

(No Model.)

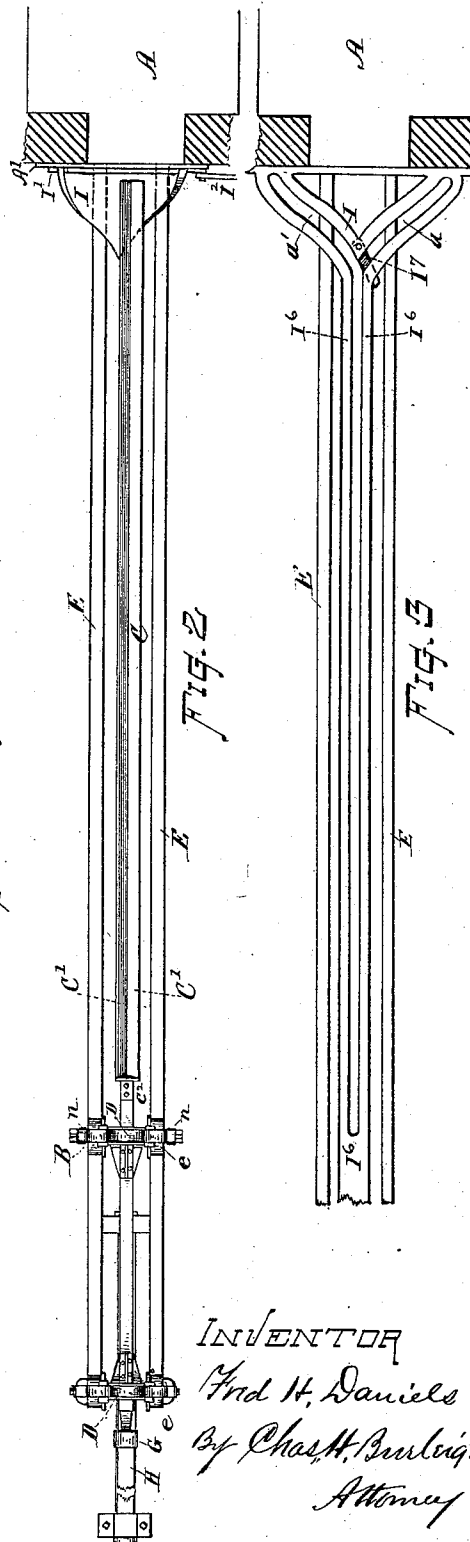
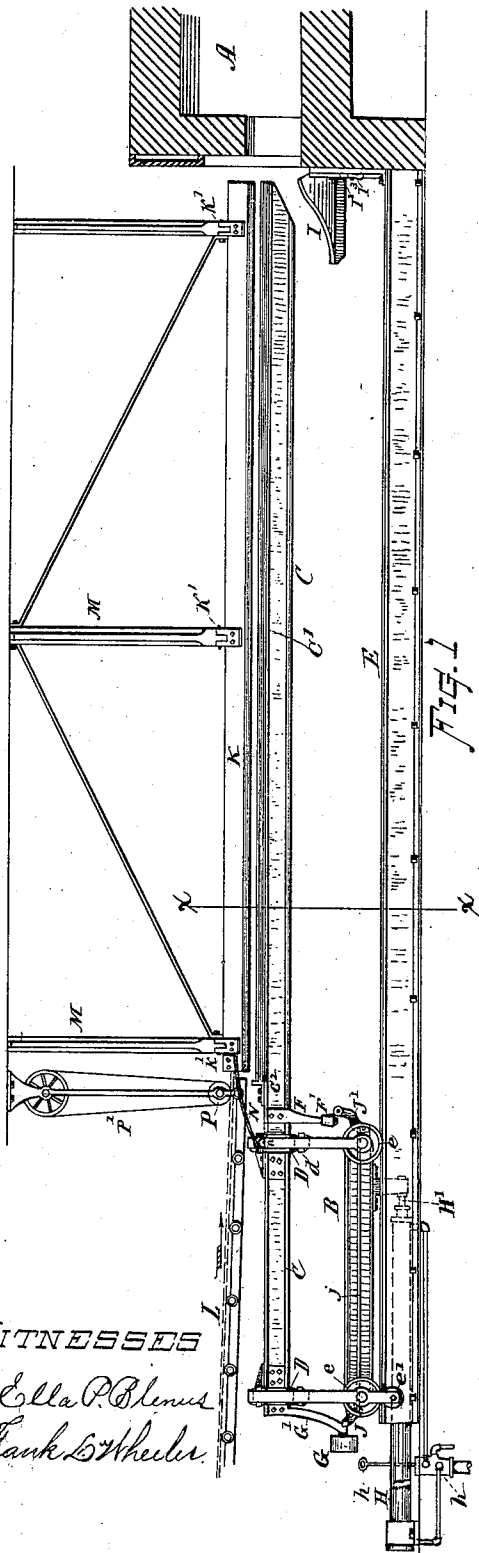
2 Sheets—Sheet 1.

