May 22, 1934. C. I. HAYES 1,960,219

FURNACE FOR HEAT TREATMENT OF SMALL ARTICLES

Filed July 29, 1932 3 Sheets-Sheet 1

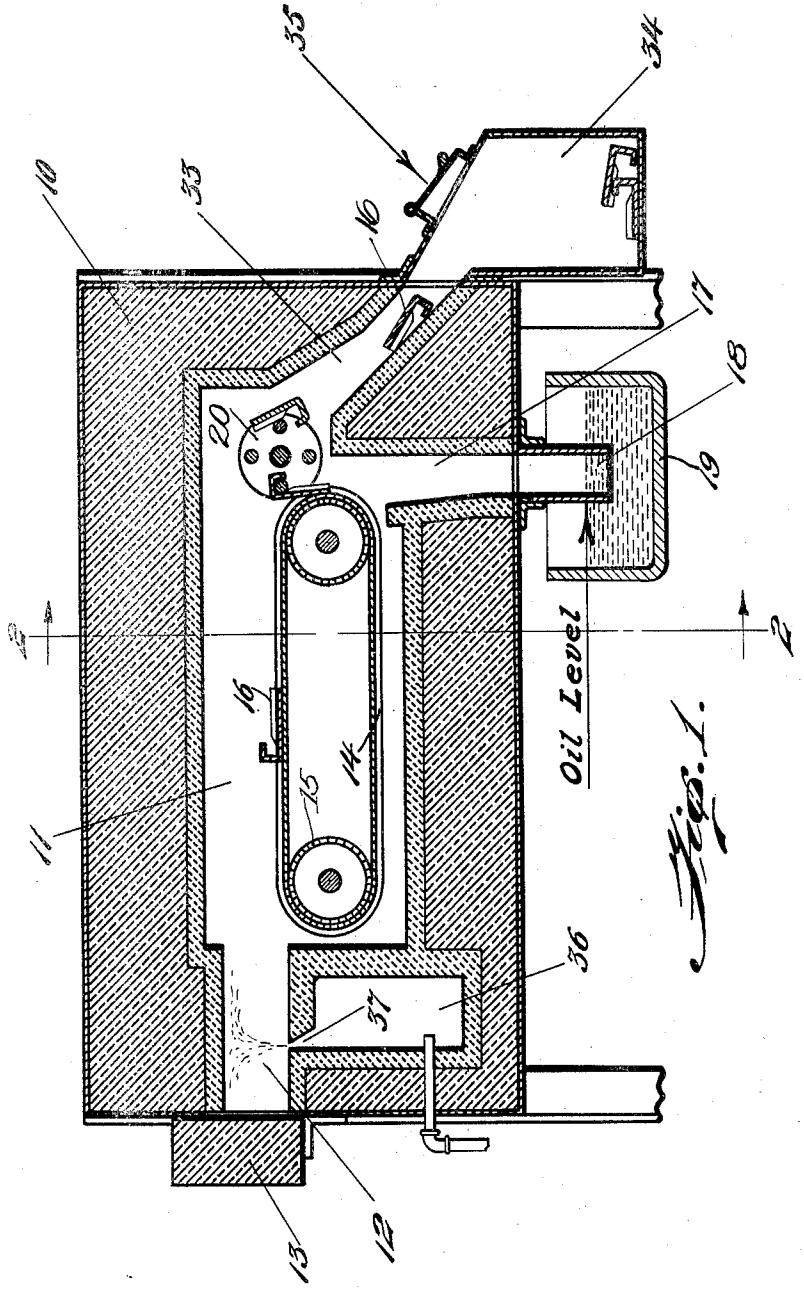


Fig. 1.

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Fig. 2.

