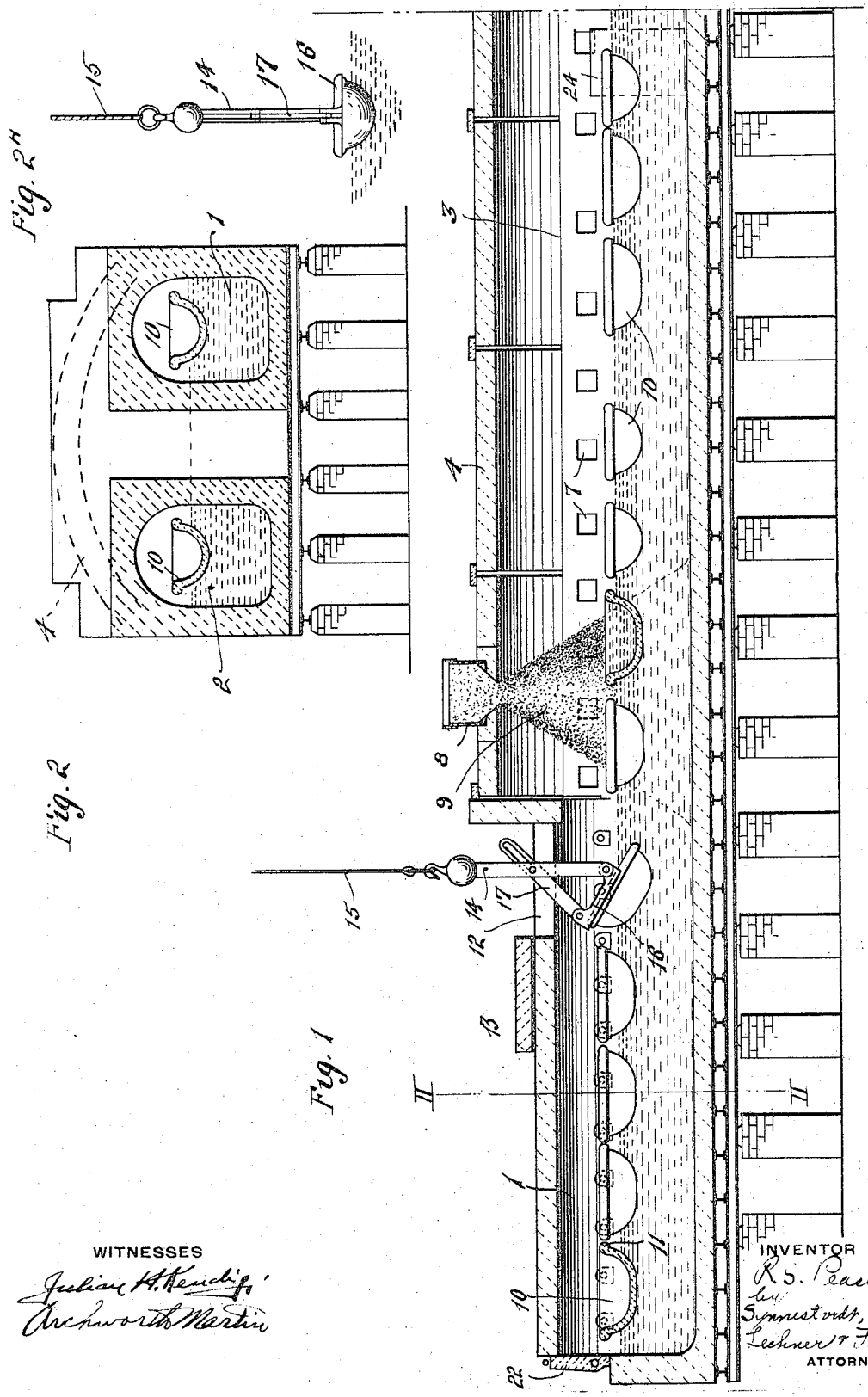


Fig. 2ª

Fig. 2

Fig. 1

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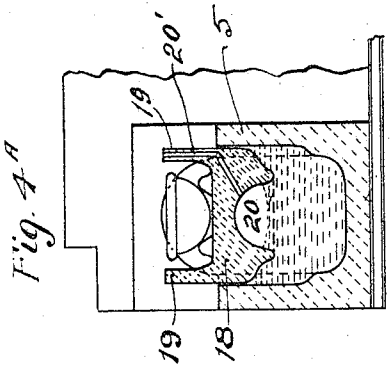