F. H. DANIELS.

FURNACE CHARGING MECHANISM.

No. 367,194.

Patented July 26, 1887.



WITNESSES

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(No Model.)

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2 Sheets—Sheet 2.

FURNACE CHARGING MECHANISM

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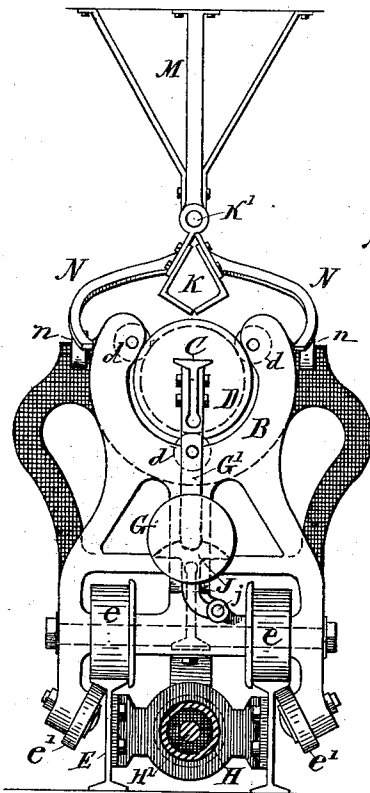


FIG. 4

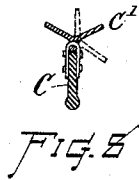


FIG. 5

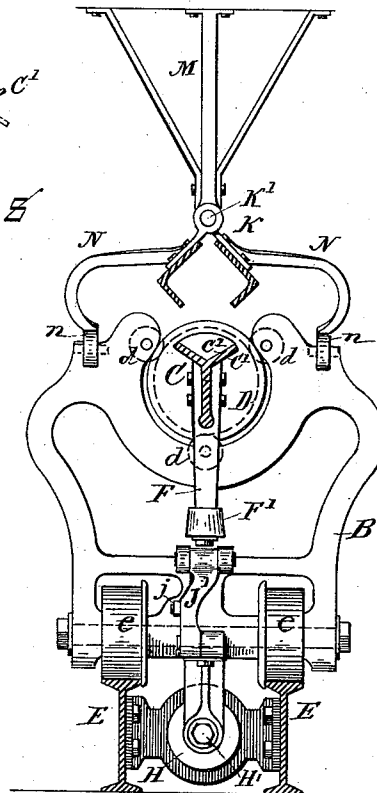


FIG. 5

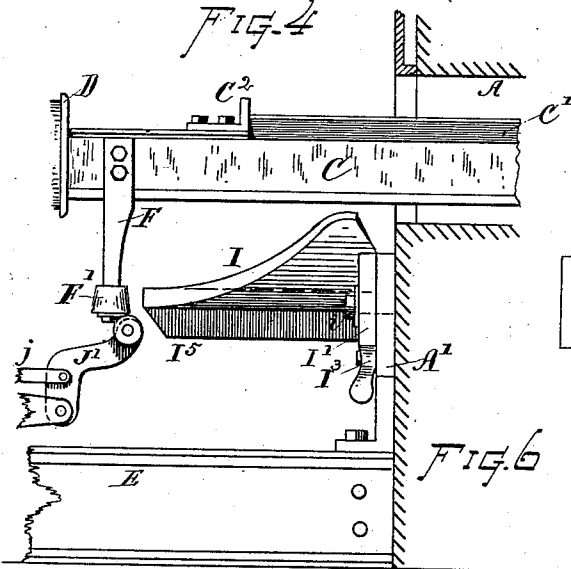


FIG. 6

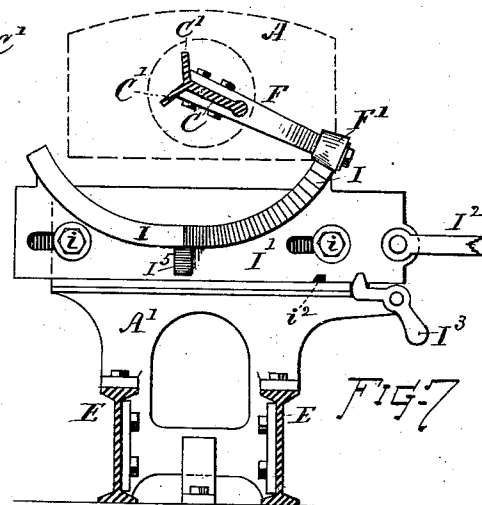


FIG. 7

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# UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

## FURNACE-CHARGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 367,194, dated July 26, 1887.

Application filed February 19, 1887. Serial No. 223,252. (No model.)

*To all whom it may concern:*

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Furnace-Charging Mechanism for Rolling-Mill Products, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The objects of my present invention are, first, to provide a simple and efficient apparatus for mechanically introducing or charging billets, bars, rods, and similar rolling-mill products into a heating furnace; second, to provide, in a furnace-charging mechanism, a carrier whereon the bar, billet, or product is supported for its introduction into the furnace, which carrier is capable of an oscillating or tipping action for effecting the discharge of the bar within the furnace; third, to provide, in a charging apparatus, in combination with means for supporting and projecting the same into a furnace, which carrier is adapted for discharging the bar or product therefrom laterally right or left; fourth, to afford, in combination with the