Nov. 6, 1934. A. R. BETHEL 1,979,662

LEER

Filed April 27, 1929 2 Sheets-Sheet 1

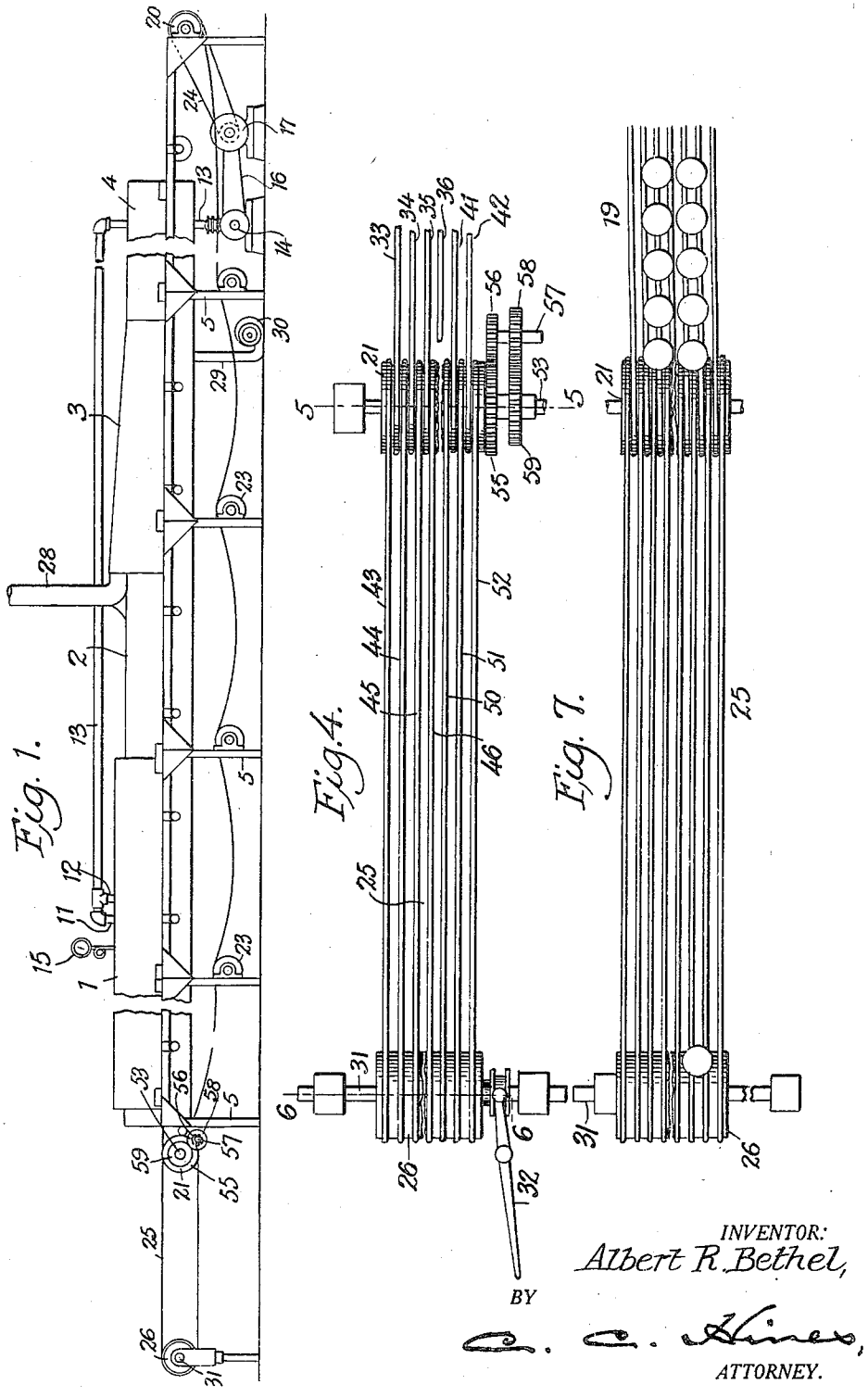


Fig. 1.