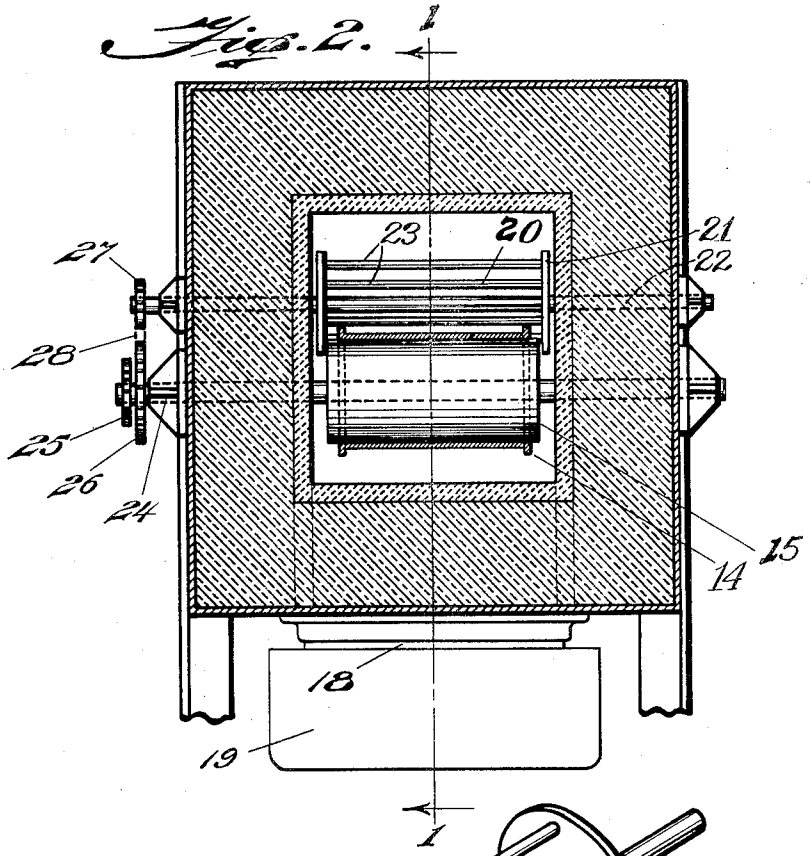


Fig. 3.

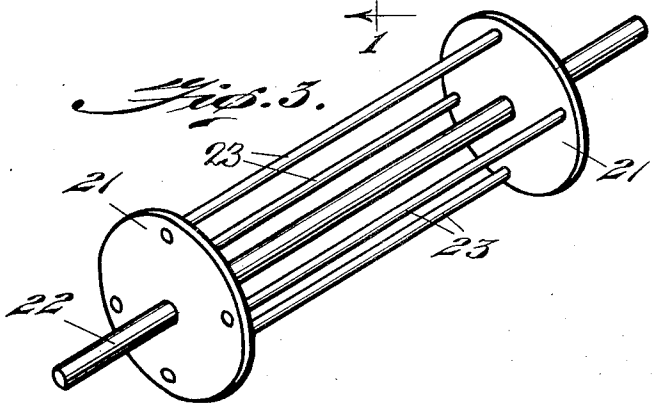
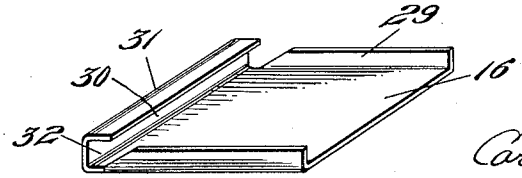


Fig. 4.



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Fig. 5.

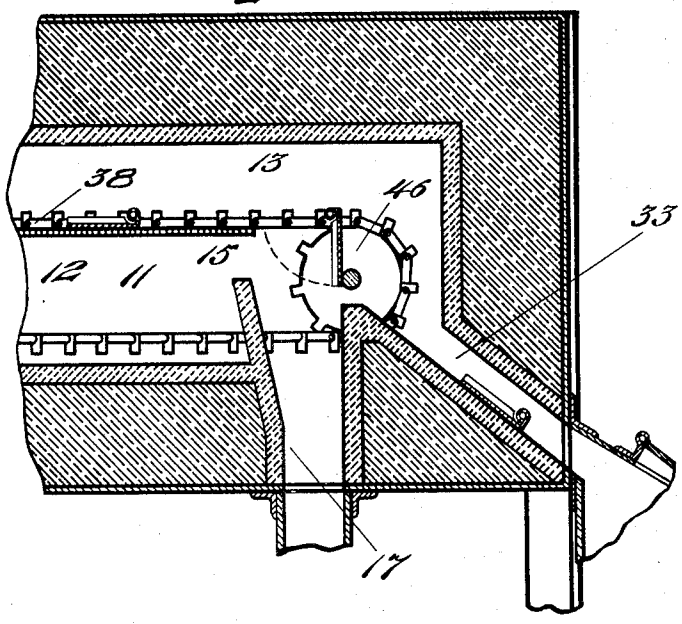


Fig. 6.

