

March 7, 1939.

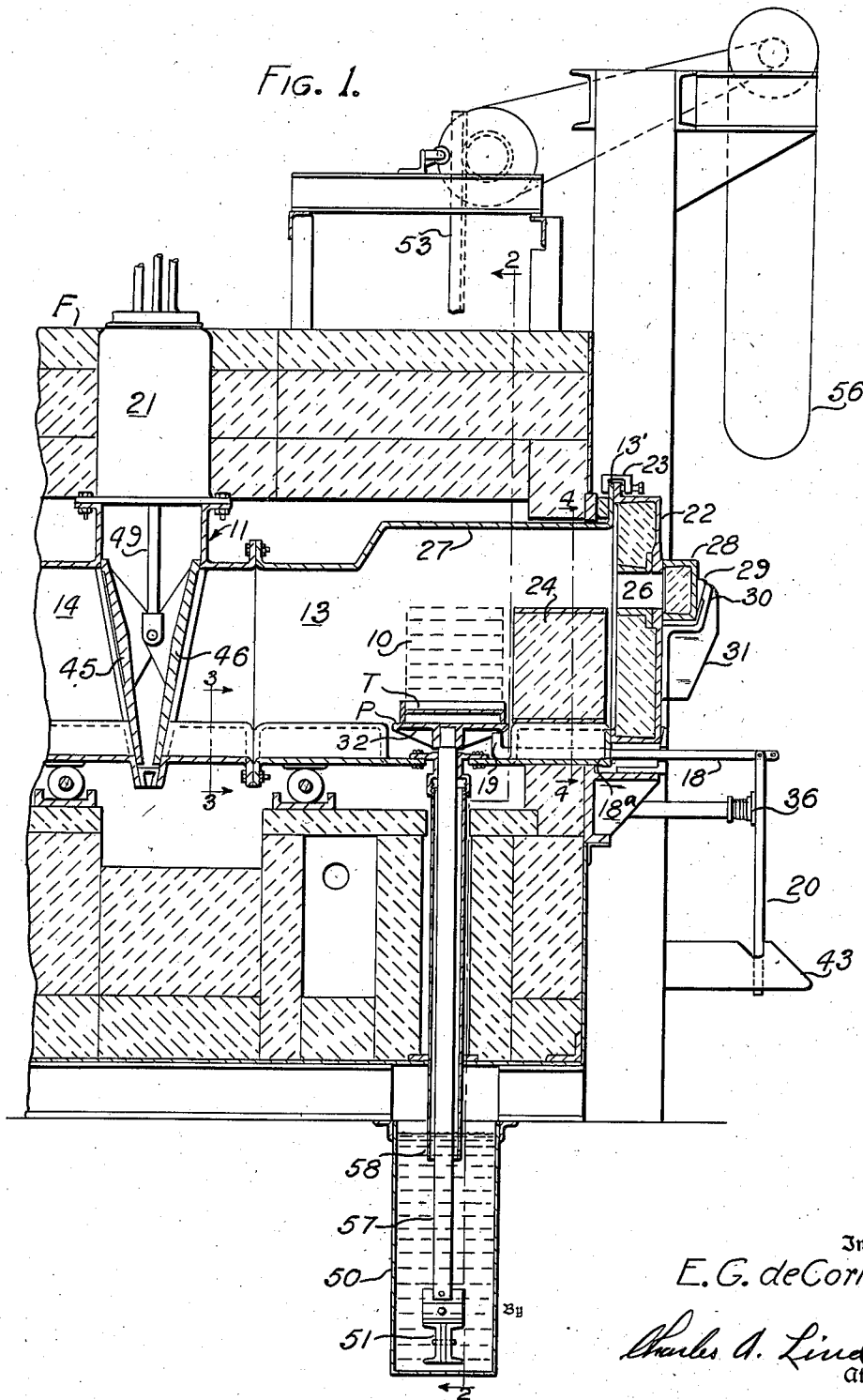
E. G. DE CORIOLIS

2,149,883

HEAT TREATING FURNACE

Filed July 3, 1937

3 Sheets-Sheet 1



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HEAT TREATING FURNACE

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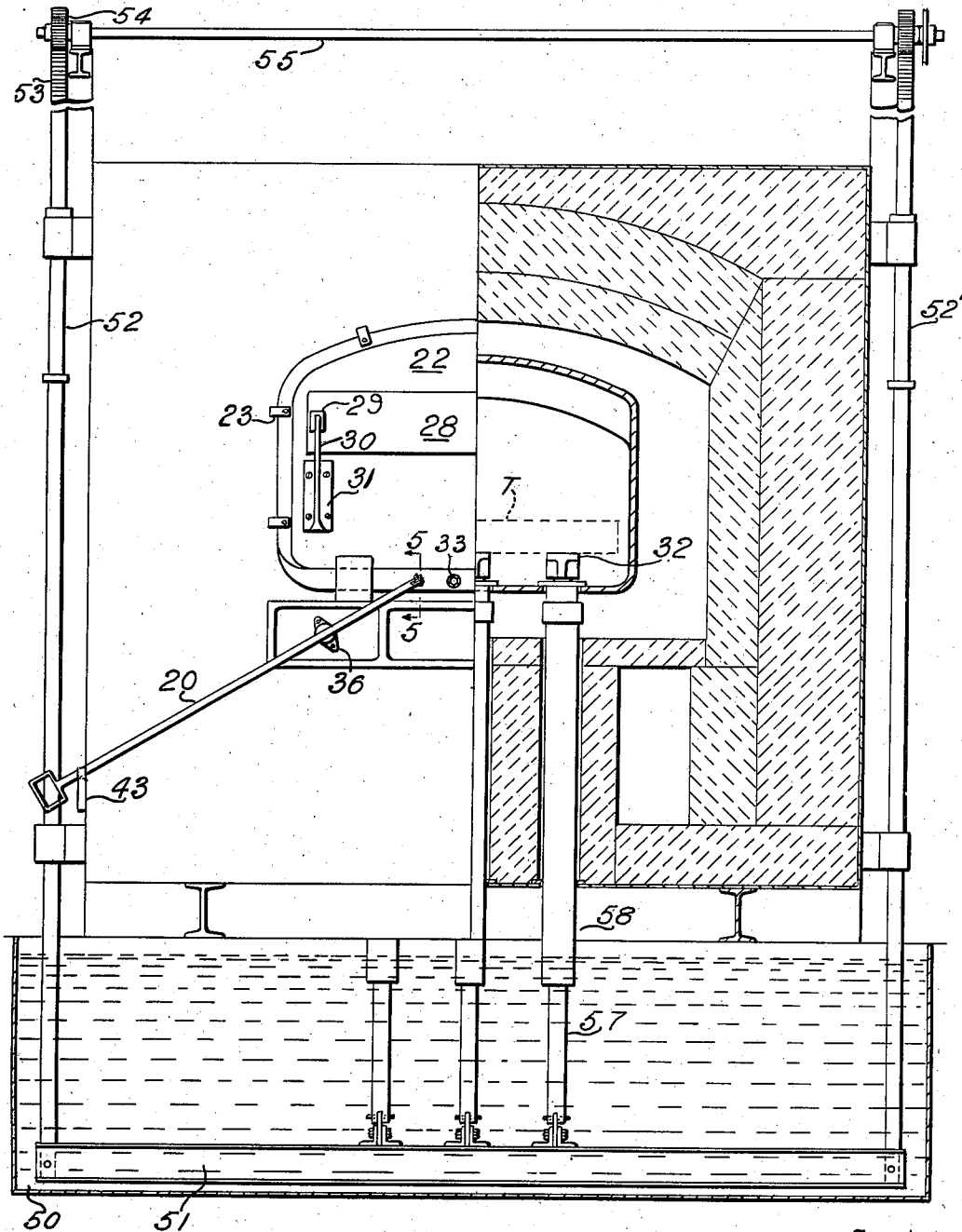


FIG. 2.

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HEAT TREATING FURNACE.

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3 Sheets-Sheet 3

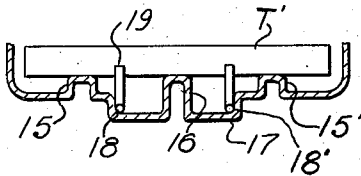


FIG. 3.

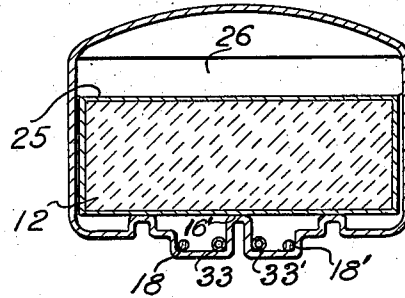


FIG. 4.