Fig. 4ª

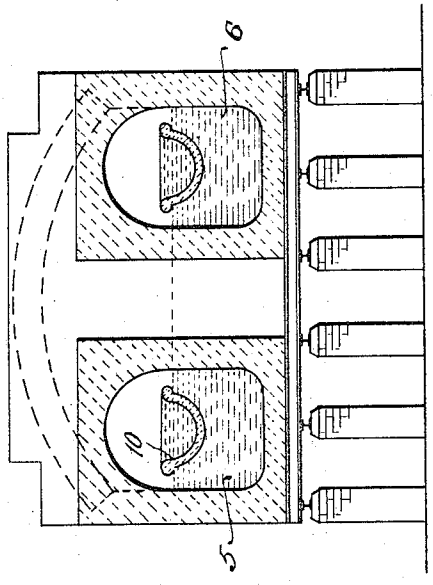


Fig. 4

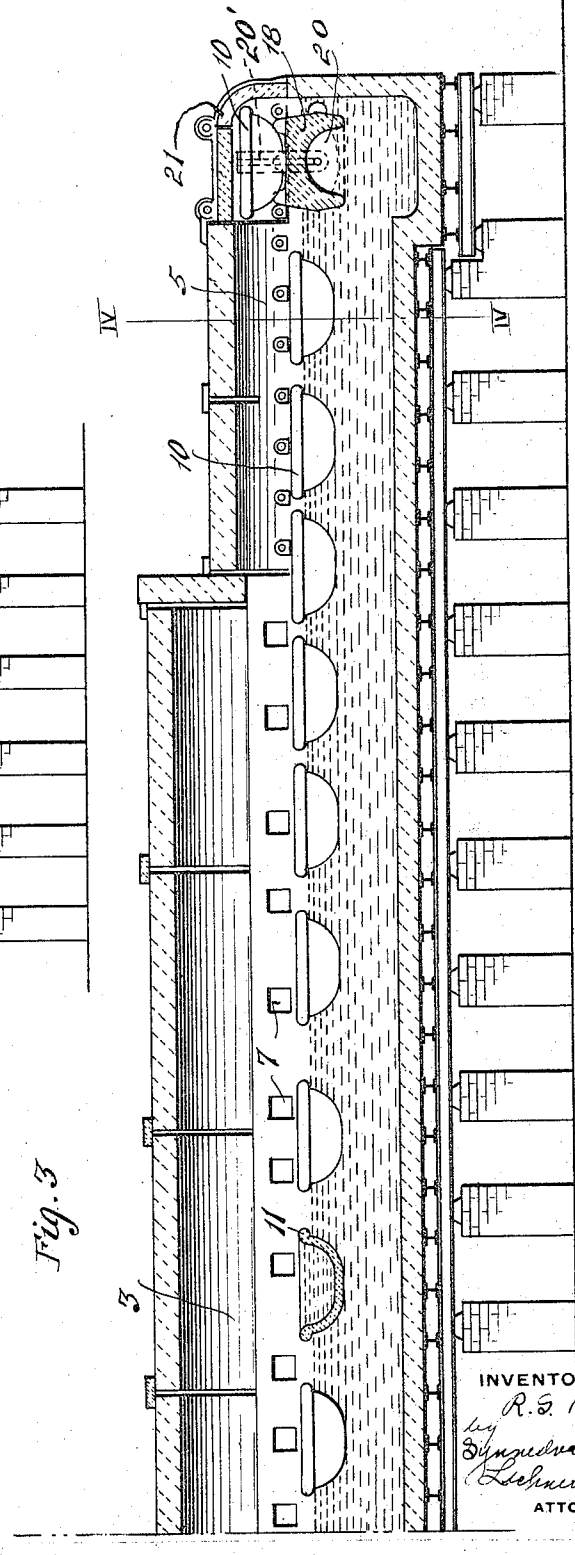


Fig. 3

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6 SHEETS—SHEET 3.