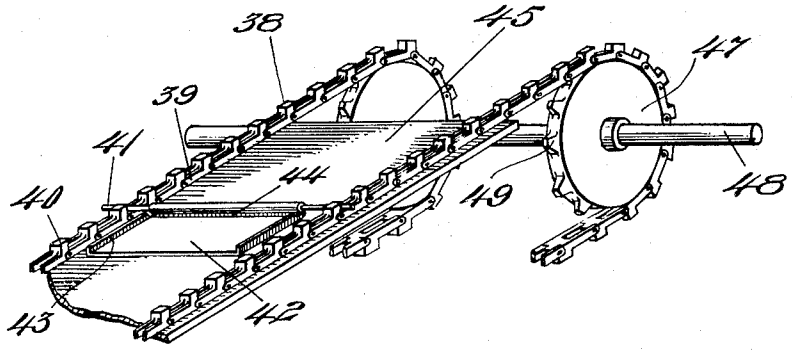
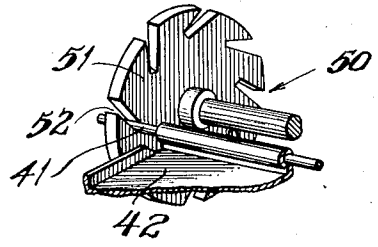


Fig. 7.



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Patented May 22, 1934 1,960,219

UNITED STATES PATENT OFFICE

1,960,219

FURNACE FOR HEAT TREATMENT OF SMALL ARTICLES

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Application July 29, 1932, Serial No. 625,682

12 Claims. (Cl. 266—4)

My present invention relates to furnaces for heat treating materials, and has particular reference to improved apparatus for facilitating heat treatment of small articles.

The heat treatment of small articles, such as metal needles, for example, has heretofore been difficult because the articles tend to cling together when quenched in liquid, such as oil or the like, thus producing uneven results. This difficulty is particularly found in furnaces of the conveyor type, as the carrier tray and its contents are usually dumped into the quenching fluid container, with resultant lack of uniformity of heat treatment, and inconvenience both in separating the work from the carrier trays and in drying the trays for additional use.

It has also been found that quenching the trays has a further detrimental effect in that the trays, which are usually made of stainless iron or steel, become hardened and warped, and must be replaced.

My present invention contemplates the provision of an automatic arrangement for projecting the heat-subjected articles from the carrier trays into the quenching fluid in scattered relation while holding the carrier trays out of the fluid, and the conveying of the carrier trays to a separate storage-receptacle from which they may be removed as desired, ready for use, whereby uniformity of treatment in ensured, need for cleaning or drying the trays is eliminated, and the trays are not subjected to quenching and do not harden or become warped.

With these and other advantageous features in view, the invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more fully defined in the claims appended hereto.

In the drawings,

Fig. 1 is a central longitudinal vertical section through a heat treating furnace constructed in accordance with my invention, on the line 1—1 of Fig. 2;

Fig. 2 is a vertical section on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of the tray holding drum;

Fig. 4 is a perspective view of a carrier tray;

Fig. 5 is a section similar to Fig. 1, partly broken away, showing a modified arrangement;

Fig. 6 is a perspective view of the conveyor chain, support hearth, and carrier tray of the modified arrangement; and

Fig. 7 is a perspective fragmentary view showing a further modification.

Referring to the drawings, the furnace 10 has the usual heat treating chamber 11 with entrance opening 12 normally closed by a removable door 13. An endless conveyor belt or the like 14 is mounted on longitudinally spaced conveyor drums 15 for movement within the heat treating chamber, and receives carrier trays 16 containing articles to be heat treated; an exit chute 17 is positioned adjacent the inner end of the conveyor, and communicates through an outlet conduit 18 with a quenching fluid container 19 for receiving the heat subjected work.

