May 29, 1956 H. N. IPSEN 2,747,855

HEAT TREATING APPARATUS

Filed Sept. 11, 1951 2 Sheets-Sheet 1

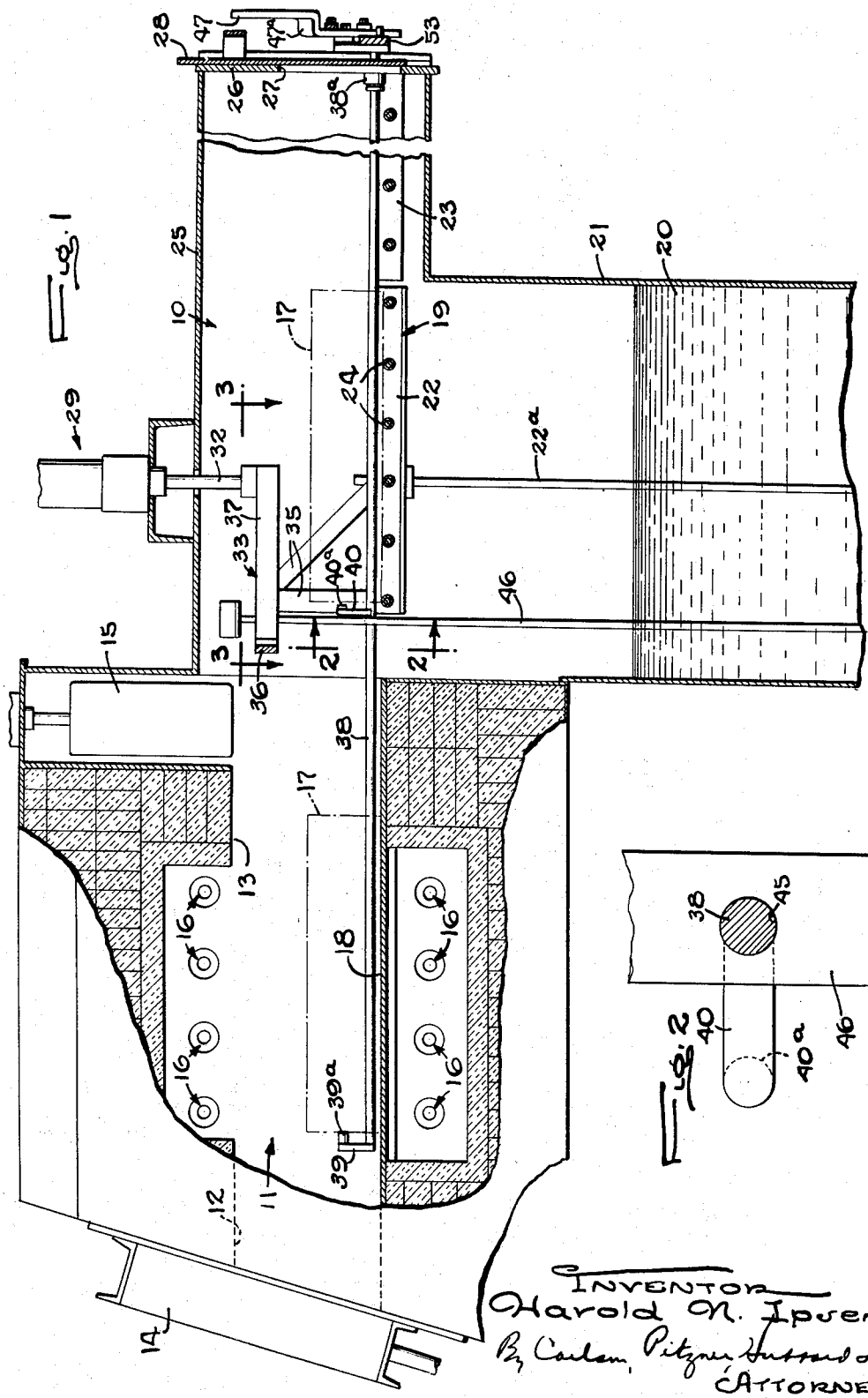


Fig. 1

Fig. 2

INVENTOR