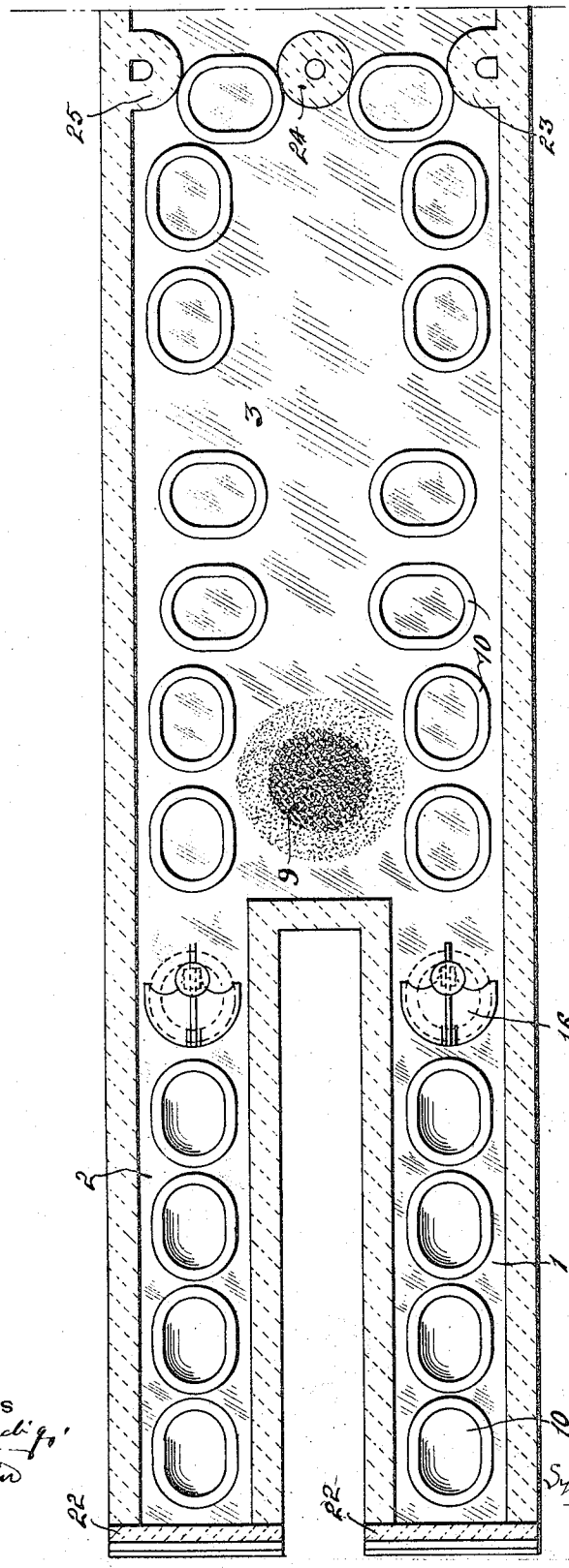


Fig. 5

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6 SHEETS—SHEET 4.

