Aug. 14, 1928. 1,680,468

F. MENNE

FURNACE

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Fig. 1.

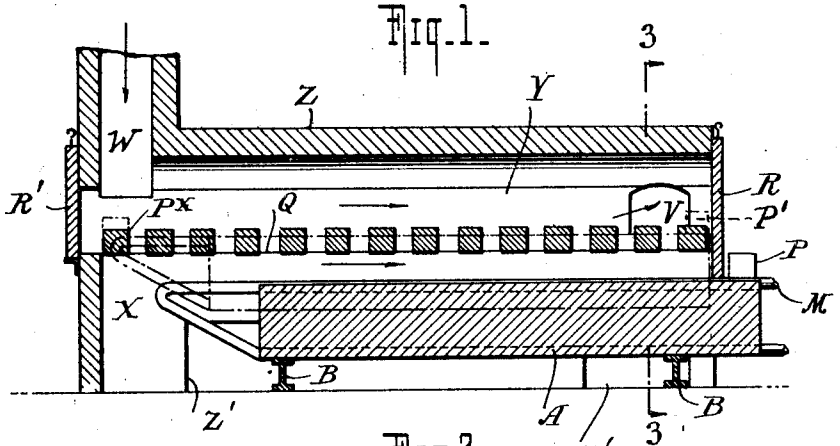


Fig. 2.

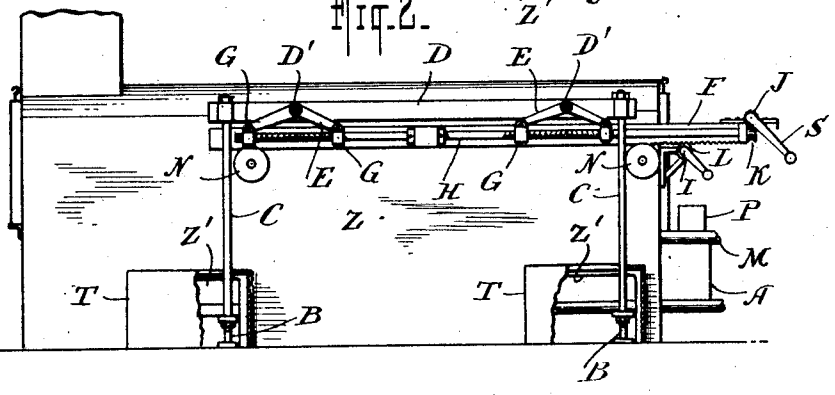


Fig. 3.

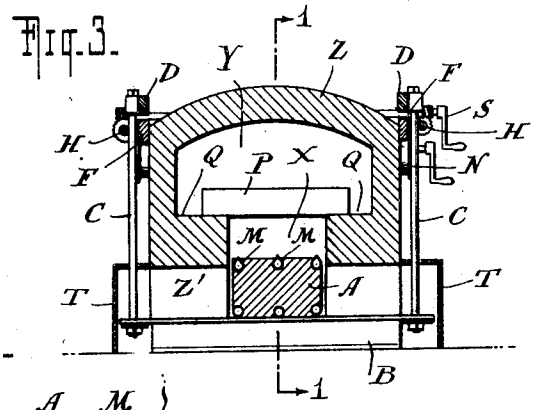
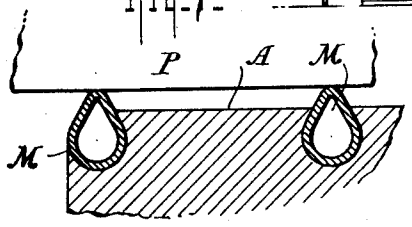


Fig. 7.



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Fig. 4.