A carrier holding drum 20 is also mounted adjacent the end of the conveyor, slightly higher than the adjacent drum 15; as shown in Fig. 3, the drum comprises two end disks 21 mounted on a shaft 22, and a series of rods 23 extending between and secured to the end disks at their peripheries in parallel alignment to the shaft 22. The conveyor drums are suitably supported on shafts 24, one shaft 24 having a power gear 25 and a sprocket gear 26 mounted thereon, the shaft 22 also having a sprocket gear 27 connected to the sprocket gear 26 by a chain 28 for movement of the drum 20 in fixed, timed relation to the movement of the conveyor chain.

The carrier tray 16, see Fig. 4, has sides 29 and a rear end 30 having a forwardly extending portion 31 positioned above the sides 29 to form a hook 32. As the tray 16 is moved along the conveyor, see Fig. 1, it is tilted to permit scattered fall of the heat subjected material into the quenching fluid and the hook 32 catches over one of the cross rods 23 to hold the tray; the tray is lifted over by the rotating tray holding drum until it is released to fall into the exit chute 33 from which it falls into the tray receiver 34, equipped with a hinged cover 35 for facilitating removal of the stored trays.

As indicated by the shading, the furnace is suitably heat insulated and preferably is equipped with a combustion chamber 36 adapted to receive predetermined volumes of gas and air for combustion, and an outlet slot 37 for forming an air excluding curtain of the products of combustion, as described in my Patent No. 1,724,583. The furnace may be heated in any suitable manner, but electric heating of the type shown in my above mentioned patent is preferred because of the uniformity of heating and the ease of regulation and control of the treating temperature.

Instead of a conveyor belt, such as shown in Fig. 1, conveyor chains 38 may be used, as shown

in Figs. 5 and 6. These chains preferably consist of double links 39 and intermediate upstanding connecting blocks 40, whereby the spaces between the blocks may receive the projecting ends 41 of carrier trays 42; the trays 42 have sides 43 and one forward end 44, and are supported by a central hearth plate or the like 45 as they are dragged along by the carrier chains. The conveyor drums 46 have end disks 47 mounted on a cross shaft 48, the end disks being provided with suitable spaced teeth 49 adapted to enter the double links 39 between the blocks 40.

This construction provides a more positive drive for the carrier trays, and eliminates the need for a separate tray holding drum, as the trays swing downward after leaving the support plate to release the work and then leave the chain to slide down the exit chute 33 into the tray receiver.

A further modified construction is indicated in Fig. 7; in this arrangement trays 42 such as shown in Fig. 6 are utilized with an endless conveyor such as shown in Fig. 1, a tray holder drum 50 having end disks 51 provided with non-radial slots 52 being utilized to engage the projecting ends 41 of the carrier trays and thus hold and move the trays in a manner similar to that shown in Fig. 1.

It is preferred to arrange the quenching tank and the tray receiver so as to exclude atmospheric air from the heating chamber, the exit chute for the work extending below the surface of the quenching fluid, and the receiver having but a single exit opening normally tightly closed by the hinged cover plate. For certain classes of work, however, it is not necessary to exclude atmospheric air, and the tray receiver may be omitted if desired, and replaced by a basket or the like for receiving the empty trays.

The above described constructions are particularly advantageous for the heat treatment of articles such as metal needles, blades, pins, and other small articles that tend to cling together when thrown into a quenching fluid such as oil; the sudden swing of the carrier tray and the long drop into the fluid separates the articles so as to facilitate uniform treatment, and the retention of the tray and its subsequent release to the tray receiver, prevents quenching and wetting of the trays and eliminates cleaning and drying prior to further use.

While I have described specific constructions, embodying the principles of my invention, it is clear that such changes in construction, in size and in arrangement of the parts as may be desirable to comply with the requirements for heat treating particular materials may be made, within the spirit and the scope of the invention as defined in the appended claims.

I claim:—

1. In a furnace for heat treatment, a heat treating chamber, said chamber having an exit chute for heat treated work in the lower portion thereof, means for conveying a work carrying tray through said chamber and over said chute, and for supporting said tray in work carrying position until it passes over said chute, and means engaging said tray for swinging support over said chute, whereby the tray swings under the influence of gravity to release the work into said chute.