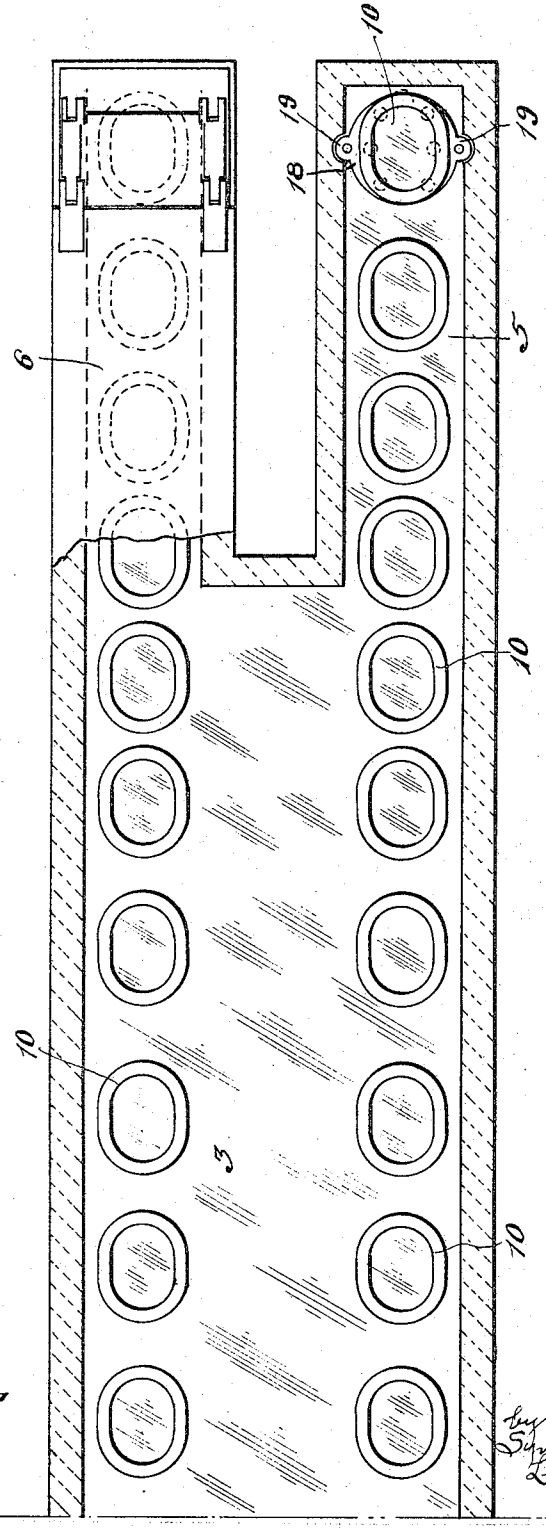


Fig. 6

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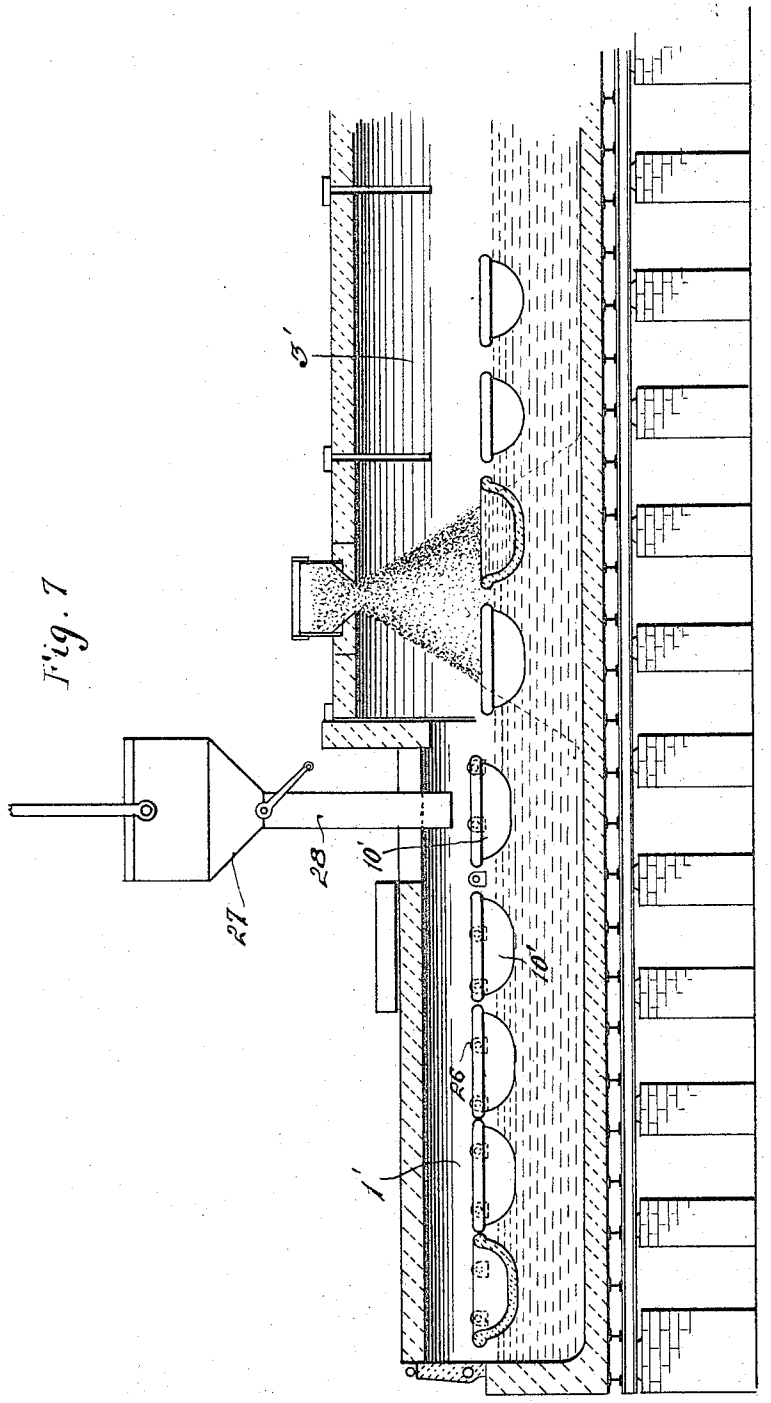
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6 SHEETS—SHEET 5.

Fig. 7



WITNESSES

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6 SHEETS—SHEET 6.

