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CHARGING APPARATUS FOR METAL HEATING FURNACES AND THE LIKE

Filed April 28, 1931

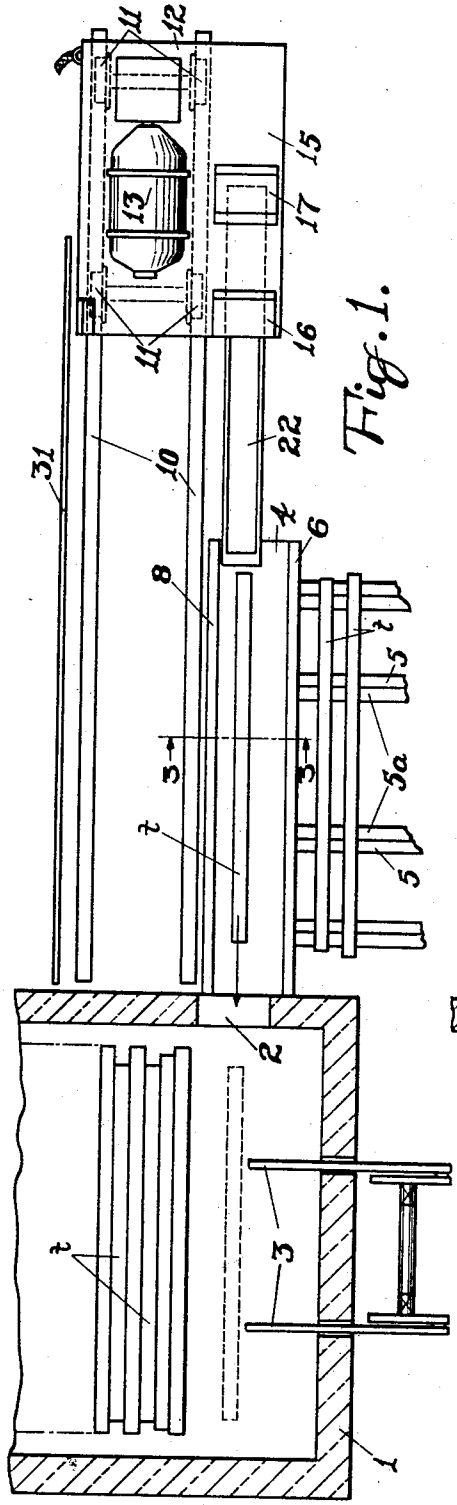


Fig. 1.

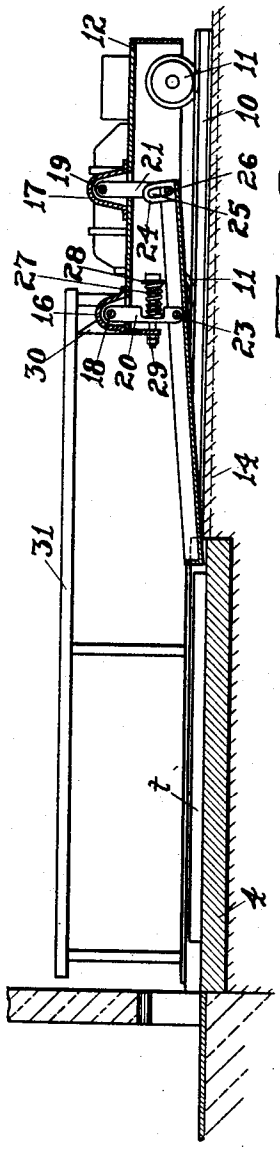


Fig. 2.

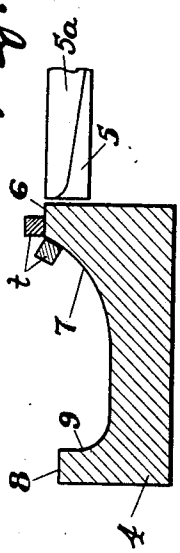


Fig. 3.

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UNITED STATES PATENT OFFICE

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CHARGING APPARATUS FOR METAL-HEATING FURNACES, AND THE LIKE

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This invention relates to the charging of a furnace or the like, with successive billets, bars or other pieces,—the charging operation involving endwise movement of each piece through a suitable charging opening, under the influence of a mechanical pusher which engages the rear end of the piece.

The invention resides in important improvements and advantages in the construction and mode of operation of charging devices of this type, all as fully set forth and described in the following detailed description, reference being had in this connection to the accompanying drawing, in which:—

Fig. 1 is a diagrammatic plan view, partly sectional, showing the invention applied to a heating furnace.

Fig. 2 is a view in side elevation, partly in section, of the apparatus shown in Fig. 1.

Fig. 3 is a transverse sectional view, on the line 3—3 of Fig. 1, looking in the direction of the arrows.

