Aug. 3, 1943. E. EHLERS 2,325,757

HEATING FURNACE

Filed June 9, 1942 2 Sheets-Sheet 1

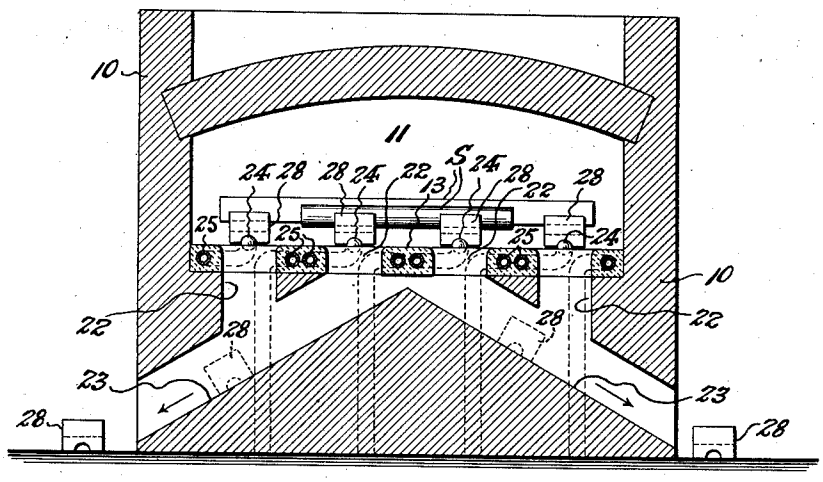


Fig. 3

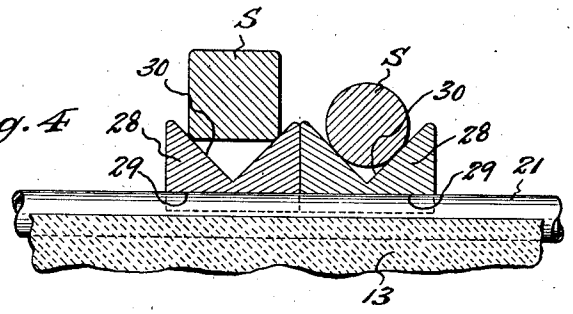


Fig. 4

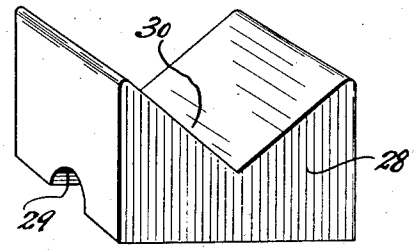


Fig. 5

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HEATING FURNACE

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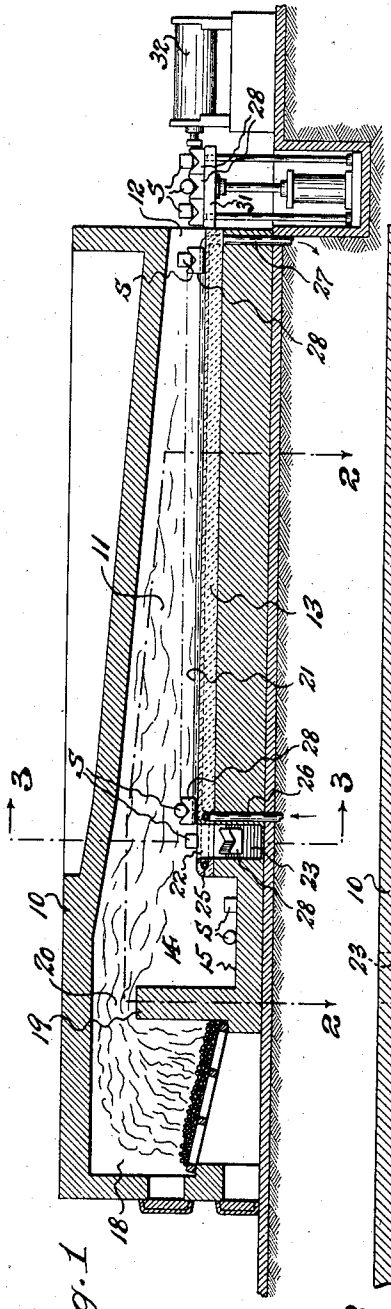