Harold N. Ipsen
By Carlson, Pitzner, Hurtard & Wolfe
ATTORNEYS

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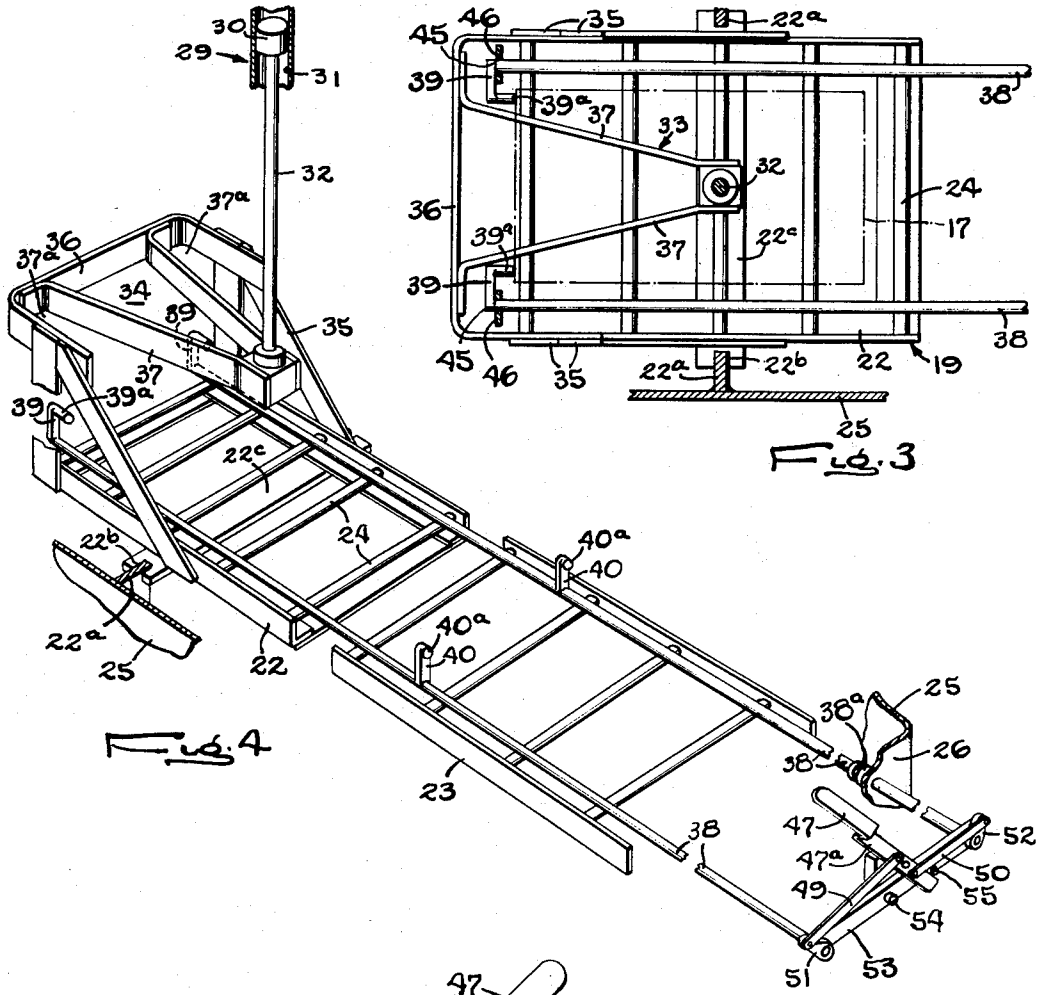