Like reference characters refer to like parts in the different figures.

Fig. 1 shows in sectional plan view the charging end of a furnace 1 having a charging opening 2, through which billets *t*, *t* are adapted to be projected endwise, each billet coming to rest on the floor or hearth of the furnace, in position to be acted upon by the usual interior broadside pushers 3, 3. The latter, after each billet-charging operation, are given a single reciprocation, whereby to impart to the newly-charged billet or billets (and the billets previously received on the furnace hearth) a broadside movement toward the discharge end of the furnace; in this manner, at each operation of the furnace pushers 3, 3 the way is cleared for the charging of an additional billet or billets through the opening 2, and also the farthest-advanced billet in the furnace is brought into line with a discharging pusher, not shown, which is operable to procure the endwise delivery of said billet through a suitable side-wall discharge opening at the other end of the furnace.

As best shown in Figs. 1 and 2, the charging opening 2 of the furnace has alined therewith a trough 4, for the reception and guidance of the billet or billets which are to be pushed endwise through said opening. The billets *t*, *t*, as here shown, are adapted to be delivered broadside into said trough 4 from suitable sets of parallel supporting skids 5, 5*a* disposed at one side of said trough. Any suitable means may be provided to secure broadside delivery of the billets from said skids into said trough; for example, certain of said skids 5*a* may be movable, relative to the other skids 5, to secure, in a manner well-known in the art, the step-by-step broadside movement of the billets thereon. Each billet *t*, by such movement is finally lifted clear of the stationary skids 5 and deposited beyond the ends thereof in position to descend by gravity to the bottom of trough 4, whose wall 6, on the receiving side presents an inner concave surface 7 of relatively large radius, so as to promote the rolling of each billet received thereon to the bottom of said trough. The opposite wall 8 of trough 4 rises more abruptly from the bottom of the trough, as shown at 9, and thereby serves as an abutment to bring to rest gradually the billets that slide or roll down the surface 7.

Arranged alongside the wall 8, on the opposite side of trough 4 from the skids 5, 5*a*, are a pair of parallel rails 10, 10, for supporting and guiding the traction wheels 11, 11, of a carriage or truck, designated as a whole by the numeral 12. This car or truck 12, so far as its operating and controlling mechanisms are concerned, may be of any suitable type of self-propelled device, arranged, at the will of an operator, to move variable distances in either direction on the track provided by the rails 10, 10; as here shown, the car 12 carries a reversible electric driving motor 13 which is suitably connected by gearing, not shown, to the traction wheels 11, 11, and this motor in the usual way is subject readily to the operator's control, for starting and stopping the car and for procuring its movement in either direction for any distance required.

The track 10, 10 for the car 12 is preferably supported substantially at the floor level 14 so that the car and its operating parts, as well as the trough 4 from which the car is offset,

are accessible, both from the floor, and from above, by means of an overhead crane, for purposes of repair and service. According to the invention, the body or frame 15 of the car 12 is laterally extended beyond the rails 10, 10, to overlie the trough 4 which runs alongside said rails; as here shown, two lateral extensions 16 and 17 are provided, these supporting the transverse trunnions 18 and 19, for the pivotal suspension of spaced yokes 20 and 21 respectively. These depending yokes provide the support for an elongated pusher bar 22 which is pivoted at 23 to the lower end of yoke 20. The inner end of pusher bar 22 provides substantially upright ears 24, 24 having elongated slots 25, 25 therein for the passage of a transverse pin 26 carried by the free end of yoke 21, said pin 26 being above the level of the pivot pin 23 of the pusher bar.

The pusher bar 22 projects forwardly, on the other side of its pivot pin 23 for a somewhat greater length than the distance between the yokes 20 and 21, this arrangement causing the pusher bar to assume the inclined position shown in Fig. 3, with its free forward end supported substantially at the level of the bottom of the trough 4. In this position, the pin 26 occupies the lower ends of the slots 25, 25. This is the operative position of the pusher bar 22, and it will be understood that when a billet is delivered to the trough 4 with the car 12 in the retracted position shown in Fig. 1, the subsequent movement of said car toward the furnace, along the tracks 10, 10, will engage the front end of the pusher bar with the rear end of said billet, to push the latter longitudinally through the charging opening 2 into the desired position on the furnace floor,—the pusher bar at its forward end projecting through said opening for as great a distance as may be required by the length of the billet.