charging mechanism, means under control of the attendant for directing the discharge of the product from the carrier either to the right or to the left thereof, as may be desired; fifth, to provide, in a furnace-charging apparatus, a receiving mechanism for receiving and supporting the billet or bar while the charging device is advancing and receding to and from the furnace; sixth, to provide, in combination with receiving and charging mechanism, means for effecting the release of the bar from the receiving mechanism and its delivery to the charging carrier when the latter is at proper position for its reception; and, seventh, to provide, in combination with a furnace-charging apparatus, a receiving and supporting mechanism for the temporary support of a hot bar, in which the supporter is adapted for inclosing and protecting the bar from the atmosphere and for retaining the inherent heat thereof. These objects I attain by mechanism the nature and operation of which is explained in the following description, the

particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a side view of a charging apparatus, illustrating the features of my invention. Fig. 2 is a plan view of the same. Fig. 3 is a plan view illustrating a modified construction of the cam devices for controlling the tipping action of the carrier. Fig. 4 is an end view on a somewhat larger scale. Fig. 5 is a transverse vertical section at line *xx*, Fig. 1, looking toward the supporting frame or carriage. Fig. 6 is a detail view showing the side of the discharging-cam, a portion of the carrier, and other parts at a position adjacent to the furnace. Fig. 7 is a vertical sectional view looking toward the discharge-cam. Fig. 8 is a sectional view illustrating a modification in construction of the carrier.