Fig. 8

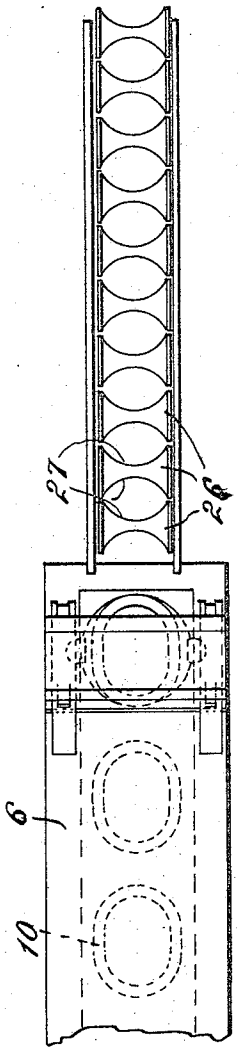
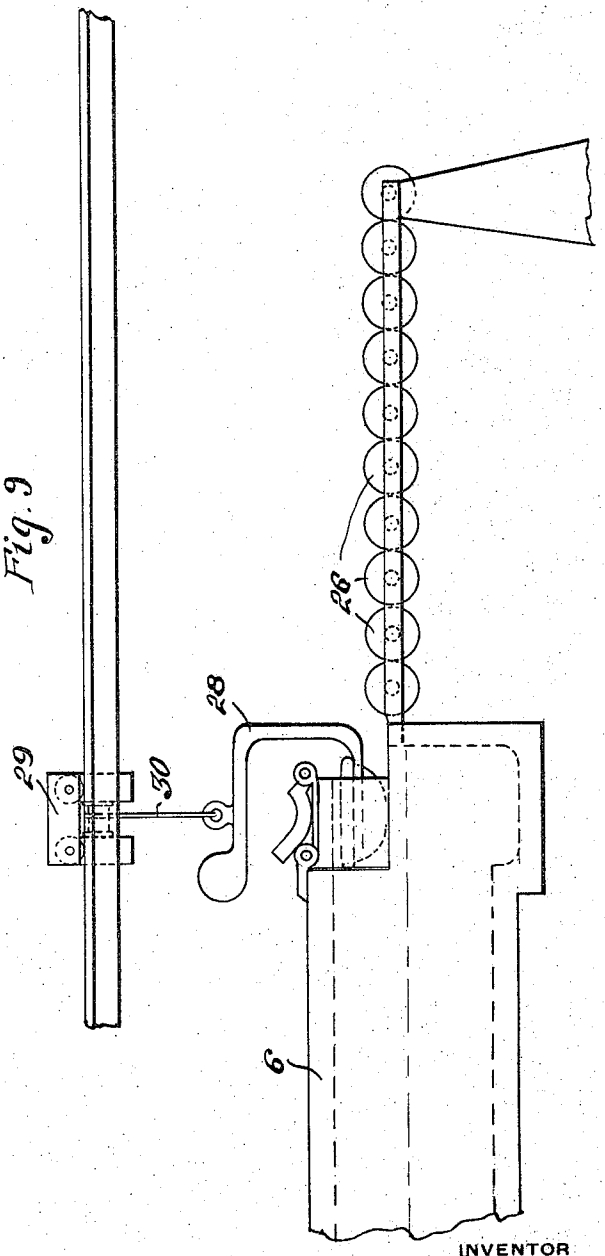


Fig. 9



WITNESSES

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UNITED STATES PATENT OFFICE.

ROGER S. PEASE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO PITTSBURGH PLATE GLASS COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

MANUFACTURE OF PLATE-GLASS.

1,217,340. Specification of Letters Patent. Patented Feb. 27, 1917.

Application filed June 5, 1915. Serial No. 32,365.

To all whom it may concern:

Be it known that I, ROGER S. PEASE, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in the Manufacture of Plate-Glass, of which the following is a specification.

The invention relates to the manufacture of plate glass and has for its primary objects; the provision of a process wherein the length of time necessary to get the glass into condition for pouring is reduced; the provision of a process wherein the fuel consumption as compared with that of the present procedure is reduced; and the provision of a process wherein the life of the pots employed is increased and the quality of the glass improved. Certain embodiments of the invention are illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal section through the forward half of the furnace employed in carrying out the operation, Fig. 2 is a section on the line II—II of Fig. 1, Fig. 2^A is a rear elevation of the pot tipping apparatus shown in Fig. 1, Fig. 3 is a longitudinal section through the rear half of the furnace of Fig. 1, Fig. 4 is a section on the line IV—IV of Fig. 3, Fig. 4^A is a section through the dog-house and lifting block taken at right angles to the section of Fig. 3, Fig. 5 is a horizontal section of the forward half of the furnace as illustrated in Fig. 1, such section being taken just above the surface of the glass, Fig. 6 is a horizontal section of the rear half of the furnace as illustrated in Fig. 3, such section being also taken above the surface of the glass, Fig. 7 is a longitudinal vertical section through the forward end of the furnace in which a different method of procedure in filling the pot is practised, Fig. 8 is a plan view of one of the dog-houses showing the transfer and pot cleaning rollers, and Fig. 9 is a side elevation of Fig. 8 with the pot tongs shown suspended from a traveling crane.