Fig. 4.

Fig. 7.

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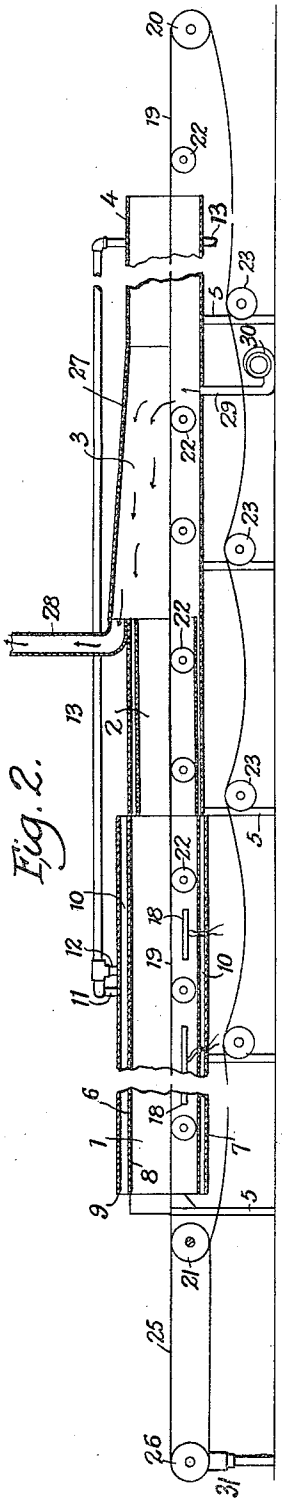


Fig. 2.

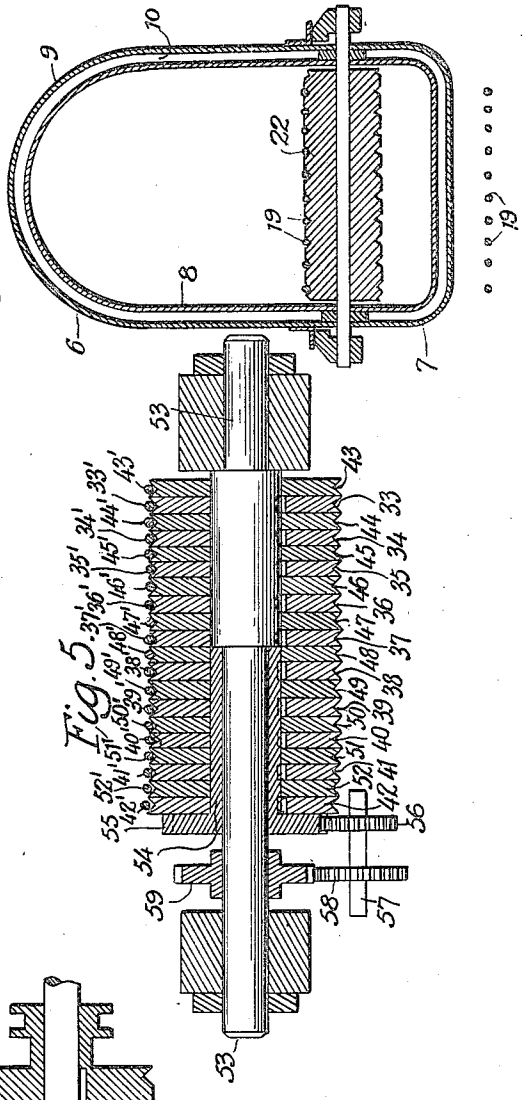


Fig. 3.

Fig. 5.