In the present drawings, the furnace A is not shown in its full dimensions, owing to the limit of space on the drawing-sheet; but it will be understood that said furnace may be of any suitable construction and dimensions. For the purpose of this description it will be considered as a furnace of the kind ordinarily employed for heating long bars or billets preparatory to reducing them by rolling operation in a wire-rod train.

The first part of my present invention relates to the means for introducing the bars into the furnace. For this purpose I employ a carrier, C, consisting of a long beam, having thereon a cradle or surface for sustaining the billet or bar, which carrier is mounted, in connection with a movable supporting-frame, in a manner to have oscillative movement, so that the end of said carrier, with the product to be charged, can be projected forward into the furnace and the cradle or sustaining surface then tipped or inclined to one side for discharging the bar or product therefrom laterally to deposit it on the bottom of the furnace. Combined with this charging-carrier I employ means for advancing and retracting it to and from the furnace by power under easy control of an attendant, and also devices for effecting the tipping of the carrier automatically when at the proper position and at the proper instant of time. The carrier is preferably formed of a single beam or girder supported in substantially horizontal position by means of the

frame or carriage B at its rear end, and longitudinally movable along a track or guideway, E, to and from the mouth of the furnace, the carriage being connected with hydraulic mechanism whereby the charger is advanced and retracted under control of the attendant, who manipulates the valve devices *h*, as desired.

The carriage B is preferably provided with truck-wheels *e e*, that run on the guideways or tracks E, and also has at its rear end a set of guard-rollers, *e'*, that lock under the flanges of the track-beams, so as to prevent the rear end of the carriage from tipping up by preponderance of weight of the carrier and its load.

The carrier C is in the present instance journaled on its supporting frame or carriage B in such a manner that it can be oscillated or tipped laterally to the right or left, the beam being furnished with cylindrical bearings D, fixed thereon, and working in connection with a series of anti-friction rollers, *d*, mounted upon the supporting-frame B. That part of the carrier C which enters the furnace extends from its supporting-carriage B in a clear projection of sufficient length to sustain the bar, and is provided with lateral arms or flanges C', preferably upwardly inclined, which form a seat or cradle for containing the bar or product to be introduced to the furnace. The space upon these flanges or cradle C' may be adapted for charging bars singly or for charging several bars, more or less, at one time. C<sup>2</sup> is a guard-lug at the back end of the cradle.

The mechanism which I deem best for moving the charger forward and back consists of a long cylinder, H, having a piston-rod, H', which connects direct to a portion of the carriage or supporting-frame B. Said cylinder H is adapted for double action or for introducing pressure at front or rear of the piston under control of suitable valve mechanism, *h*. In Figs. 1 and 2 of the drawings this cylinder is shown shortened, so as to bring it within the limit of the drawing-sheet.

F indicates an arm attached to the carrier-beam C near the supporting-frame B. The end of this arm, which is preferably provided with a roller, F', engages with an inclined deflector or cam, I, as the charger-frame approaches the furnace, and is by said deflector forced to one side for oscillating or tipping the carrier sufficiently to dump the bar from the carrier onto the furnace-bottom.

G denotes a counterbalance-weight connected to the carrier-beam C by an arm, G', which serves to return the carrier to normal position as it is retracted after depositing the bar within the furnace.

The deflector or cam-plate I is preferably made double and adjustable, or provided with a switching device, so that it can be used for tipping the charging-carrier either to the right or to the left, as desired. A convenient construction for this mechanism is shown in Fig. 7. In this instance the cam-plate I is fixed to

a slide-plate, I', which is movable upon its supporting-frame A' in a direction lateral to the charger. The supporting-frame A' may be attached to the guideway-tracks E or to the end of the furnace A, as preferred. The slide-plate I' is retained to the frame A' by bolts *i*, that pass through slots, as indicated, or in other equivalent manner.