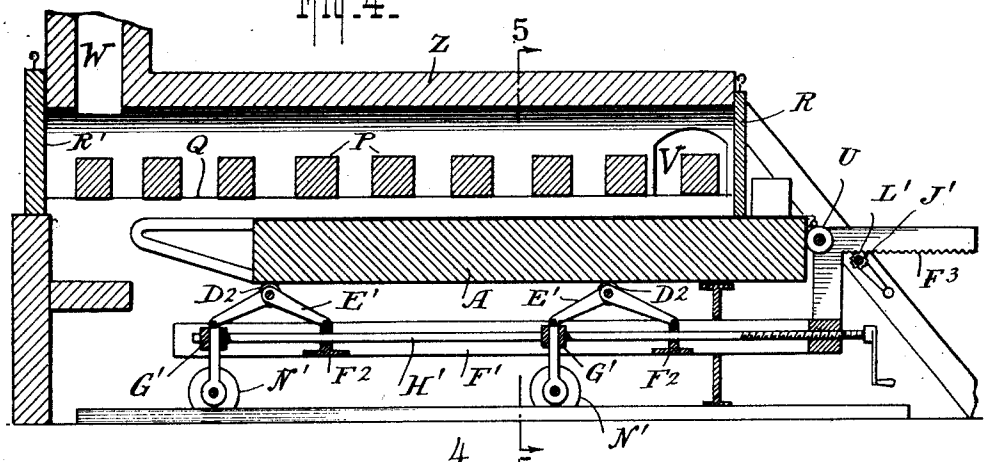


Fig. 5.

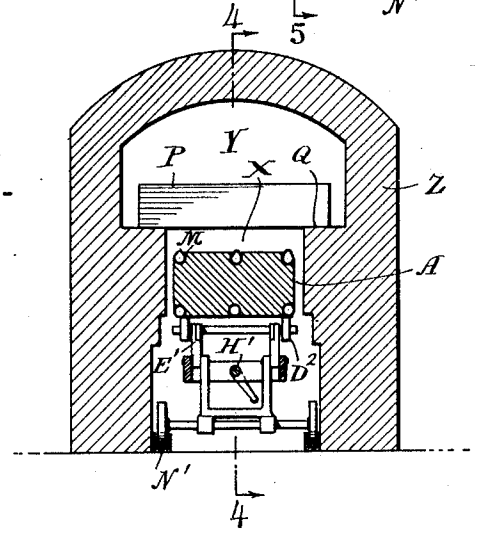
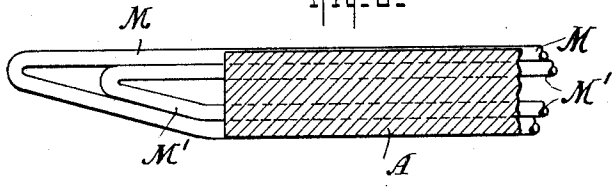


Fig. 6.



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UNITED STATES PATENT OFFICE.

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FURNACE.

Application filed May 20, 1927, Serial No. 192,815, and in Germany October 9, 1925.

My invention relates to furnaces of the type in which the material to be heated is caused to travel within the furnace. The particular embodiments of my invention illustrated by the accompanying drawings have been devised for heating bundles of metal scrap to a temperature exceeding red heat, so that the pieces of scrap iron or the like will become welded together, thus facilitating the handling and further treatment of such bundles. I desire it to be understood, however, that my invention may be applied to other uses as well. The object of my invention is to provide an efficient furnace of the type indicated, having an improved arrangement for feeding the material interiorly of the furnace with a minimum of jarring or other disturbance. Other features of the invention will appear from the detailed description following hereinafter and from the appended claims.

Reference is to be had to the accompanying drawings, in which Fig. 1 is a longitudinal vertical section through a furnace embodying my improvements, said section being taken on the line 1—1 of Fig. 3, Fig. 2 is an outside view of the furnace, with parts broken away; Fig. 3 is a cross-section on the line 3—3 of Fig. 1; Fig. 4 is a longitudinal section taken on the line 4—4 of Fig. 5 and showing another form of my invention; Fig. 5 is a cross section on the line 5—5 of Fig. 4, Fig. 6 is a partial longitudinal section of still another form of my invention and Fig. 7 is a detail transverse section of a movable bottom, showing the same with a bundle supported thereon. The furnace Z is shown as having a longitudinal chamber or passage Y the ends of which may be closed by doors R, R′, generally suspended and arranged to be moved up or down by means of any suitable mechanism (not shown). At its center, the passage Y is provided with a downward extension X, and the portions Q at the sides of this extension or channel X constitute a floor or support for the articles P to be heated in the furnace and to be fed lengthwise thereof, in the direction from R to R′ (from right to left). These articles may, for instance, be bundles of scrap iron, such bundles being preferably of rectangular prismatic shape, as shown, and of such a length as to bridge the channel X, see Figs. 3 and 5.