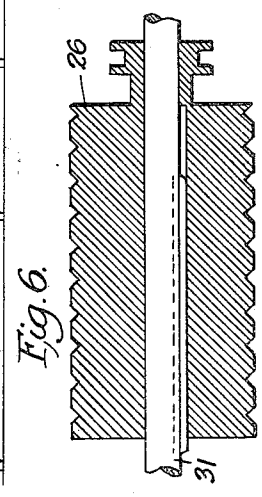


Fig. 6.

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UNITED STATES PATENT OFFICE

1,979,662

LEER

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Application April 27, 1929, Serial No. 358,562

7 Claims. (Cl. 49—47)

This invention relates to leers, and particularly to leers of the tunnel type for use in annealing articles of glassware.

One object of the invention is to provide a simple, reliable and efficient construction of leer in which proper temperature conditions may be maintained and proper exposure of the ware ensured to always obtain a uniformity of treatment to anneal the ware to the exact degree required.

A further object of the invention is to provide for a vacuum-insulation of one or more chambers or portions of the leer and the maintenance of the vacuum in order to keep the temperature uniform and constant and to prevent undue waste of heat and undesirable cooling of a portion of the leer the temperature of which should be kept substantially constant.

A still further object of the invention is to provide means for cooling the cooling chamber or portion of the leer without causing undesirable flow of heating and cooling media improperly affecting temperature conditions in such cooling portion or other portions of the leer.

A still further object of the invention is to provide novel means for conveying the ware to and through the leer whereby a properly timed feed may be secured, the ware transferred from conveyor to conveyor in a smooth and easy manner, and proper exposure of the ware to the heating and cooling media ensured in the travel of the ware through the tunnel.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation of a leer embodying my invention.

Figure 2 is a vertical longitudinal section of the same.

Figure 3 is a vertical transverse section on line 3—3 of Figure 1.

Figure 4 is a fragmentary top plan view of the feed conveyor and a portion of the main conveyor.

Figures 5 and 6 are cross-sections on lines 5—5 and 6—6 of Figure 4 on an enlarged scale, Figure 5 showing the full complement of cables (with the exception of the lower stretches, omitted for sake of convenience) of the two conveyors and disks of the drive pulley on the sectional drive shaft.

Figure 7 is a view similar to Figure 4 illustrating the lateral adjustability of the feed conveyor.

In the practical embodiment of my invention, I provide a leer of tunnel type and comprising a plurality of chambers or portions 1, 2, 3 and 4 arranged in end-to-end relation and supported at intervals upon pedestals 5. These chambers or portions may constitute abutting sections which may be suitably fastened at their abutting ends and which are interchangeable with corresponding sections, so as to facilitate shipment of the parts of a leer, their assemblage in erecting the leer for use and the disassemblage of a leer in whole or in part for repairs, removal or other purposes.

The chamber or portion 1 constitutes a soaking chamber in which the ware is heated to the desired high annealing temperature, the chamber or portion 2 is a preliminary cooling or temperature reduction chamber in which the ware is allowed to have a natural temperature reduction, the chamber or portion 3 is a cooling chamber in which the ware is artificially cooled, and the chamber 4 is a final natural cooling and delivery chamber from which the ware, after having been annealed, is discharged.

The soaking chamber 1 is preferably formed of horizontally divided top and bottom sections 6 and 7, each comprising inner and outer shells 8 and 9 spaced apart and united to form a vacuum sealing or insulating space 10 in which a vacuum of a certain degree is maintained for the purpose of insulating the chamber 1 from the atmosphere and preventing heat losses. The two sections 6 and 7 are bolted or otherwise suitably secured together, and their vacuum spaces are respectively connected through pipes 11 and 12 with a suction pipe 13 leading to a suction pump 14 which is operated as required in practice to maintain a constant vacuum of the intended degree in the vacuum sealing space. A vacuum gage 15 communicating with the vacuum space may be employed so that the operating attendant may at all times be advised of the vacuum condition of the vacuum space. The pump 14 may be driven by a pulley or chain 16 from an electric or other motor 17, which drives the leer conveyors, as hereinafter described, and constitute a part of the equipment of the conveyor per se, or said pump may constitute a part of the equipment of a molding apparatus using a suction feed or wherein suction operated elements are employed. Special provision is thus made for accurately maintaining a predetermined temperature in the chamber 1, which may be heated by one or more electrical or other heating devices 18.