Fig. 3

Fig. 4

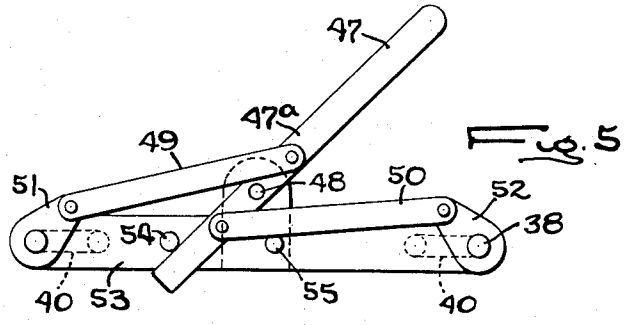


Fig. 5

INVENTOR
Harold N. Ipsen
By Carlson, Pitzner, Hursond, Wolfe
ATTORNEY

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HEAT TREATING APPARATUS

Harold N. Ipsen, Rockford, Ill.

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9 Claims. (Cl. 266—4)

This invention relates to heat treating apparatus of the type in which a heating chamber is associated with an enclosure around an adjacent quenching tank having an elevator onto which the heated work or a tray containing the same may be transferred and lowered into the quenching liquid while being maintained in an inert or non-oxidizing atmosphere.

The general object is to provide, in heat treating apparatus of the above character, a novel mechanism which is manually operable from the exterior of the apparatus to enable the work to be transferred from the heating chamber to the quenching tank, which holds the work tray in proper position and against cocking during its transfer, and which does not interfere with the lowering and raising of the work into and out of the quenching bath.

A more detailed object is to provide such a transfer mechanism having two laterally spaced members extending through the quenching chamber and the outer wall of the latter and mounted for endwise sliding to effect the transfer and also for turning into and out of engagement with a work tray disposed between the members.

The invention also resides in the novel manner of slidably supporting the transfer members and adapting the quenching elevator for actuation by an overhead operator.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a fragmentary longitudinal sectional view of head treating apparatus embodying the novel features of the present invention.

Fig. 2 is a fragmentary sectional view taken along the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary view of the work transfer mechanism and the quenching elevator platform.

Fig. 5 is an end view of the transfer mechanism with the parts thereof in a different position.

In the apparatus shown in the drawings to illustrate the invention, the work to be treated is heated in the chamber **11** of a furnace having inlet and outlet openings **12** and **13** controlled by doors **14** and **15**. Conventional heating elements **16** within or surrounding the chamber **11** bring the work, usually carried in a tray **17**, to the desired temperature while the tray is resting on the floor **18** of the chamber.

After the work has been heated the tray **17** is transferred out of the furnace through the exit opening **13** into a closed quenching chamber **10** and onto an elevator **19** by which it is lowered into a quenching bath **20** in a tank **21** adjacent to and below the furnace opening **13**. In its elevated position (Fig. 1), the platform **22** is at the level of the furnace floor **18**. At the same level and within the quenching chamber **10** is a stationary shelf **23** disposed adjacent and beyond the outer end of the platform **22** to receive each tray **17** as it is slid off from the platform preparatory to removal from the quenching chamber. The platform **22** and the shelf **23** may comprise laterally spaced bars **24** rigidly connected by rounded crossbars across which the tray will slide easily. In its vertical movements, the platform **22** is guided along bars **22a** secured to the tank walls and received in notches **22b** in the projecting ends of a crossbar **22c** on the platform.

In order that the heating and the quenching may be performed under a controlled atmosphere, the quenching chamber **10** is defined by a box-like casing **25** covering the tank **21** and enclosing the furnace opening **13**, the elevator **19**, and the shelf **23**. The end wall **26** of the casing **25** adjacent the shelf has an exit opening **27** therein alined with the furnace outlet **13** and normally closed by a door **28** which may be slid upwardly when it is desired to withdraw a tray of treated workpieces resting on the shelf **23**.

The elevator platform **22** may be raised and lowered by an overload actuator **29** herein comprising a piston **30** slidable within a vertical cylinder **31** mounted on the top of the casing **25** with its rod **32** extending downwardly and connected to the platform **22** through a framework **33**. Herein, the framework **33** comprises brackets **35** rigid with and upstanding from each side of the platform **22** and joined at the upper ends by a bar **36** cooperating with the brackets to define an opening **34** horizontally alined with the furnace outlet **13**, and substantially wider than the work tray. A horizontal member **37** projecting rigidly from the member **36** overlies the central portion of the platform **22** and is connected to the lower end of the actuator rod **32**. This member **37** is spaced inwardly from the side brackets to define openings **37a** the purpose of which will appear later.