I<sup>2</sup> indicates a link whereby the slide-plate is connected with a lever or other suitable handle at convenient position for moving the plate I' for shifting the cam.

I<sup>3</sup> indicates a locking latch or dog for retaining the parts at positions of adjustment. When the cam I is in the position shown, the arm F runs onto the right-hand side of the cam-plate I and the carrier C is tipped to discharge its load to the left. By releasing the dog I<sup>3</sup>, and shifting the slide-plate I' so that the dog will take into notch *i'*, the cam I is carried to the left, so that the arm F will run onto the opposite side of the point of said cam, and the carrier will be thereby tipped to discharge its load to the right, or in opposite direction to that shown in Fig. 7. A suitable spring-catch, J, is provided for retaining the carrier C at normal position. Said catch is connected by a rod, *j*, with a lever or arm, J', at the front of the carriage B, which lever is engaged and depressed by a downwardly-inclined portion, I<sup>2</sup>, on the cam-plate I, as the roll F' approaches the point of said cam-plate. This action draws up the rod *j* and releases the latch J, so that it will not interfere with the tipping of the carrier C by the arm F. When the charger is retracted and the arms F and J' are relieved from the cam I, the counter-weight G swings the parts into engagement with the catch J. The latch is provided with oppositely-directed inclines, so as to accommodate both right and left swinging action of the carrier and counter-weight.

In lieu of making the entire carrier-beam C to tip or oscillate, it may in some instances be made with hinged flanges or with the cradle C' hinged to the body or web of the beam, the discharge of the bars being effected by rocking over the cradle or dropping one of the flanges at the side of the beam. (See Fig. 8.)

The cam devices I, if desired, may in some instances be constructed, as illustrated in Fig. 3, with side guiding-bars, I<sup>2</sup>, which confine the end of the arm F or its roll F' throughout the course of its movement as the charger runs forward and back. The rear ends of bars I<sup>2</sup> can extend through the openings of the frame B and be sustained by any suitable form of rigid standard disposed on the tracks E or floor at a position back of the said frame. In the event of using this cam and guides such as shown in Fig. 3 the counter-weight G and latching device J could be dispensed with, as the guides I<sup>2</sup> would return and retain the beam at normal position by the aid of the arm F. In this construction the switching for right and left discharge is effected with a bar, I', pivoted to the cam I in a manner to swing

across either of the spaceways  $a$  or  $a'$ , thereby forcing the roll  $F'$  to pass into the other space-way as it approaches the cam.

The second part of my invention relates to means for receiving and temporarily supporting the bar during the time the charging-carrier is making its advance and retractive movements. This feature is more especially designed for service when charging hot bars or billets continuously or automatically delivered to the charging mechanism, said bars being transferred from a rolling-mill or elsewhere by means of a roller-bed, endless traveling apron, or other suitable transfer and delivering mechanism. For this purpose I arrange above the carrier  $C$  and parallel therewith a bar receiver or supporter,  $K$ , having a chamber or space into which the bar is delivered from a transfer device,  $L$ , and from which the bar can be dropped or transferred to said carrier  $C$  when the latter is at its retracted position.

The bar-supporter  $K$  is preferably formed with channeled, curved, or angular side pieces of a length equal to or exceeding that of the bar, which pieces fit together and form an inclosing-case, within which the bar is inclosed and temporarily retained, and while so retained is protected from the oxidizing and cooling effects of the atmosphere. The supporter is provided with hinges, as at  $K'$ , so that the parts can swing open or separate longitudinally to release the bar and allow it to fall or be delivered upon the carrier  $C$ . This bar-receiving mechanism is disposed in a position overhead of the charging-carrier, and is supported by a suitable frame-work or hangers,  $M$ , in a manner that will permit of the charging apparatus running to and from the furnace without interfering therewith.