The ware is transported through the tunnel chambers 1, 2, 3 and 4 by an endless main convey-

or 19, preferably comprising a series of endless cables, arranged side by side in parallel relation and running over an upper group of terminal drive pulleys 20 and 21 and intermediate pulleys 22 and a lower group of supporting pulleys 23, which pulleys are grooved to receive the cables, the pulleys 20, 21 and 22 supporting the upper stretch of the conveyor on which the articles are rested for transportation through the leer, while the pulleys 23 support the lower return stretch of the conveyor. The main conveyor may be driven by a belt 24 from the motor 17, said belt having a drive connection with the drive pulley 20 which is disposed beyond the delivery end of the tunnel a sufficient distance so that the articles delivered will be finally cooled in the atmosphere for a certain time preparatory to removal. The ware is conducted from a molding apparatus or other source of supply to the intake end of the main conveyor by a taking-in or feed conveyor 25 passing around the pulley 21 and a pulley 26, which conveyor 25 is of special construction and driven in a novel manner from the main conveyor, as hereinafter described.

The articles of glassware transported by the main conveyor through the tunnel section 1 are heated to the intended annealing temperature therein, and thence pass into the chamber or portion 2 which is so constructed as to give a certain natural temperature drop to the ware. From this chamber 2 the ware passes in to the cooling chamber 3 in which it is artificially cooled to a predetermined degree, and from the chamber 3 the ware passes into the final chamber 4 in which it is again allowed to cool naturally down to a temperature permitting it to be safely discharged for removal while it is subjected to atmospheric temperature. The chamber 3 is of any suitable length for the artificial cooling of the ware through a certain temperature range during a certain time period of its travel, and this chamber is of special construction and provided with an upwardly and rearwardly inclined or sloping top wall 27, making the said chamber 3 of greater depth at its receiving end than at its delivery end. The delivery end of the chamber 3 may be substantially of the same depth or height as the chambers 2 and 4, so that by the inclination of the wall 27 to a desired degree the inlet end of the chamber 3 will be of greater depth than the outlet end of the chamber 2 which it intersects, and at which point, above the level of the chamber 2, the inlet end of the chamber 3 communicates with an air exhaust flue 28 leading to the atmosphere. The artificial cooling medium employed, which may be atmospheric air, is supplied to the bottom of the chamber 3, adjacent to the shallow discharge end thereof, through an inlet pipe or flue 29 leading from an air supply fan or pump 30 which may be of self-contained, electrically-driven type, or driven by a suitable driving connection from the motor 17. The air passing through the flue 29 into the smaller delivery end of the chamber 3 travels rearward toward the inlet end of said chamber, or in the reverse direction to the direction of travel of the ware, and the expansion of this air is taken care of by the gradually increasing depth of the chamber 3 between the air inlet flue 29 and the air exhaust flue 28. This air, in thus flowing upwardly and rearwardly through the chamber 3, meets the current of hot air traveling rearwardly through the tunnel and reduces the temperature thereof and the temperature of the ware, a certain proportion of the heated air discharging with the cooling current through the flue 28, whereby a highly efficient cooling action at a substantially constant cooling temperature is obtained. By this mode of introducing the cooling air through the flue 29, mixing the same with the heated air in the chamber 3 and discharging the resulting tempered air through the flue 28, the air forced in through the flue 29 is prevented, by the draft created through the flue 28, from being drawn out through the tunnel chamber 4, and thus being more or less lost, thus avoiding any material irregularities in the cooling action, while at the same time the damping effect of the cooling air upon the heated air passing from chamber 2 into the chamber 3 prevents the heated air from being directly drawn out through the flue 28, so that at all times a very uniform and stable tempering of the air currents in the chamber 3 will be obtained to cool down the ware to the exact degree desired prior to its passage into the final chamber 4.