Means are preferably provided to cushion the impact of the pusher bar with the billet; as shown in Fig. 2, the forward yoke 20 on which the pusher bar is pivoted is yieldingly held against counterclockwise swinging about its trunnion 18 by a spring 27, the latter bearing at one end against yoke 20 and at the other end against an annular member 28 which is carried on a rod 29 adjustably supported by the extension 16 of car 14. This spring 27 absorbs the impact of the pusher bar with the billet or billets in trough 6 and limits the counterclockwise rocking of the yokes 20 and 21 resulting from such impact. In other words, the engagement of the forwardly moving pusher bar with a billet or billets at rest in the trough 6 occurs without noticeable shock; this is due not only to the cushioning action of spring 27, but also to the fact that the wheels 11, 11 of car 12 produce their tractive effect by frictional engagement with the rails 10, 10. The action of spring 27 is especially important when the car is working at high speed, since it enables the pusher bar 22 to take on its load gradually, thus tending to maintain the "standing" frictional contact between wheels 11 and rails 10, instead of changing to a "sliding" frictional contact.

The successive billets *t*, *t* as deposited in front of the pusher may vary somewhat in length, and in order to secure their symmetrical positioning within the furnace, as shown in Fig. 1, the car may provide a pointer 30 that is carried by the motion of the car along a suitable scale 31, the latter displaying markings to indicate to the operator the correct stopping positions of the car for different billet lengths. In this way, the front end of the pusher bar 22 can be made to move just far enough into the furnace through the opening 2 so that, regardless of the length of any billet, its longitudinal center always will come to rest at the same point within the furnace.

The trunnion mounting between pusher and carriage permits the former to override, on its return stroke, any billet that may have gotten prematurely into the trough 4 while the pusher is still in a forward position. I make no claim, broadly, to the provision of a pivotally mounted pusher, but I do claim as new the provision of a pusher whose pivotal mounting is remote from the billet-engaging front end of the pusher, whereby, in the projection of the pusher's front end into the furnace as each billet is charged, there is no damage to the pivotal mounting, from the intense heat prevailing in the furnace.

I claim:

1. In charging apparatus of the class described, the combination with a furnace having a charging opening, of a trough alined with said opening and adapted for the reception and endwise delivery to said opening of elongated pieces of stock, a track alongside said trough and offset therefrom, a carriage movable on said track, and a pusher for engaging the rear ends of said pieces, said pusher being supported by said carriage in overhanging relation to said trough, with its stock-engaging end appreciably nearer to said opening than said carriage.

2. Charging apparatus of the class described, comprising a trough adapted for the reception and delivery, endwise, of elongated pieces of stock, a carriage adapted to travel alongside said trough, and an elongated pusher member pivotally suspended near one end from said carriage, with its other end bottoming substantially in said trough, to engage the stock in said trough at a point remote from said carriage.

3. Charging apparatus of the class described, comprising a trough adapted for the reception and delivery, endwise, of elongated pieces of stock, a carriage adapted to travel

alongside said trough in offset relation thereto, a pivot on said carriage, in transverse overlying relation to said trough, and a pusher trunnioned near one end on said pivot, with its other end bottoming substantially in said trough, to engage the stock in said trough at a point remote from said carriage.

4. Charging apparatus of the class described, comprising a trough adapted for the reception and delivery, endwise, of elongated pieces of stock, a carriage adapted to travel alongside said trough in offset relation thereto, a pivot on said carriage, in transverse overlying relation to said trough, a pusher trunnioned near one end on said pivot, with its other end bottoming substantially in said trough, to engage the stock in said trough at a point remote from said carriage, and means for maintaining said last-mentioned end substantially at the level of the trough bottom, when the pusher moves out of said trough.

5. Charging apparatus of the class described, comprising a trough adapted for the reception and delivery, endwise, of elongated pieces of stock, a carriage adapted to travel alongside said trough and providing a portion overhanging said trough, a pusher pivotally suspended from said overhanging portion, with its free forward stock-engaging end appreciably spaced from said carriage, and means for maintaining said pusher's forward end substantially at the level of the trough bottom.

6. Charging apparatus of the class described, comprising a trough into which the articles to be charged are delivered, a carriage adapted to travel substantially parallel to said trough, a member pivotally suspended from said carriage, and a pusher extending longitudinally of said trough and pivoted, in offset relation to its longitudinal center, at the free end of said pivotally suspended member.

7. Charging apparatus of the class described, comprising a trough adapted for the reception and delivery, endwise, of elongated pieces of stock, a carriage adapted to travel substantially parallel to said trough, a member pivotally suspended from said carriage, and a pusher extending lengthwise of said trough, and attached near one end to said pivotally suspended member, the stock-engaging end of said pusher being appreciably spaced from said carriage and bottoming substantially in said trough.

8. Charging apparatus of the class described, comprising a trough into which the articles to be charged are delivered, a carriage adapted to travel substantially parallel to said trough, a pair of longitudinally spaced members, both pivotally suspended from said carriage, an elongated pusher extending lengthwise of said trough and pivoted at an intermediate point in its length to the free end of one of said members, and a connection between said pusher and the other of said members to hold said pusher at an incline to the bottom of said trough, with the other end of said pusher substantially at the level of said bottom.

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