$N$  indicate arms or levers which are combined with the hinged parts of the inclosing-case or supporter  $K$ , for the purpose of opening or swinging said hinged parts away from each other for releasing the inclosed bar. In the present instance said levers are curved in proper manner to engage with lugs or rolls  $n$  on the charger-carriage  $B$ , whereby the supporter  $K$  is opened automatically when the charger is run back to its normal position, and the cradle of the carrier  $C$  is in proper location to catch the bar as it falls from the supporter  $K$ . Then when the charger is advanced, the rolls  $n$  release the levers  $N$ , and the supporter is closed for receiving and retaining the next succeeding bar while the charger is delivering the bar contained on the carrier into the furnace.

Other means may be employed for opening and closing the supporter  $K$ , if preferred, and the same may be arranged for operation either automatically or by hand, as most convenient in any particular case.

If desired, a hydraulic pressure cylinder and piston or other means can be employed for opening and closing the receiving-supporter

$K$  in lieu of the levers  $N$  and engaging-rolls  $n$ , said cylinder being arranged at any convenient position.

$P$  indicates a presser-roll, combined with the transfer delivery-bed  $L$ , for driving forward the bar from said bed into the receiving-supporter  $K$ . Roll  $P$  may be operated by a belt,  $P'$ , from an overhead shaft and pulley, or in any other convenient manner.

In case it is desired to employ a transfer mechanism or delivery-way that delivers the bars laterally instead of longitudinally, the supporter  $K$  may be made open at the top, so as to allow the bar to pass into the inclosing-space. A receiving-supporter of this nature may be formed of two channel-beams placed at a short distance apart, with a trap or door across the bottom of the space to open and close for releasing and confining the bar, as desired.

The operation of my improved apparatus is as follows: The bar having been placed upon the carrier  $C$ , the valve of the hydraulic cylinder  $H$  is opened, admitting power to force forward the piston. This moves the carriage  $B$  along the tracks  $E$  and advances the carrier  $C$  and bar into the furnace  $A$ . When the charger reaches its forward position, the arm  $F$  runs onto the cam  $I$ , which by throwing said arm to one side tips the carrier-cradle laterally and dumps the bar therefrom upon the furnace-bottom. The valve is then shifted and pressure in the cylinder reversed, and the hydraulic piston retracts the carriage and carrier. When said parts arrive at their rear-most position, the rolls  $n$  engage and lift the levers  $N$ , thereby opening the receiving-supporter  $K$ , allowing a bar which has been entered therein to fall onto the carrier  $C$ , when the above operation is repeated.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In a furnace-charging mechanism for rolling-mill product, a carrier consisting of a beam mounted on a movable support to present a forwardly-projecting portion adapted for entering the furnace, and provided upon said projecting portion with a seat or cradle for containing the bar or product to be charged, and means, as described, for effecting the discharge of the bar laterally therefrom when within the furnace, substantially as set forth.

2. A charging mechanism for introducing rolling-mill product into a heating-furnace, consisting of a carrier-beam, having a seat or cradle, whereon the product is placed, mounted to have oscillating or tipping action, in combination with a movable support or carriage for advancing and retracting said carrier into and from the furnace, substantially as set forth.

3. A furnace-charging device consisting of an overhanging beam, having a seat or cradle for retaining a metal bar or rolling-mill product while advancing it into a heating-furnace, in combination with a support for carrying said beam into and from the furnace and

means for imparting oscillatory or tipping action for discharging the product into the furnace-bottom, substantially as set forth.

4. In a furnace-charging apparatus, the combination of an oscillating or tipping carrier for sustaining the bar or product to be charged, a movable carriage whereon said carrier is mounted, a guideway for directing said carriage to and from the furnace, and a power mechanism or motor with connections for imparting motion to said carriage, substantially as set forth.