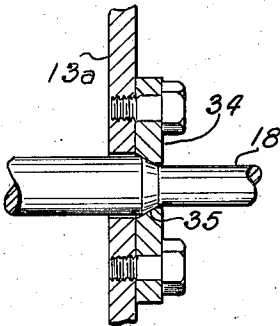


FIG. 5.

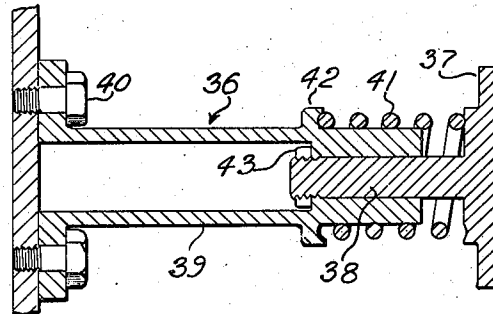


FIG. 6.

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2,149,883

HEAT TREATING FURNACE

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Application July 3, 1937, Serial No. 151,784

8 Claims. (Cl. 263—6)

This invention relates to improvements in heat treating furnaces of the type having a vestibule at the discharge end of a horizontal retort, it being understood that after the articles have been heat treated in the retort they are withdrawn therefrom into the vestibule preparatory to removal from the furnace.

The general object of the invention is to provide a furnace of the type indicated that shall have special utility in connection with carburizing operations.

In the case of metal articles which may be stacked one on top of the other, for example, ring gears, it is customary to carburize them in a stacked condition on a tray. However, when it comes to removing such articles from the vestibule, they are removed one at a time from the top of the stack and quenched, the removal being through a door at the outer end of the vestibule. When the door is opened air tends to enter the vestibule with resultant decarburization and oxidation and cooling of the highly heated articles. This is most objectionable and it is one of the more particular objects of the present invention to prevent such conditions from occurring.

Referring to the accompanying drawings, wherein the preferred form of the invention is shown,—

Fig. 1 is a vertical longitudinal section of the discharge end of the furnace;

Fig. 2 is in part a front elevation and in part a vertical section of the construction shown in Fig. 1, the section being on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detail section on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary detail section on line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary detail section on line 5—5 of Fig. 2, and

Fig. 6 is an enlarged section of a yieldable abutment forming part of the furnace construction.

Letter F indicates the discharge end of a furnace structure which in general is similar to that disclosed in patent to de Coriolis et al. 2,033,331 dated March 10, 1936, and which like the patent embodies a primary heating chamber or retort 14, a secondary heating chamber or vestibule 13, a valve structure 11 which separates the two chambers, the valve structure embodying a housing 21 which is anchored in the roof of the furnace structure, the housing being adapted to receive the valve elements 45 and 46 when the operating rod 49 for the latter is raised.

As previously indicated, the articles to be heat

treated will be stacked on trays, one such tray being indicated at T in Fig. 1 with a stack of articles 10 thereon, the articles being shown in dotted lines. In passing through the retort 14 and into the receiving end of the vestibule 13, the trays rest on longitudinally extending ledges forming part of the floor thereof. The form of the floor at either side of the valve structure 11 is shown in Fig. 3, the same comprising two side ledges 15 and 15' and a central ledge 16. A tray T' is shown as supported on the ledges, it being noted that central portion of the floor is depressed with reference to its side portions thereby forming what amounts to two side channels 17. The purpose of these channels is to accommodate tray-pull-out rods 18 and 18', one in each channel, each rod having an upturned inner end 19 for engaging behind the tray to pull it out of the retort 14 into the vestibule 13, and also having an outside hinged handle extension 20. These rods are independently operable from outside of the vestibule, and when not in use the hinged extension is disposed as shown in Figs. 1 and 2 for reasons presently appearing.

The outer end of the vestibule is closed by a door frame 22. Inasmuch as it is frequently necessary to have ready access to the vestibule, the door frame is shown as clamped to a peripheral flange 13' of the vestibule by clamps 23. Removably supported on the floor of the vestibule in front of and next to the door frame is a flat top refractory block 24. This block extends the full width of the vestibule and is preferably encased by a metal band 25 to protect its top side and to prevent undue wear in handling. That part of the floor on which the block 24 rests preferably takes the form shown in Fig. 4, the form being substantially the same as shown in Fig. 3, primarily to provide a working space for the rods 18. The door opening in the door frame 22 is indicated at 26 and it is of slot type with its bottom on a level with the top of the block 24. The block is as high as possible consistent with the space required to remove the top article of the stack 10 from the vestibule by means of tongs or the like inserted through the door opening. To insure ample working space above the block, the roof of the vestibule may be stepped upwardly as indicated at 27 for a portion of its length. The door for the opening 26 is indicated at 28, the same being vertically movable and being normally held tightly closed by any preferred means as by wedges 29 secured to the outer face of the door, the wedges cooperating with outwardly

inclined wedging arms 30 forming part of brackets 31 secured to the door frame 22.