In the channel X is arranged a bottom A movable up and down so that its upper surface may be brought either below the level of the floor Q as shown in full lines, or above such level, as indicated by dotted lines in Fig. 1. In addition to its vertical movement, the bottom A also has a longitudinal movement in the channel X. These movements may be performed in any suitable manner, but the mechanism for effecting them is preferably located exteriorly of the furnace proper, so as not to be exposed to the direct heat of the furnace gases.

According to Figs. 1, 2 and 3, the movable bottom A is supported on cross bars B extending through lateral openings Z′ of the furnace. The ends of these cross bars are located exteriorly of the furnace proper, and secured to the lower ends of external suspension rods C. The upper ends of said rods C are secured to external longitudinal bars D, supported at D′ by means of toggle-like links E the upper ends of which are pivoted at D′. The lower ends of said links are pivotally connected with nuts G movable lengthwise on shafts H. The nuts connected with the same pair of links engage shaft portions threaded in opposite directions. Thus, as the shafts H are rotated, the nuts G of the same pair will be moved toward or from each other, and the bars D with the bottom A raised or lowered as the points D′ move up or down. The shafts H are journaled in longitudinal bars F in such a manner as to prevent longitudinal movement of the shafts relatively to said bars F. Any suitable mechanism may be provided for rotating said shafts, for instance worm gearing K on a transverse shaft J having a handle or crank S for operating it, all these parts being located exteriorly of the furnace proper. The bars F and all the parts carried thereby, are movable lengthwise of the furnace. For this purpose, said bars may rest on the peripheries of rollers N suitably journaled on the furnace and a transverse shaft I journaled on the furnace adjacent to the door R may be provided with pinions L in mesh with rack teeth on said longitudinal bars F. Thus, by rotating the shaft I, the operator can move the bottom A lengthwise of the furnace, and by rotating the shaft J, he can raise or lower said bottom.

In operation, the first bundle P is depos-

ited on the bottom A while the latter is in its lower position and projected from the furnace, as indicated at the extreme right in Fig. 1. The bottom A is then raised with said bundle P until the latter is above the level of the floor Q. Thereupon the door R is opened temporarily, and the bottom A moved toward the left to bring the bundle P to the position P′, within the furnace, and the door R is closed again, the bottom A being in the position indicated by the dotted lines. The bottom A is then dropped back to its initial position, thus depositing the bundle P on the floor Q.

By a periodical repetition of the operations just described, additional bundles P are introduced into the furnace, while at the same time the bundles previously introduced are moved, step by step, toward the outlet door R′. The furnace gases (of any suitable character) are admitted at W and travel in the chamber or passage Y to the outlet V, in the direction opposite to the travel of the bundles P. It will be noted that the bundles are spaced regularly, and that their central portions, above the channel or extension X, are unsupported and freely exposed to the heating medium when the bottom A has been lowered as shown in Fig. 3. The heating gases therefore have free access to practically all portions of the bundles P, and the scrap iron or other material is heated very efficiently, and preferably to welding heat so as to produce a bundle that will not fall apart during subsequent handling. For instance, when a bundle has reached the final position indicated at P^x, at the extreme left of Fig. 1, the door R′ may be opened and said bundle grasped by jaws or tongs (not shown) to withdraw it from the furnace and place it in a suitable press where such bundle is reduced in size considerably and thus made more convenient for shipment or further treatment. When the bottom A is moved to the right, a sufficient space is left below the inlet W to allow solid matter to drop between the door R′ and the adjacent end of the bottom A. For the purpose of making repairs, the bottom A may be slid lengthwise on its supporting cross bars B toward the right and if desired removed from the furnace entirely.