In the practice of my invention I preferably employ a long relatively narrow tank such as that illustrated in Figs. 1, 3, 5 and 6, but it will be understood that the form of the tank may be varied to suit requirements. The forward end of the furnace as illustrated in Figs. 1 and 5 comprises a pair of introducing channels or canals 1 and 2 having the cross section indicated in Fig. 2, and the main melting tank portion 3, such tank being heated preferably by regenerator gas furnaces of the Siemens type and having an arch or crown 4 (Fig. 2) extending from one longitudinal side wall of the furnace to the other. The rear half of the tank as illustrated in Figs. 3 and 6 is very similar to the forward half and comprises the tank portion 3 forming a continuation of the portion 3 of Figs. 1 and 5, and two end channels or canals 5 and 6, such channels or canals being shown in cross-section in Fig. 4.

Heat is supplied to the melting tank 3 from the regenerators to the passages or ports 7 in the usual way, and the heat regulation is such that the temperature at the left hand end of the tank is higher than at the right hand end, the maximum temperature at the left hand end of the tank being sufficient to properly refine the glass and approximating 2700° F. The temperature in the channels or canals 1 and 2 into which the pots are introduced is much less than in the melting portion of the tank, as is also the temperature in the channels or canals 5 and 6 at the other end of the furnace where the pots are removed and at which point it is desirable to have a temperature approximating a proper pouring temperature of the glass.

The glass batch with which the melting tank 3 is supplied is introduced into a receptacle 8 in the top of the furnace and passes down and forms the cone 9 illustrated in Fig. 2. Gas burners are provided to play upon this body of unmelted material, and the temperature at this point is relatively high. The batch is supplied to the cone 9 at a rate sufficient to take the place of the material which is melted, and the width of the tank at this point is sufficient to permit the pots employed to pass the cone 9 on either side thereof as indicated in Fig. 5. However, the method of supplying batch to the tank constitutes no part of my present invention and any suitable means may be employed for performing this function.

The pots employed are preferably of the relatively shallow dish shape illustrated in Figs. 1 and 5, the pots being somewhat oblong, but it will be understood that any other form of pot meeting the requirements may be employed. The pots are preferably made of a capacity approximating that of

the plate glass melting pot now in use and are made of the same composition of clay. These pots, to which the reference numeral 10 is applied, are preferably provided at their upper edges with the rims or beads 11, beneath which the carrying tongs engage when the pot is removed from the tank.

When the pots reach the right hand end of the channels 1 and 2 they are filled with glass by means of the tilting device illustrated in Figs. 1, 2^A and 5. This tilting device operates through an opening 12 in the roof of the tank, such opening being closed by means of a cover 13 when the tilting device is not in use. The tilting device consists of a weighted bar 14 raised and lowered by means of a connection 15, and a semi-circular member 16 adapted to fit the edge of the pot and pivoted to the lower end of the member 14. A guide arm 17 pivoted to the member 16 and having a pivot and slot connection with the bar 14 serves to hold the member 16 in a horizontal position when the apparatus is raised. The bar 14 lies to the right of the center of gravity of the pot, so that when the member 16 is placed in position upon the pot and the connection 15 lowered, the weight causes the pot to tilt to the position indicated in Fig. 1, thus allowing the molten glass to run into the pot, after which the tilting device is lifted and the next pot brought into position. After the pots have passed through the melting furnace 3 and through the canals or channels 5 and 6 at the right hand end of the melting tank, they are removed or lifted from the glass to a position at which they may be engaged by the carrying tongs by means of the lifting blocks 18 illustrated in Figs. 3, 4^A and 6. These lifting blocks 18 are provided with guides 19 working in recesses in the walls of the tank (Fig. 6), and have their lower sides recessed as indicated at 20 (Fig. 3). Connections are provided for supplying air under pressure to this recess, so that after a pot has been floated over the lifting block, the air supplied to the recess 20 through the duct 20' (Figs. 3 and 4) causes the block to lift the pot to the position illustrated in Fig. 3 at which time the cover 21 may be removed and the carrying tongs applied to the pot to transport it for pouring.