When a loaded tray T is pulled into the vestibule 13 from the retort 14 by the pull rods 18, it is pulled into position next to the inner face of the block 24 as clearly shown in Fig. 1. In this position, the tray rests on a vertically movable platform or elevator P shown as comprising three supporting members or shoes 32 in longitudinal alignment with the individual ledges 15, 15' and 16 shown in Fig. 3. It will, therefore, be understood that when a tray is pulled out of the retort 14, it is pulled into position on said platform. Ordinarily the stack of articles on the tray will be high enough with respect to the block 24 to permit removal of the first top article by tongs or the like inserted through the door opening 26 without raising the said platform, but if such is not the case, the platform is elevated a sufficient distance to permit such removal; and such upward movement of the platform is continued as the articles are removed one after the other from the top of the stack. Before describing the preferred means for elevating the platform, let us briefly consider the advantages of the improved construction thus far described.

After the carburized articles have been moved into the vestibule 13 from the carburizing retort 14, it is essential to maintain a carburizing atmosphere in the vestibule 13 to prevent decarburization of the articles, pending their removal from the latter. To this end, the vestibule is continuously supplied with a stream of carburizing gas in sufficient amounts to effectively prevent the inflow of air through the door opening 26 when the door 28 is open. This carburizing gas may be introduced at an appropriate point or points. However, as illustrated in the drawings, the carburizing gas is introduced through a pair of pipes 33 and 33', shown as extending into the vestibule below the block 24, the pipes being conveniently disposed in the floor channels at either side of the central ledge 16' as shown in Fig. 4, the discharge end of the pipes terminating in relatively close proximity to the inside vertical face of the block 24. It is also desirable to prevent the highly heated articles on the tray from losing heat by radiation through the door frame and this is effectively prevented by the refractory block 24.

Leakage of air into the vestibule at the point 18a (see Fig. 1) where the pull rods 18 enter the vestibule is also prevented in a novel manner, when the rods are not in use. Referring to Fig. 5 wherein a detail feature of the improvement is shown, 13a indicates a flange portion of the vestibule, each rod 18 entering the vestibule through an opening in this flange. Secured to the outside face of this flange is a plate 34 provided with a tapered passage to form a valve seat for a correspondingly tapered portion 35 of the rod. When the rod is in the position shown in Fig. 5, it is in retracted or non-use position and when tightly held to its seat in the plate 34 there will be no infiltration of air into the vestibule at that point. As previously mentioned, each rod 18 has a hinged extension 20. When the rod is being used to pull a tray into the vestibule 13 from the retort 14, the extension will be brought into longitudinal alignment with the other portion of rod 20 and locked in such position by any preferred means, as by a locking pin passed through both rod portions near the hinge.

When the rod is not being used, said extension is utilized as part of means for holding the valve 35 of the rod tightly to its seat in the plate 34

and the manner in which it is so utilized is briefly as follows. 36 indicates a yieldable abutment secured to the framework of the furnace structure. As shown in Fig. 6, this abutment may comprise a head 37 having a stem 38 which extends into a tube 39, which is anchored to the framework of the furnace structure as by cap screws 40. One end of a coil spring 41 presses against the inner side of the head, the other end thereof pressing against a radial abutment 42 secured to the outer side of the tube. A nut 43 on the inner end of the stem 38 holds the latter in place. The abutment 36 is located below and at one side of the point where the rod 18 enters the vestibule. The rod must, therefore, turn on its axis so as to permit the handle portion 20 to contact the abutment 36 after which the outer end of the handle portion is pushed into locking position with a notched plate 43 secured to the framework of the furnace structure adjacent the side thereof. The spring 41 of the abutment 36 is, therefore, under compression and consequently tends to hold the valve of the rod 18 tightly to its seat. When the rod 18 is turned as stated, the hooked portion 19 thereof will be below the top side of the platform P on which the tray T rest in unloading position and, consequently, the rod may be retracted to the position shown in Fig. 1.