Fig. 1

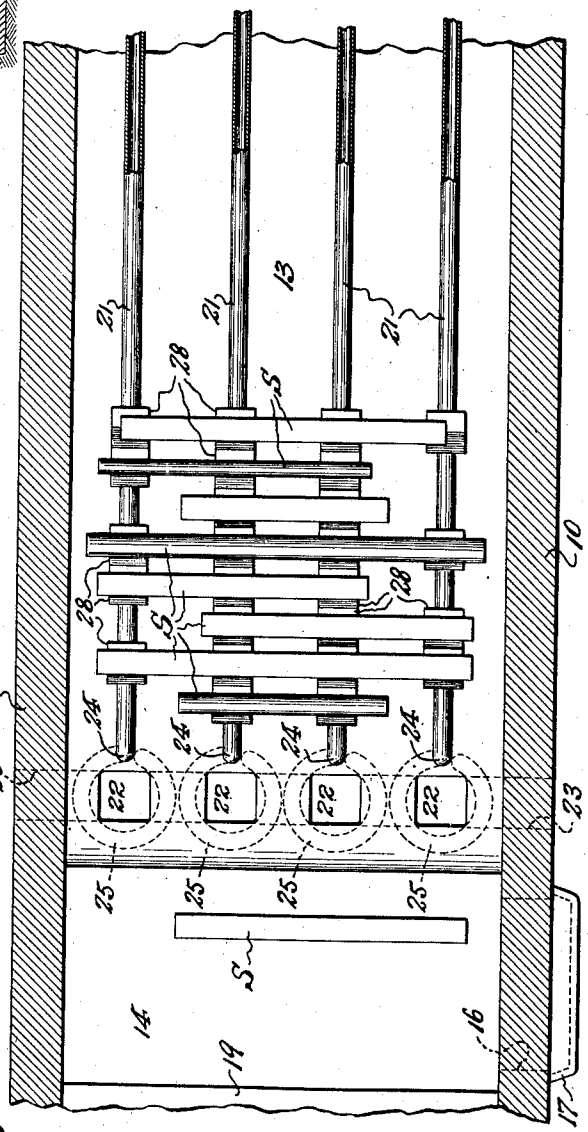


Fig. 2

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HEATING FURNACE

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Application June 9, 1942, Serial No. 446,346

5 Claims. (Cl. 263—6)

This invention relates to improvements in heating furnaces; and the invention has reference, more particularly, to a novel construction of continuous heating furnace for use in heating metal stock, such as billets, scrap fagots, rods, bars or metal masses of other shapes, preparatory to annealing, forging, rolling, welding or otherwise desirably working the metal; the heat applied by the furnace to the stock being varied or regulated to that degree best suited to condition the stock for a given kind of working operation.

This invention has for an object to provide a novel construction of continuous heating furnace including novel means to carry stock of various lengths and cross-sectional shapes desired to be passed through the furnace heating chamber, said carrying means being adapted to be progressively moved in trains with the supported stock along skids extending through the heating chamber, and at the discharge end of the latter to be automatically separated from the stock and discharged out of the furnace, as said stock is delivered into a discharge chamber subject to either hand or automatic removal from the furnace.