Referring to Figs. 8 and 9, the pot removing and handling apparatus consists of a series of rollers 26 provided with concave bearing surfaces 27 of the same contour as the bottom of the pot, over which the pots may be dragged by means of a carrying tong 28 suspended from a traveling crane 29 by means of a cable 30. The dragging of the pot over the rollers serves to remove all strings of glass and foreign matter which might adhere to the pot, and the number of the rollers is sufficient that the adhering glass will be chilled before reaching the extreme end rollers. When the pot reaches the end rollers, the carrying tongs are removed and the pot is then ready to be picked up by the teeming crane (not shown) and the glass therein subsequently poured on the rolling table.

The method of procedure, in which my invention particularly resides, and as carried out by the apparatus just described, is as follows: Upon the removal of the gates or covers 22 at the left hand end of the canals or channels 1 and 2, the pots 10 are introduced empty as indicated in Fig. 1, such pots either being new pots or pots from which a pour has just been made. The pots at this time are of course relatively cold and it is desirable that they should be heated before being filled with glass in order to avoid strain tending to injure them. The pots are floated to the right through the channels 1 and 2, and by the time they arrive at the right hand end of such channels are in condition to receive the molten glass, at which time they are tilted by the device indicated in Fig. 1, thus filling them with molten batch, which by reason of its proximity to the point of introduction of the batch at 9 is relatively crude and unrefined.

The pot is then moved gradually to the right through the melting tank 3, the length of this melting tank being such, and the time consumed in the passage of the pots being such that by the time the pots are floated therethrough the glass will be entirely refined and ready for use. During this period any bubbles caused in the glass incident to the dipping of the glass into the pot and any bubbles due to the chemical reaction in the pot during the refining operation will have disappeared and the quality of the glass will correspond to, or be superior to that, of the glass as reduced from dry batch in individual pots as in the method now universally practised. This refining operation will ordinarily require several hours, the pots being moved to the right at a rate necessary to secure the desired results, either manually, or by the current of the glass which sets to the right due to the removal from the furnace of the pots at the right end thereof. The movement of the pots to the right may be retarded for any desired interval by means of the projections 23, 24 and 25 illustrated in Figs. 1 and 5, such projections extending above the surface of the glass and serving to stop the movement of the pots when they are turned with their longitudinal axes transverse to the longitudinal axis of the furnace as shown in Fig. 5. It will be understood that openings are provided through the walls of the tank to give access, by means of moving rods, to the pots at various points throughout the length of the furnace so that the movements of the pots may be kept under control.

As the temperature at which the glass is poured is necessarily lower than the temperature at which the glass is refined, the temperature in the right hand end of the melting tank is reduced, so that when the pots reach such right hand end of the furnace, the temperature of the glass is reduced to a very considerable extent. The pots as they arrive at the extreme right hand end of the channels or canals 5 and 6 are elevated by the lifting blocks 18 and carried away by means of the carrying tongs secured to an overhead conveyer in the manner previously described. The operation of pouring the glass is just the same as heretofore practised, and after the glass is poured the pot is returned to the canals 1 and 2 at the left hand end of the furnace as heretofore described.

The foregoing operation presents many advantages over the method now universally practised, and comprising the reduction of the glass from dry batch in individual pots in a furnace. In this old operation a large amount of time is consumed in bringing the pots to a proper temperature and in melting the batch in the pots preliminary to the refining action. The removal of the pots from the furnace requires the removal of the side wall thereof and the heat losses involved are very great. Furthermore, the strains imposed upon the pot due to the method of applying the heat thereto are so great that the pots can be used only a limited number of times which fact renders the expense for pots very heavy. My method of procedure minimizes these difficulties. The loss incident to heating a pot and reducing the batch to a molten state is avoided, since the number of pots is so large that the operation is a substantially continuous one, and the batch is already melted when it is dipped into the pot. The heat losses incident to the insertion of the pot and the removal thereof is relatively small since the openings required for this purpose are not large and the portions of the tank to which they communicate have a relatively low temperature. The pots are not subject to any undue strain and will last indefinitely, the heating and cooling operations being gradual, and the surface of the pot being substantially surrounded by molten glass so that it is not subject to uneven heat conditions, and is little exposed to the action of the heated gases in the tank, as is the case in the old process wherein substantially the entire outer surface of the pot is exposed to the action of the air in the furnace. The glass in the melting tank is continuously changed by the addition of batch and the withdrawal of the molten glass, so that the body of glass tends to remain in relatively good condition, but if a more rapid change of the body of glass is desired, a portion thereof can be withdrawn for the manufacture of window glass or any other desired purpose. The relatively shallow type of pot employed is advantageous, since a relatively large area of glass will be exposed to the radiated heat from the crown or arch of the furnace, thus increasing the rapidity of the refining operation. It will also be seen that the labor incident to the filling of the pots is reduced to a minimum, and is very much less than in the old type, which involved the filling of the pots after they were placed in the furnace by means of ladles inserted through openings in the walls of the furnace. Other advantages incident to the method of procedure will be readily apparent to those skilled in the art.