There remains to be described the means for elevating the platform P. It may be stated at the outset that it is of more or less secondary importance whether the platform be elevated by lifting rods extending upwardly through the roof of the vestibule or by push rods extending through the floor of the vestibule. The latter construction is preferred and is the one chosen for illustrative purposes.

Extending crosswise beneath the furnace structure is a relatively narrow tank 50 adapted to contain a sealing liquid such as oil. In this tank is a cross beam 51 which is suspended from above by side rods 52 and 52', the upper end of the rods being in the form of a rack 53 for engagement with a pinion 54 on a drive shaft 55, the shaft being turned by any preferred mechanism as by a hand operated hoist whereof the pull chain is indicated at 56. Supported by and extending upwardly from the cross beam 51 are three push rods 57, one for each platform shoe 32, the rods extending through tubes 58 which are supported by and extend downwardly from the floor of the vestibule to a point below the level of the liquid in the tank 50, the shoes 32 being fixedly secured to the upper end of their respective rods 57. The purpose of the tubes 58 is, of course, to prevent infiltration of air into the vestibule by way of the lifting rod passages.

What I claim is:

1. In a heat treating furnace having a chamber wherefrom articles in a stack on a tray are required to be removed, the combination comprising a block of substantial height positioned within and extending across and substantially filling the discharge end of the chamber except at the upper portion thereof, a closure at the discharge end of the chamber having a door opening which provides access to said upper portion, a platform normally disposed adjacent the floor of the chamber in front of said block for receiving a tray which is to be unloaded, and means for elevating the platform to bring the top article of the stack on the tray into position for removal from the chamber across the top of said block as the articles are successively removed from the top of the stack.

2. In a heat treating furnace having a chamber wherefrom articles in a stack on a tray are required to be removed, the combination comprising a block of substantial height positioned within and extending across and substantially filling the discharge end of the chamber except at the upper portion thereof, a closure at the discharge end of the chamber having a door opening which provides access to said upper portion, and vertically movable means normally disposed adjacent the floor of the chamber in front of said block and adapted to engage a tray from beneath for elevating the tray to bring the top article of the stack on the tray into position for removal from the chamber across the top of said block as the articles are successively removed from the top of the stack.

3. A heat-treating furnace having a work-holding chamber, a rod in the chamber for moving a body in the chamber, a wall having an opening through which the rod extends out of the chamber, a valve on said rod adapted to form a gastight closure between the rod and said wall at said opening, a handle extension hinged to said rod at such a point that when the valve on the rod is in engagement with said wall the hinge will be outside of the chamber, an abutment against which the said extension may be fulcrumed to exert outward pull on the rod when the valve on the latter is in engagement with said wall, and means remote from said abutment for releasably holding the extension in position against the abutment.

4. A heat-treating furnace having a work-holding chamber, a rod in the chamber for moving a body in the chamber, a wall having an opening through which the rod extends out of the chamber, a valve on the rod adapted to form a gas-tight closure between said rod and said wall at said opening, and means for holding said valve against said wall at said opening when the rod is not in use.

5. A heat-treating furnace having a work-

holding chamber, a rod in the chamber for moving a body in the chamber, a wall having an opening through which the rod extends out of the chamber, a valve on the rod adapted to form a gas-tight closure between said rod and said wall at said opening, a handle hinged to the outer end of said rod, and means adapted to cooperate with said handle to hold said valve against said wall at the opening when the rod is not in use.

6. In a heat-treating furnace, means including a floor, roof, side walls and an end wall forming a work-holding chamber, said end wall having an opening a substantial distance above said floor, and means including an elevator in said chamber and a shelf between the elevator and said opening for making the work in the chamber accessible for removal from the latter through said opening.

7. In a heat-treating furnace, means including a floor, roof, side walls and an end wall forming a horizontally-extending work-holding chamber, said end wall having a work-discharge passage a substantial distance above said floor, an elevator in the chamber and whose normal position is adjacent said floor, and a pull rod between said floor and elevator and adapted to be manipulated from the outside to pull a load of work along said floor on to the elevator.

8. The combination with a furnace chamber wherefrom articles are required to be removed from a stack adjacent the discharge end of said chamber, of a wall forming a closure at the discharge end of said chamber, a stack-elevating means within said chamber in spaced relation with respect to said wall, a heat-insulating block arranged between said means and said wall and substantially filling the lower half of said chamber, and said wall having a relatively restricted, normally closed doorway in communication with the upper portion of said chamber, the articles being removable through said doorway.

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