2. In a furnace for heat treatment, a heat treating chamber, means for supporting a work carrying tray in said chamber, a quenching fluid container communicating with said chamber, a tray receiver communicating with said chamber, and means for moving the tray to first release the work into said container and then guide the tray into said receiver.

3. In a furnace for heat treatment, a heat treating chamber, an entrance opening at one end of said chamber, a quenching fluid container and a tray receiver at the other end of said chamber, means for conveying work carrying trays from said entrance opening towards the other end of said chamber, and means for moving the tray to first release the work into said container and then guide the trays into said receiver.

4. In a furnace for heat treatment, a heat treating chamber, means for supporting a work-carrying tray in said chamber, an exit chute for the work, an exit chute for the tray, and means for guiding the work into the first exit chute and then guiding the tray into the second exit chute.

5. In a furnace for heat treatment, a heat treating chamber, means for supporting a work carrying tray in said chamber, an exit chute for the work; an exit chute for the tray, and means for retaining the tray in the chamber for a predetermined period of time, then moving the tray to release the work into the first exit chute and then guiding the tray into the second exit chute.

6. In a furnace for heat treatment, a heat treating chamber, an entrance opening at one end of said chamber, an exit chute for work and an exit chute for work carrying trays at the other end of said chamber, means for conveying a work carrying tray from said entrance opening to said exit chutes, and means for tilting the tray to release the work into the exit chute for work, and for releasing the emptied tray into the exit chute for trays.

7. In a furnace for heat treatment, a heat treating chamber, an entrance opening at one end of said chamber, an exit chute for work and an exit chute for work carrying trays at the other end of said chamber, means for conveying a work carrying tray from said entrance opening to said exit chutes, means for tilting the tray to release the work into the exit chute for work, means for releasing the empty tray into the exit chute for trays, and means for excluding atmospheric air from said heat treating chamber.

8. In a furnace for heat treatment, a heat treating chamber, an exit chute for work and an exit chute for work carrying trays in said chamber, means for supporting a work carrying tray in said chamber, and means for moving said tray and swingably detachably holding said tray adjacent said work exit chute to release the work into said work exit chute, and for shifting said tray and releasing the same into said tray exit chute.

9. In a furnace for heat treatment, a heat treating chamber having an inlet opening at one end, and spaced exit chutes for work and for work carrying trays at the other end, a conveyor for conveying work carrying trays through the heat treating chamber, and means for detachably holding said trays for swinging movement adjacent said work exit chute to release the work, shifting the emptied trays adjacent said tray exit chute, and releasing the emptied trays into said tray exit chute.

10. In a furnace for heat treatment, a heat treating chamber having an inlet opening at one end and spaced exit chutes for work and for work carrying trays at the other end, a conveyor movable through said chamber, trays supported on

said conveyor and having pivot hook devices, and a rotatable holder positioned adjacent said exit chutes and having cooperating hook engaging members for lifting one end of said trays and moving said trays bodily, whereby said holder engages said tray hook devices to permit swinging movement of said trays over said work exit chute for releasing the work, and to carry said trays over said tray exit chute for releasing the trays.

11. In a furnace for heat treatment, a heat treating chamber having an inlet opening at one end and spaced exit chutes for work and for work carrying trays at the other end, spaced conveyor chains movable through said chamber and extending over said work exit chute and terminating adjacent said tray exit chute, said chains having vertical projecting members, a tray support hearth plate between said chains terminating adjacent said work exit chute, and work carrier trays having lateral projections adjacent one end adapted to be engaged by said projecting chain members, whereby said trays are pulled over said hearth plate and swing over said work exit chute to release the work and are carried over said tray exit chute to be released thereto.

12. In a furnace for heat treatment, a heat treating chamber, said chamber having an exit chute for work and a second exit chute for trays in the lower portion thereof, means for conveying a work carrying tray through said chamber and over said chutes and for supporting said tray in work carrying position until it passes over said first exit chute, and means detachably engaging said tray for swinging support over said first chute and for releasing said tray over said second chute, whereby the tray swings under the influence of gravity to release the work into the first chute and is then released to enter the second chute.

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