The present invention contemplates the provision of a novel mechanism extending horizontally through the quenching chamber **10** and the outer casing wall **26** and manually operable from a point externally of the quenching chamber to slide into and out of the heating chamber **11** through the opening **13** while being rotatable into and out of engagement with the work tray to be removed from the furnace. To this end, the transfer mechanism comprises two parallel elongated rods **38** disposed above and movable endwise along the heating chamber floor **18**, the elevator platform **22**, and the shelf **23** and spaced apart to receive the tray **17** between them. Each rod **38** is journaled in and slidable endwise through a bearing **38a** mounted in the outer wall **26** of the casing **25**. The outwardly projecting ends of the rods are journaled in opposite ends of a bar **53** which is held against axial shifting along the rods and serves to hold the outer end portions of the rods properly spaced apart when retracted through the wall **26** as shown in Fig. 4.

At a point adjacent the inner end of the platform **22**, each rod **38** extends through a hole **45** in a bar **46** rigid with the casing **25** and slidably supporting the inner end portion of the rod. The rods **38** are thus properly guided and spaced apart so as to lie along and adjacent opposite sides of the tray. Thus, they perform the additional function of holding the tray against lateral displacement or twisting as it is being slid along the furnace floor or along the top of the platform **22**.

Rigid with and projecting laterally from the extreme inner end of each rod **38** is a short finger **39** with an outwardly projecting lug **39a** formed as an integral part thereof. By turning of the rod, the fingers may be swung in behind a transverse part of the tray, in this instance the end wall of the tray as shown in Fig. 3. After the rods are turned to swing the fingers upwardly and outwardly into vertical position as shown in Fig. 4, they will, during endwise shifting of the rods, pass the tray without engagement with the latter. When the fingers

are disposed horizontally, they will, as shown in Figs. 2 and 3 abut against the guides **46** with the lugs, which are substantially longer than the width of the guides, extending to the edge of the platform **22**.

To enable a work tray resting on the platform **22** after quenching to be transferred onto the shelf **23** simultaneously with the transfer of a heated tray out of the chamber **11**, a second finger **40** with a shorter lug **40a** is secured on the opposite side of the guide **46** to each rod in the same angular position as the fingers **39** and spaced along the rods from the latter a distance such that when the finger **39** is advanced into the furnace as shown in Fig. 1, and swung inwardly behind a tray on the floor **18**, the fingers **40** will be swung in behind the inner end of a tray resting on the elevator platform in a location determined by the fingers **39** in the previous transfer of the tray out of the furnace. Inward movement of the transfer rods is limited by engagement of the crossbar **53** with the casing wall **26**, while outward movement is similarly limited by the fingers **39** coacting with the guide **46**.

Means manually operable from a point outside the casing **25** is provided for enabling the rods **38** to be turned thereby swinging the fingers **39** and **40** into and out of engagement with the trays **17** in the chambers **10** and **11**. While this means may take the form of separate handles, it is preferred to employ a single handle **47** connected to the rods **38** in a manner such as to swing the two in opposite directions between horizontal tray engaging positions (Fig. 5) and vertical or inactive positions (Fig. 4). Herein, the handle **47** comprises the upstanding end of a lever **47a** fulcrumed intermediate its ends on a horizontal pivot **48** rigid with and projecting outwardly from a bar **53** joining the ends of the rods **38** outwardly beyond the wall **26** and the bearings **38a**. The bar **53** constitutes a handle which may be grasped conveniently in pulling the rods **38** and the trays outwardly or pushing the rods inwardly.