This invention has for a further object to provide a novel construction of continuous heating furnace, as above generally characterized, wherein the heating chamber hearth is provided with a plurality of laterally spaced, longitudinally extending fluid cooled skids, and wherein the stock carrying means comprises carriage blocks to slidingly engage said skids, carriage block drop hatchways being provided adjacent the discharge end of said hearth, coiled extensions of said fluid cooled skids being preferably imbedded in the hearth, or on the hearth surface if desired, to extend around the mouth portions of said drop hatchways, whereby to protectively lower the temperature of contiguous portions of the hearth, and said drop hatchways communicating with guide chute means adapted to discharge the dropped carriage blocks exteriorly of the furnace.

This invention has for a further object to provide stock carriage blocks of novel shape, having grooved bottom portions to slidingly fit the skids of the furnace heating chamber, and transverse substantially V-shaped top portions having either flat plane or curved surfaces to receive and support the stock.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view of a continuous heating furnace according to this invention; Fig. 2 is a fragmentary horizontal sectional view, taken on line 2—2 in Fig. 1, but drawn on an enlarged scale; Fig. 3 is a transverse vertical section, taken on line 3—3 in Fig. 1, and also drawn on an enlarged scale.

Fig. 4 is an enlarged fragmentary sectional view of the furnace heating chamber hearth and a skid, and showing stock carriage blocks in operative supported relation to the latter, and Fig. 5 is an enlarged perspective view of a stock carriage block.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the illustrative form of heating furnace therein shown comprises a suitably constructed furnace housing 10 interiorly formed to provide an elongated heating chamber 11 having a receiving opening 12 at its outer end. The hearth 13 of said heating chamber 11 comprises a suitably constructed floor made of any suitable refractory material, usually fire clay. At its inner end said heating chamber 11 terminates in a discharge chamber 14, the floor 15 of which is preferably stepped down below the level of the heating chamber hearth 13. Access to said discharge chamber 14 for removal of heated stock therefrom, may be had through a suitably located door opening 16 normally closed by a door 17.

The heating chamber 11 may be fired in any suitable manner and optionally by the combustion of solid, liquid or gaseous fuel. The arrangement of the combustion space will depend, of course, upon the character of fuel employed. Illustratively as shown, if solid fuel is burned, a suitably located grate equipped fire-box 18 is provided, and bounded by a bridge or baffle wall 19 suitably arranged to define admission space 20 through which the hot products of combustion may flow into and through the furnace interior in contact with the stock to be heated. Any suitable flue arrangement (not shown) may be provided for discharging the products of combustion from the furnace interior after they have served their purpose.

According to the present invention, a plurality of longitudinally extending laterally spaced skids 21 are provided to extend inwardly along the furnace hearth 13 from the furnace receiving opening 12. Preferably the skids 21 comprise fluid conductive pipe, partially imbedded in the

hearth 13. Cold water or other suitable cooling fluid is caused to flow through the skid pipes 21, and to such end the same are coupled in circuit with suitable water or cooling fluid supply and circulating means (not shown).

Suitably formed at the inner terminal portion of the hearth 13 and in the underlying furnace bottom are a series of drop hatchways 22 which correspond in number to the number of skids 21, and the same being respectively disposed in alignment with the respective skids. Formed in the furnace bottom are laterally extending inclined discharge chute means leading outwardly from the furnace to the exterior thereof. Said drop hatchways 22 communicate with said discharge chute means, and the latter preferably comprises oppositely extending chute passages 23 leading from a laterally central point respectively to and out of opposite exterior sides of the furnace housing.

The effective exposed trackway portions of the respective skid pipes 21 terminate adjacent to a drop hatchway 22 aligned therewith, thus providing skid trackway terminals 24 at such points. The skid pipes 21 are continued from such terminals 24 to extend upon or into the body of the hearth 13 so as to be imbedded therein, being formed to provide encircling branches 25 extending around the mouth of the corresponding drop hatchway 22, and preferably through the hearth body mass, continuing thence, as e. g. at 26, in any suitable manner for connection with the water or other cooling fluid supply and circulating means. Said encircling branches 25 of the fluid cooled skids thus upon or preferably imbedded in the hearth 13 around the mouth of the drop hatchways, tend to keep down the temperature of the hearth material at such points, thus increasing the resistance thereof to fracture, wear or like deterioration. Preferably the direction of flow of cooling fluid is through the intakes 26, thence through the drop hatchway encircling branches 25 to and through the effective skid trackway portions 21, to be thence discharged through outgoing extensions 27.