In Fig. 7 a modified procedure for securing the filling of the pots is illustrated. In this construction illustrated in Fig. 7 canals or channels 1′, heated by burners 26, as in the other construction, are provided, and the melting tank 3′ is also the same in this construction. Instead of the tilting device illustrated in Fig. 1, however, the filling device 27 is employed, such filling device comprising a hopper containing batch and a spout or tube 28 extending down through the roof of the tank. When the pots 10′ arrive beneath this spout they are filled with the requisite amount of dry batch instead of melted batch being dipped up as heretofore described and illustrated. The procedure from this point on is just the same as in the operation heretofore described, the refining operation being however necessarily somewhat longer due to the fact that the batch in the pot must be melted before it is refined. The pots are made also somewhat larger when this method is employed, since the dry batch occupies more space than when melted down.

This method of procedure, while having the disadvantage of requiring somewhat longer time than the procedure heretofore described, has the advantage that the character of the mixture introduced into the pot is more definitely and accurately fixed than is the case where the mixture is dipped up from the body of molten glass, and furthermore, the danger of the bubbles induced by the dipping operation is avoided. The character of the batch introduced to the pots by this method is substantially the same as that introduced into the pots during the practice of the method as now commonly used and as described heretofore. When this method of Fig. 7 is practised it would be highly desirable to utilize the body of glass in the melting tank for the manufacture of window glass or for some other similar purpose so that the body of glass would not be wasted and could be kept in good condition by changing. While the process of both modifications is designed primarily for the production of plate glass, the glass in the pots might be used for other purposes

and the broad invention is not limited to the step of pouring the glass from the pots after they are removed from the furnace.

What I claim is:

1. The process of making plate glass which consists in floating a pot containing glass along the surface of a body of molten glass, exposing the pot and its contents to a refining heat during its passage through the body of glass, and then removing the pot with its contents from the body of glass and pouring the glass from the pot.

2. The process of making plate glass which consists in floating a pot containing glass along the surface of a body of molten glass, exposing the pot and its contents to a refining heat and then to a decreasing heat during its passage through the body of glass, and then removing the pot with its contents from the body of glass and pouring the glass from the pot.

3. The process of making plate glass which consists in floating a pot upon the surface of a body of molten glass, dipping up into the pot from the body of molten glass a quantity of the glass, floating the pot along the surface of the body of molten glass and exposing it and its contents to heat during such movement, and then removing the pot with its contents from the body of glass and pouring the glass from the pot.

4. The process of making plate glass which consists in floating a pot upon the surface of a body of molten glass, dipping into the pot from the body of molten glass a quantity of unrefined glass, floating the pot along the surface of the body of molten glass and exposing it and its contents to a refining heat to refine the glass and then to decreasing heat, and then removing the pot with its contents from the body of glass and pouring the glass from the pot.

5. The process of making plate glass which consists in floating a pot in a body of molten glass until the pot attains a desired temperature, dipping up into the pot a quantity of unrefined glass, floating the pot along the body of glass and exposing it and its contents to a refining heat to refine the glass and then to a decreasing heat, and then removing the pot with its contents from the body of glass and pouring the glass from the pot.

6. The process of making plate glass which consists in floating a pot containing a quantity of glass, through a glass melting tank upon the surface of the molten glass contained therein, and then removing the pot from the tank and pouring the glass contained therein.

7. The process of making glass which consists in floating a pot upon the surface of a body of molten unrefined glass, dipping up into the pot from the body of molten glass a quantity of the glass, floating the pot along the surface of the body of glass and exposing it and its contents to a refining heat and then to a lesser degree of heat to permit of the cooling of the glass in the pot, and then removing the pot with its contents from the body of glass.

8. The process of making glass which consists in floating a pot containing glass along the surface of a body of molten glass, exposing the pot and its contents to a refining heat during its passage through the body of glass and then removing the pot with its contents from the body of glass.

9. The process of making glass which consists in floating a pot upon the surface of a body of molten glass until the pot attains a desired temperature, supplying the pot with glass, floating the pot along the body of glass and exposing it to a refining heat, and then to a decreasing heat, and finally removing the pot with its contents from the body of molten glass.

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