At points spaced equal distances on opposite sides of the fulcrum **48**, the lever **47a** is pivotally connected through oppositely projecting links **49** and **50** to the free ends of crank arms **51** and **52** fast on the outer ends of the rods **38**. The angular spacing of the arms is such that when the handle **47** is swung to the right to a position determined by a stop **54** on the bar **53** the fingers **39** and **40** are disposed horizontally and project inwardly toward each other as shown in Fig. 5. Now, when the lever is swung to the left (Fig. 4) to a position determined by a stop **55**, the arms **51** and **52** swing outwardly to dispose the fingers **39** and **40** in vertical position.

In the operation of the apparatus described above, an inert or nonoxidizing gas is delivered continuously into the heating chamber **11** and allowed to escape through the outer end of the quenching chamber **10** so that air is always excluded from both chambers even during the short periods of opening of the doors **14** and **27** to load or remove the work trays. While a new tray of work is being loaded into the furnace through the opening **12**, the rear door **15** is closed and the transfer bars are retracted into the quenching chamber as shown in Fig. 4 with their fingers **39** and **40** disposed vertically.

Upon completion of the heating of the work, the door **15** is opened and the handle **53** is pushed inwardly sliding the rods **38** and the fingers **39** into the heating chamber **11** and past the tray **17** therein. The handle is then turned to the position shown in Fig. 5 thus rotating the rods **38** inwardly and swinging the fingers **39** in behind the tray **17** in the chamber **11**. Next, the handle and the entire transfer mechanism are pulled outwardly to slide the tray along the furnace floor, through the furnace outlet **13** and opening **34** in the framework **33**, and onto the platform **22**, this motion being limited when the fingers **39** encounter the guides **46** as shown in Fig. 3. During this sliding movement, the rods **38** hold the tray in its transverse position and prevent it from cocking or becoming jammed in the furnace or on the platform **22**.

The work in the tray supported on the platform **22** may now be quenched by lowering the platform into the bath **20**. This is accomplished by deenergizing the actuator **29** whereupon the platform descends by gravity, the fingers **39** and the adjacent end positions of the bars **38** passing through the recesses **37a** in the framework **33** without interference. Since the transfer rods **38** are disposed above the platform **22** and spaced somewhat from opposite sides of the tray, the latter passes freely through the opening between the rods. Similarly, since the horizontal position of the tray on the platform is not disturbed during the quenching operation, the tray again comes in between the transfer rods as the platform is again raised by energization of the actuator **29**.

While the first tray of workpieces is in the quenching tank **21** and the transfer mechanism is in retracted position, a second tray may be loaded into the chamber **11**. After the second tray has been heated, the door **15** is opened and the rods **38** are again pushed into the furnace **10** past the second tray **17**. Meanwhile, the elevator **19** has returned the platform **22** to its raised position, and the first tray **17** is again positioned between the rods **38**. Now, when the handle **47** is swung clockwise (Fig. 5), both sets of fingers **39** and **40** will engage the trays in the chambers **11** and **10** and these trays will, as the handle is pulled outwardly, be transferred onto the platform **22** and the shelf **23** respectively. While the second tray is being quenched, the door **28** may be opened and the relatively cooled tray resting on the shelf **23** may be withdrawn from the quenching chamber.

It will be apparent that the double transfer bar arrangement above described is easily operated from the exterior of the fully enclosed heating and quenching chambers which may, during the transfer of the work out of the heating chamber and into the quenching liquid, be maintained fully closed. At the same time, the transfer rods hold the position of the work tray during its transfer and thus locate it properly on the platform **22** for lowering and raising without interference with the transfer mechanism. Moreover, the transfer mechanism is extremely simple in its construction and in its mounting.

I claim as my invention:

1. In a heat treating apparatus, the combination of, a furnace having a heating chamber and a door-controlled opening to permit a work tray to be slid along the floor of said chamber and out of an opening in said furnace, a quenching tank adjacent and below said furnace opening, a platform mounted in said tank to move vertically into and out of an elevated position at the level of said floor, mechanism operable to move said platform vertically into and out of said position, a casing enclosing said tank and said platform and extending to said furnace opening and defining a chamber communicating with said heating chamber through said opening, two parallel rods mounted above said platform to slide endwise through said opening into and out of said heating chamber between a first position above said floor and a second position above said platform, said rods being laterally spaced apart to receive and hold a work tray between them, and a finger rigid with and projecting laterally from each of said rods and swingable in behind a transverse part of a tray when the rods are turned while in said first position, said fingers, while said rods are being withdrawn from said heating chamber, sliding a work tray along said floor out of said heating chamber and onto said platform.