Stock carriage blocks are provided for sliding engagement upon and along the skids 21. These stock carriage blocks may be made of any suitable heat resistance material, such e. g. as any hard and tough refractory material such as firebrick or the like, heat resistant steel or other suitably heat resistant metal. Each carriage block comprises a rectangular body 28 of suitable length, width and height. Formed in the bottom face of said body 28 is a longitudinal tracker groove 29 of suitable cross-sectional shape to embracingly engage a skid 21 for sliding movement therealong. Formed in the top of said body 28 is a transverse substantially V-shaped trough 30 having either flat plane or curved surfaces, the sides of which diverge at a desired included angle, preferably one of approximately 90 degrees.

In use two or more carriage blocks are mounted abreast on selected skids 21 according to the length of stock piece S to be carried thereby, and the latter is then deposited across the carriage blocks thus disposed so as to lodge and center in the troughs 30 thereof, and thus in supported bridging relation across said carriage blocks. Trains of carriage blocks thus arranged and loaded are caused to abut one behind another, so that the trains and their loads may be progressively pushed along over the skids 21 and through the furnace heating chamber 11, whereby the thus carried stock is subjected to the desired heating treatment as it is progressively advanced over the hearth 13.

It will be obvious that by reason of the substantially V-shape of the transverse stock supporting troughs of the carriage blocks, the stock pieces S will automatically center themselves upon said carriage blocks no matter what may be their cross-sectional shape, whether of square or other polygonal shape, or round, oval or other curvilinear shape. It will therefore be understood that the carriage blocks are well adapted to accommodate many different types of stock, such as billets, scrap fagots, rods, shafts, strips, etc.

Since the areas of bearing contact of the stock pieces S with the surfaces of the carriage blocks will be reduced to a minimum, it will be apparent that substantially the entire surface areas of the supported stock pieces will be subjected to furnace heat with a minimum of loss by conduction through the support, and consequently but a minimum of discoloration or spotting of the stock will occur.

Inasmuch as a number of laterally parallel spaced skids 21, at least more than two, are provided, it will also be seen that the carriage blocks may be easily grouped and arranged in given laterally spaced relation best adapted to accommodate stock pieces S of variously different lengths, and yet such adjoining pieces and their supporting carriage blocks may be operatively arranged to form the desired trains of carriage blocks at suitable points so as to assure progressive propulsion of the supported stock through the furnace heating chamber 11 (see Fig. 2).

Any suitable means may be provided in aid of handling and assembling the carriage blocks and their accommodated stock loads preparatory to entering the same into the heating chamber 11 through the receiving opening 12 thereof, such e. g. as a loading platform or table 31 (Fig. 1). Suitable means may likewise be provided, for pushing the trains of loaded carriage blocks into and through the furnace heating chamber, such e. g. as hydraulically or mechanically operated propulsion means 32 (Fig. 1). Such loading and propulsion facilities are well known to the art.

In operation, as the leading set of carriage blocks and the stock piece S supported thereby, which heads the train of stock moving through the furnace heating chamber 11, reach and pass off of the terminals 24 of the skids 21, said carriage blocks will, when thus pushed off the skids, fall into the adjacent drop hatchways 22, thereby separating the same from the stock piece S. The stock piece remains supported upon the hearth end, subject to being pushed off therefrom for deposit onto the floor 15 of the discharge chamber 14 (see Fig. 1), whence it may be manually removed through the opened doorway 16, or automatically removed by suitably provided conveyer means in accordance with practice already well known in the art.