As the operating mechanism for moving the bottom A is located exteriorly of the furnace, such mechanism is not exposed to the direct action of heat, and will therefore be very durable. Protective housings T may be provided at the lower ends of the suspension rods C.

I have found it desirable in many cases to protect the bottom A, and particularly its upper portion, that is to say, the portion which comes in contact with the hot gases. For this purpose, pipes M through which cooling water is caused to flow, are arranged at said upper portion and also, if desired, at other portions of the bottom A. Preferably, these pipes project upwardly from the upper surface of the bottom, and may be made roof-shaped, as shown, so that the bundles P will not rest directly on said upper surface, but only on the pipes M, thus enabling the hot gases to get at the central portions of the lower surfaces of the bundles, even when the bundles are raised above the floor Q. At the end of the bottom A nearest the outlet door R′, the pipes M preferably project lengthwise from the bottom A forming an open-work or grate like support through which scale and my other loose matter may drop from the bundles P before the latter are discharged from the furnace. In Figs. 1, 2 and 3 I have indicated three cooling pipes M each comprising an upper run and a lower run located in the same vertical plane. In Fig. 6, greater strength is obtained by employing, in addition to the said pipes M, pipes such as M′, fitted within or between the runs of the corresponding pipe M, and in the same vertical plane therewith.

In the construction illustrated by Figs. 4 and 5, the toggle links E′ are disposed below the bottom A, and at their upper pivots said links carry rollers D^2 supporting the bottom A. Each pair of links has the lower end of one link connected pivotally with a bracket or cross bar F^2 rigid with a longitudinally movable frame F′. The lower end of the other link of each pair is pivotally connected with a cross head G′ movable lengthwise of the frame F′, and provided with a roller N′ running on a stationary track. The two cross heads G′ are connected with a shaft H′, in such a manner that shaft and cross heads will be compelled to move in unison lengthwise of said frame F′, the shaft having a threaded portion fitting into a correspondingly threaded opening of said frame. This mechanism enables the bottom A to be raised and lowered, for the same purpose as described in connection with Figs. 1, 2 and 3. The longitudinal movement of the bottom A is obtained by moving the frame F′ lengthwise of the furnace Z. For this purpose, the said frame may be provided with a central longitudinal rack portion F^3 engaged by a pinion L′ on a transverse shaft J′ which is journaled on the furnace Z. A roller U journaled on the frame F′ and engaging one end of the bottom A may be employed to guide said end during its vertical movement. It will be noted that in this case also, the mechanism for operating the bottom A is located externally of the furnace proper and therefore protected against the direct action of the heating gases.

Various modifications may be made without departing from the nature of my invention as set forth in the appended claims.

I claim:

1. A furnace having a longitudinal passage, a loose bottom adjacent to said passage, toggle links operatively associated with said bottom, a support movable lengthwise of the furnace and carrying said toggle links, mechanism mounted on said support for varying the distance between the ends of the toggle links and thereby raising or lowering said bottom, and mechanism for moving said support lengthwise of the furnace together with said bottom.

2. A furnace having a longitudinal passage, a loose bottom arranged adjacent to said passage longitudinally thereof and provided with cooling pipes projecting lengthwise from the upper surface of the bottom and beyond one end thereof and spaced to form an open-work support at such end to permit loose material to drop through.

3. A furnace having a longitudinal passage, a loose bottom movable both lengthwise of the furnace adjacent to said passage and also movable up and down, a support movable lengthwise of the furnace but held against vertical movement, toggle links pivotally connected with each other in pairs, the distant or free ends of links of the same pair being carried by said support, and relatively movable lengthwise of the furnace to decrease or increase the distance between such free ends and thereby cause the adjacent ends of the links of each pair to move up or down, means whereby the up or down movement of said adjacent ends of the toggle links will cause a like movement of the loose bottom, and mechanism for moving said support with the toggle links and the bottom lengthwise of the furnace.

In testimony whereof I have hereunto set my hand.

FRITZ MENNE.