2. In a heat treating apparatus, the combination of, a furnace having a heating chamber and a door-controlled opening to permit a work tray to be slid along the floor of said chamber and out of said furnace, an elevator adjacent said furnace opening and having an elevated position at the level of said floor, two parallel rods mounted above said elevator to slide endwise through said opening between a first position above said floor and a

second position above said elevator and laterally spaced apart to receive and hold a work tray between them, a finger rigidly mounted on each of said rods and projecting laterally therefrom to swing in behind a transverse part of a tray to pull the latter from said floor to said elevator when said rods slide from said first position to said second position, a quench tank disposed beneath said elevator, said elevator being adapted to lower the tray away from said rods and into said tank and to return the tray to its former position between said rods, and means to turn said rods to thereby swing said fingers into and out of engagement with a work tray.

3. In a heat treating apparatus, the combination of, a furnace having a heating chamber and a door-controlled opening to permit a work tray to be slid along the floor of said chamber and out of said furnace, a platform adjacent said furnace opening and at the level of said floor, a quench tank disposed beneath said platform, mechanism for lowering said platform into said tank, two parallel rods mounted above said platform to slide endwise through said opening between a first position above said floor and a second position above said platform and laterally spaced apart to receive and hold a work tray between them, a finger rigidly mounted on each of said rods and projecting laterally therefrom to swing in behind a transverse part of a tray to pull the latter from said floor to said platform when said rods slide from said first position to said second position, and means to turn said rods thereby to swing said fingers into and out of engagement with a work tray.

4. In a heat treating apparatus, the combination of, a furnace having a heating chamber and a door-controlled outlet opening to permit a work tray to be slid along the floor of said chamber and out of said furnace, a quenching tank adjacent and below said furnace opening, an elevator having an elevated position above said tank at the level of said floor and a lower position in said tank, a casing enclosing said tank and said elevator and extending to said furnace opening, said casing having a wall remote from said furnace with a door controlled opening therein alined with said furnace opening, two parallel rods mounted above said elevator and journaled in said casing wall to slide endwise through said outlet opening between a first position above said floor and a second position above said elevator, said rods being laterally spaced apart to receive and hold a work tray between them, a finger rigidly mounted on each of said rods and projecting laterally therefrom to swing in behind a transverse part of a tray to pull the latter from said floor to said elevator when said rods slide from said first position to said second position, said elevator being adapted to lower a tray into said tank and return the tray to its former position between said rods, and means outside said casing to turn said rods to thereby swing said fingers into and out of engagement with a work tray.

5. In a heat treating furnace, the combination of, means defining a heating chamber and an adjacent quenching chamber communicating with the heating chamber through a door-controlled opening, a platform mounted in said quenching chamber for vertical movement into and out of a quenching bath from a position at the level of the floor of said heating chamber, mechanism operable to move said platform vertically into and out of said position, a stationary shelf mounted at said floor level within said quenching chamber on the side of said platform opposite the heating chamber, a pair of rods disposed above said platform and shelf and mounted for angular movement and also for endwise sliding into and out of said heating chamber through said opening, and two arms projecting laterally from each of said rods and spaced along the latter to move simultaneously in behind work trays in said heating chamber and on said platform during turning of the rods after entry thereof into the heating chamber, said trays being slid onto said platform and said shelf respectively during endwise retraction of the rods out of the heating chamber, and means by which said rods may be turned to carry said arms into and out of tray-engaging positions.