As the carriage blocks pass downwardly through the drop hatchways 22, the same lodge in the outgoing chute passages 23, down which they slide so as to be ejected onto the furnace room floor exteriorly of the furnace, and thus conveniently disposed for cooling, recovering and subsequent reuse.

From the above description it will be obvious that the present invention provides a novel and very efficient continuous heating furnace, which, among other advantages hereinbefore referred to, is especially well adapted for handling and

treating stock pieces of various lengths and cross-sectional shapes.

I am aware that some changes could be made in the above described constructions, and widely different embodiments of this invention could be made without departing from the scope thereof as defined by the herefollowing claims. It is therefore intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A heating furnace having a heating chamber, a series of laterally spaced parallel skids, more than two in number, extending along the heating chamber hearth from its receiving toward its discharge end, stock carriage elements adapted to be slidably mounted on said skids and selectively laterally grouped on two or more of the latter according to a length of stock piece to be supported and carried thereby, at least some of the thus grouped carriage elements longitudinally abutting those of adjacent groups whereby to form trains adapted to be pushed with the carried stock through said heating chamber, and means adapted to separate said carriage elements from a stock piece carried thereby and to discharge the same exteriorly of the furnace when said stock piece reaches the end of the heating chamber hearth subject to discharge therefrom.

2. A heating furnace having a heating chamber, a series of laterally spaced parallel skids more than two in number, extending along the heating chamber hearth from its receiving toward its discharge end, the bottom portion of said furnace having drop hatchways opening through the heating chamber hearth adjacent to the discharge end of the latter, said hatchways corresponding in number to and being respectively aligned with and adjacent to the respective discharge ends of said skids, said furnace bottom portion being further provided with chute passage means leading from said hatchways to the furnace exterior, and stock carriage elements adapted to be slidably mounted on said skids and selectively laterally grouped on two or more thereof according to a length of stock piece to be supported and carried thereby, at least some of the thus grouped carriage elements longitudinally abutting those of adjacent groups to form trains adapted to be pushed with the carried stock through said heating chamber, said carriage elements being adapted to be discharged exteriorly of the furnace through said hatchways and chute passage means when a stock piece carried thereby reaches the end of the heating chamber hearth subject to discharge therefrom.

3. A heating furnace having a heating chamber, a plurality of fluid cooled skid pipes extending upon and along the heating chamber hearth from its receiving toward its discharge end, the bottom portion of said furnace having drop hatchways opening through the heating chamber hearth adjacent to the discharge end of the latter, said hatchways corresponding in number to and being respectively aligned with said skid pipes, the effective trackway portions of said skid pipes terminating adjacent to said hatchways, said skid pipes including encircling branches to extend around the mouths of said hatchways and thence to said effective trackway portions thereof, said furnace bottom portion being further provided with chute passage means leading from said hatchways to the furnace exterior, and stock carriage elements adapted to be slidably grouped thereon according to a length of stock piece to be carried thereby, at least some of the thus grouped carriage elements longitudinally abutting those of adjacent groups to form trains adapted to be pushed with the carried stock through said heating chamber, said carriage elements being adapted to be discharged exteriorly of the furnace through said hatchways and chute passage means when a stock piece carried thereby reaches the end of the heating chamber hearth subject to discharge therefrom.

4. For application to a skid of a heating furnace, a stock carriage element comprising a rectangular block-like body made of heat resistant material, said body having a longitudinal tracker groove in its bottom face to slidingly embrace a skid; and said body being further provided in its top with a transverse trough to receive and seat a stock piece immovably across the body with a minimum of surface contact therewith.

5. For application to a skid of a heating furnace, a stock carriage element comprising a rectangular block-like body made of heat resistant material, said body having a longitudinal tracker groove in its bottom face to slidingly embrace a skid, and said body being further provided in its top with a transverse substantially V-shaped trough to receive and seat a stock piece immovably across the body with a minimum of surface contact therewith.

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