The taking-in or feed conveyor 25 is similar in character to the main conveyor 19, that is to say, is composed of a number of parallel endless wire ropes or cables, which are preferably equal in number to the cables of the main conveyor. This feed conveyor 25 may be of any suitable length and its cables pass at the outer end of the conveyor over the grooved pulley 26 which may be of similar type to the pulleys 22 and 23, but is preferably feathered or keyed to slide upon and rotate with its shaft 31, so that said pulley and the outer or receiving end of said conveyor may be laterally shifted by means of a shifter 32, as shown in Figure 7, from a normal direct line position, as shown in Figure 4, to different angles with relation to conveyor 19, in order that the receiving end of the conveyor 25 may be arranged to suit a loading point not directly in alinement with the conveyor 19 or to adjust conveyor 25 to deposit the articles A in different rows or at different points on the leer conveyor or from side to side thereof. In the present instance, each conveyor 19 and 25 (see Fig. 5) is shown as made up of ten wire ropes or cables, the conveyor 19 comprising the cables 33, 34, 35, 36, 37, 38, 39, 40, 41 and 42 while the conveyor 25 comprises the cables 43, 44, 45, 46, 47, 48, 49, 50, 51 and 52. At their contiguous ends the cables of the two conveyors pass about the drive pulley 21 and alternate in arrangement with each other, so that no break or uneveness is presented on the top surface of the conveyors at their point of intersection and the articles therefore will pass smoothly, and without jar, jerk or interruption, from the conveyor 25 to the conveyor 19.

Inasmuch as the conveyor 19 travels at a comparatively slow speed, while the conveyor 25, if of any material length, must travel at a higher speed in order to prevent the articles thereon from being kept in the open atmosphere too long, special provision is made to cause this conveyor 25 to travel faster than the conveyor 19, to which end the driving pulley 21 is made of a special sectional construction. As shown in Figure 5, the pulley 21 is made up of a bank of grouped pulley disks equal in number to the number of cables of the two conveyors, each pulley disk being grooved for the reception of one of the conveyor cables and the disks being designated by primed reference numerals corresponding to those designating the cables. The disks or small pulleys comprising the bank are arranged in sets or groups of fixed driving pulleys 33', 34', 35', 36', 37', 38', 39', 40', 41' and 42', and loose or idle pulleys 43', 44', 45', 46', 47', 48', 49', 50', 51' and 52'. These

sets of pulleys are mounted upon a divided shaft structure comprising a main shaft 53 journaled in suitable supporting bearings and a sleeve or hollow shaft 54 loosely mounted on said shaft 53. As shown the set of pulleys 33' to 37' are locked on the shaft 53, and the set of pulleys 43' to 47' are loose on said shaft 53, while the set of pulleys 38' to 42' are locked on the shaft 54 and the set of pulleys 49' to 52' are loose on the shaft 54. The shaft 53 and sleeve or shaft 54 are connected by gearing comprising a gear member 55 on the sleeve 54 meshing with a pinion 56 on a transmission shaft 57, which shaft 57 is connected by gears 58 and 59 with the shaft 53, the ratio of the gearing being such that the conveyor 19, traveling at any predetermined low speed, will transmit motion through the speed gear train 55 to 59, inclusive, to drive the conveyor 25 at a predetermined speed higher than that of the conveyor 19. The speed of the conveyor 25 with respect to conveyor 19 may, of course, be varied to any extent desired by the use of interchangeable gears in the speed train, according to the length of the conveyor 25, so that its speed may be governed to prevent the articles being transported to the leer from being exposed too long to atmospheric temperature.