6. In a heat treating apparatus, the combination of, a furnace having a heating chamber and a door-controlled opening to permit a work tray to be slid along the floor of said chamber and out of said furnace, a quenching tank adjacent and below said furnace opening, a platform above said tank at the level of said floor, a framework rigid with and extending above said platform and defining an opening therein alined with said furnace opening to permit a tray to be slid out of the heating chamber through the framework opening and onto said platform, a power actuator disposed above and connected to the top of said framework and operable to lower said platform into said tank and to raise the platform therefrom, two parallel rods mounted above said elevator to slide endwise through said openings between a first position above said floor and a second position above said platform and laterally spaced apart to receive and hold a work tray between them, a finger rigidly mounted on each of said rods and projecting laterally therefrom to swing in behind a transverse part of a tray to pull the latter from said floor to said platform when said rods slide from said first position to said second position, said platform being adapted to lower the tray away from said rods and return the tray to its former position between said rods, and means to turn said rods thereby to swing said fingers into and out of engagement with a work tray.

7. In a heat treating apparatus, the combination of a furnace having a heating chamber and a door-controlled opening to permit a work tray to be slid along the floor of said chamber and out of said furnace, a platform adjacent said furnace opening to receive a work tray slid outwardly therethrough, a quench tank disposed beneath said platform, mechanism for lowering said platform into said tank, a casing enclosing said platform and defining a chamber communicating with said heating chamber through said furnace opening, said casing having a wall on the side of said platform opposite said opening, a pair of rods mounted above said platform and journaled in said casing wall for angular movement and also for endwise sliding into and out of said heating chamber through said opening, a pair of stationary guides, one for each of said rods, disposed between said platform and said opening and spaced apart to maintain said rods parallel to each other thereby to hold a tray positioned between said rods against lateral displacement, and a finger rigid with and projecting laterally from each of said rods and swingable in behind a tray when the rods are turned after projection thereof into said heating chamber, said fingers, while said rods are being withdrawn from the chamber, sliding a work tray along said floor out of said heating chamber and onto said platform.

8. In a heat treating apparatus, the combination of, a wall structure defining a heating chamber and an adjacent quenching chamber communicating with the heating chamber through an opening, a platform mounted in said quenching chamber to receive a work tray slid through said opening, two parallel rods mounted above said platform and projecting through and journaled in an outer wall of said structure for rotation and for endwise sliding into and out of said heating chamber through said opening, said rods being laterally spaced apart to receive and hold a work tray between them, a finger rigid with and projecting laterally from each of said rods to swing in behind a transverse part of a tray, means rigid with the outer end of one of said rods and defining a pivot, a lever fulcrumed on said pivot, and means to transmit turning motion of said lever to said rods to rotate the latter in opposite directions and swing said fingers into and out of engaging relation with respect to a tray on said furnace floor.

9. In a heat treating apparatus, the combination of, a wall structure defining a heating chamber and an adjacent

quenching chamber communicating with the heating chamber through an opening, a platform mounted in said quenching chamber to receive a work tray slid through said opening, two parallel rods mounted above said platform and projecting through and journaled in an outer wall of said structure for rotation and for endwise sliding into and out of said heating chamber through said opening, said rods being laterally spaced apart to receive and hold a work tray between them, a finger rigid with and projecting laterally from each of said rods to swing in behind a transverse part of a tray, a handle outside said structure, and means connecting said handle to the outer ends of said rods to swing said fingers inwardly and outwardly with movement of said handle back and forth.

References Cited in the file of this patent

UNITED STATES PATENTS

1,027,010	Steedman	May 21, 1912
1,168,313	Kenworthy	Jan. 18, 1916
1,435,046	Birnstock	Nov. 7, 1922
1,560,373	Birnstock	Nov. 3, 1925
1,731,318	Platt	Oct. 15, 1929
1,731,319	Platt	Oct. 15, 1929
1,888,960	Talley	Nov. 22, 1932
1,979,108	Ipsen	Oct. 30, 1934
2,223,603	Darrah	Dec. 3, 1940
2,269,838	Wroblewski	Jan. 13, 1942
2,325,677	Hoak	Aug. 3, 1943
2,473,445	Reed	June 14, 1949
2,493,493	Mariano	Jan. 3, 1950