5. In a charging apparatus for rolling-mill product, the combination of an oscillating or laterally-tipping carrier, whereon the product is placed, a movable carriage supporting said carrier, a hydraulic motor whereby said carrier with its load is advanced into the furnace, and means for automatically effecting tipping action of said carrier while within the furnace for discharging the load therefrom, substantially as set forth.

6. The combination, in a charging mechanism, of a stationary guideway, a supporting-frame or carriage movable on said guideway, a carrier-beam supported in bearings on said carriage and having a cradle for containing the product to be charged into the furnace, means, substantially as described, for effecting tipping action in either right or left direction to discharge the product from said cradle, and mechanism for advancing and retracting the charger to and from the furnace, substantially as set forth.

7. The combination, in a charging mechanism, of a tipping beam or cradle supporting the product to be introduced into the furnace, an arm for tipping said cradle, and a cam for controlling the tipping action, substantially as set forth.

8. The combination, with the charging beam or carrier mounted for tipping action on its supporting-frame or reciprocating carriage, of an arm attached to said beam, and a cam or deflector for engaging said arm as the supporting-frame approaches the furnace to effect tipping action of the carrier, substantially as and for the purpose set forth.

9. In a furnace-charging apparatus, the combination, with a carrier mounted to have oscillatory action and provided with an operating-arm, as F, of a cam or deflecting device for engaging said arm, having right and left inclines, and means for shifting or switching the mechanism at will to effect deflection of said arm either by the left or by the right hand incline, substantially as and for the purpose set forth.

10. In a furnace-charging apparatus, the combination of a charging-carrier mounted to oscillate or tip on its supporting-carriage, and a counter-weight connected with said carrier for returning it to normal position, substantially as set forth.

11. In a furnace-charging apparatus, the combination of an oscillating carrier-beam, a cam or deflector for tipping said beam, a coun-

ter-weight connected with said carrier for returning it to normal position, and a locking device for retaining the same, substantially as and for the purpose set forth.

12. The combination, with a charging mechanism for introducing rolling-mill product into a heating-furnace, of means for receiving and temporarily supporting a succeeding bar or product delivered to the apparatus while the charger is advancing or returning to or from the furnace in making the preceding charge and for releasing said bar to deposit it upon the charger when said charger has returned to normal position, substantially as set forth.

13. A furnace-charging apparatus having an overhead receiver and support for the billet, bar, or product above the charging-carrier in a position to deliver the bar upon the said carrier, in combination with the charging-carrier and means for releasing or discharging the bar therefrom to permit it to fall to its position on the carrier when said carrier is at normal position, substantially as set forth.

14. In combination with the charging carrier, a receiving mechanism having a hinged supporter adapted, when closed, for receiving and supporting the bar and for releasing said bar to deliver it upon the charging-carrier by opening or separating said hinged supporter, substantially as set forth.

15. In combination with the charging carrier, a receiving mechanism having a hinged supporter for retaining the bar, when closed, and adapted to open for releasing the bar, and means for automatically opening said receiver when the carrier is at normal position for depositing the bar thereon, substantially as set forth.

16. In a furnace-charging apparatus, the combination, with the charging-carrier, of a receiving mechanism having a supporter which surrounds or incloses the bar, substantially as set forth, whereby hot metal bars are protected from the oxidizing effect of the atmosphere and their inherent heat retained.

17. In a furnace-charging apparatus, the combination of a delivering-way, as L, an overhead supporter receiving the bars or product from said way and temporarily supporting the same, a charging-carrier mounted adjacent thereto on a supporting-carriage, means for opening said receiving-supporter to transfer the bar therefrom to the charging-carrier, a power-motor connected with said carrier-supporting carriage, guideways along which said carriage travels to and from the furnace, and devices for discharging the bar from the carrier into the furnace, substantially as set forth.

Witness my hand this 11th day of February, A. D. 1887.

FRED H. DANIELS.

Witnesses:

CHAS. H. BURLEIGH,  
ELLA P. BLENUS.