Having thus fully described my invention, I claim:—

1. A leer comprising a tunnel including a natural cooling chamber arranged between preceding and succeeding portions of the tunnel, the succeeding chamber having an inlet for a cooling fluid at its base near its rear or discharge end and an updraft outlet for the fluid at its top adjacent its forward or inlet end, said succeeding chamber being of increasing depth between its discharge end and its inlet end, and means for introducing a cooling fluid through the said inlet at the base of said chamber to produce an upwardly and forwardly flowing current of the cooling fluid therein.

2. A leer comprising a tunnel embodying a preliminary soaking chamber, a discharge chamber, a preliminary natural cooling chamber following the soaking chamber, and an air cooled cooling chamber between the preliminary cooling chamber and the discharge chamber, said air cooled cooling chamber being of increasing depth between the discharge chamber and the preliminary cooling chamber, means for admitting an upflowing current of cooling fluid to said chamber at its base adjacent to its rear end, an updraft flue for the discharge of fluid from said chamber at its top adjacent to the forward end thereof, and means for transporting ware through the tunnel.

3. A leer comprising a tunnel, a main conveyor comprising endless cables for transporting ware through the tunnel, a feed conveyor comprising endless cables for transporting ware to the main conveyor, a multiple pulley having grooved members about which the ends of the cables of the conveyors pass in alternation with each other, alternate ones of said members being fixed and the other members loose, and means for driving said conveyors through said multiple pulley at different speeds.

4. A leer comprising a tunnel, a main endless conveyor for transporting ware through the tunnel, a feed conveyor for transporting ware to the main conveyor, and operating means at the outer end of the feed conveyor for laterally shifting said feed conveyor at an angle to the main conveyor for varying its line of feed.

5. A leer comprising a tunnel, a main conveyor for transporting goods through the tunnel comprising a set of endless cables, a feed conveyor for transporting goods to the main conveyor comprising a set of endless cables, concentrically arranged shafts carrying grooved pulleys about which the adjacent ends of said conveyors pass, the pulleys of the two conveyors alternating in arrangement with each other and some of said pulleys being loose on the shafts and the others fixed on the shafts, means for driving the main conveyor, and gearing between said shafts for driving the feed conveyor at a higher rate of speed than the main conveyor.

6. In a leer, a main conveyor, a feed conveyor in end to end relation to the main conveyor, each conveyor consisting of a plurality of endless cables, pulleys at the outer ends of said conveyors engaged by the cables thereof, and an inner pulley engaged by the cables of both conveyors, said inner pulley comprising a rotary shaft, a sleeve fitting loosely about said shaft, and means for transmitting rotary motion between said sleeve and shaft with one rotating at a higher rate of speed than the other, and a plurality of disks carried by the sleeve and shaft with the cables of one conveyor engaged about alternate disks and the cables of the other conveyor engaged about the other disks, disks carried by the sleeve and engaged by cables of the main conveyor being fixed to said shaft and disks carried by the shaft and engaged by cables of the feed conveyor being fixed to the shaft, the remaining disks being free and turned about the sleeve and shaft by cables engaging the same.

7. In a leer, a main conveyor, a feed conveyor in end to end relation to the main conveyor, each conveyor consisting of a plurality of endless cables, pulleys at the outer ends of said conveyors engaged by the cables thereof, and an inner pulley engaged by the cables of both conveyors, said inner pulley comprising a rotary shaft, a sleeve fitting loosely about said shaft, and means for transmitting rotary motion between said sleeve and shaft with one rotating at a higher rate of speed than the other, and a plurality of disks carried by the sleeve and shaft with the cables of one conveyor engaged about alternate disks and the cables of the other conveyor engaged about the other disks, disks carried by the sleeve and engaged by cables of the main conveyor being fixed to said shaft and disks carried by the shaft and engaged by cables of the feed conveyor being fixed to the shaft, the remaining disks being free and turned about the sleeve and shaft by cables engaging the same, and operating means at the outer end of the feed conveyor for shifting the pulleys thereof at such end of said conveyor to dispose the cables of the feed conveyor at an angle to the cables of the main conveyor.

ALBERT R. BETHEL.