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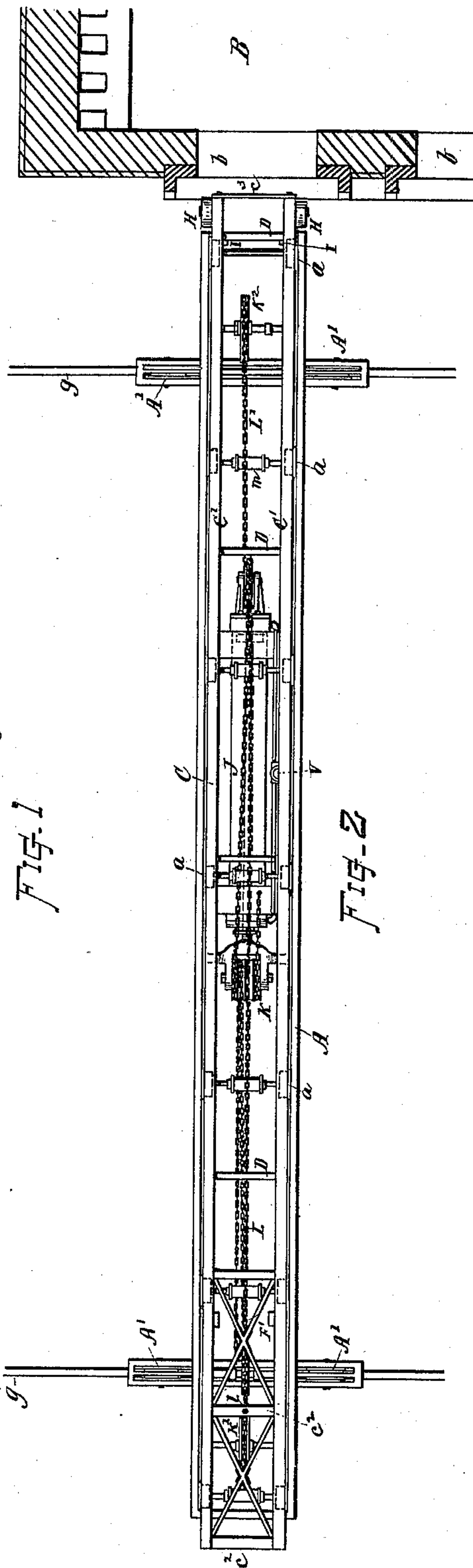
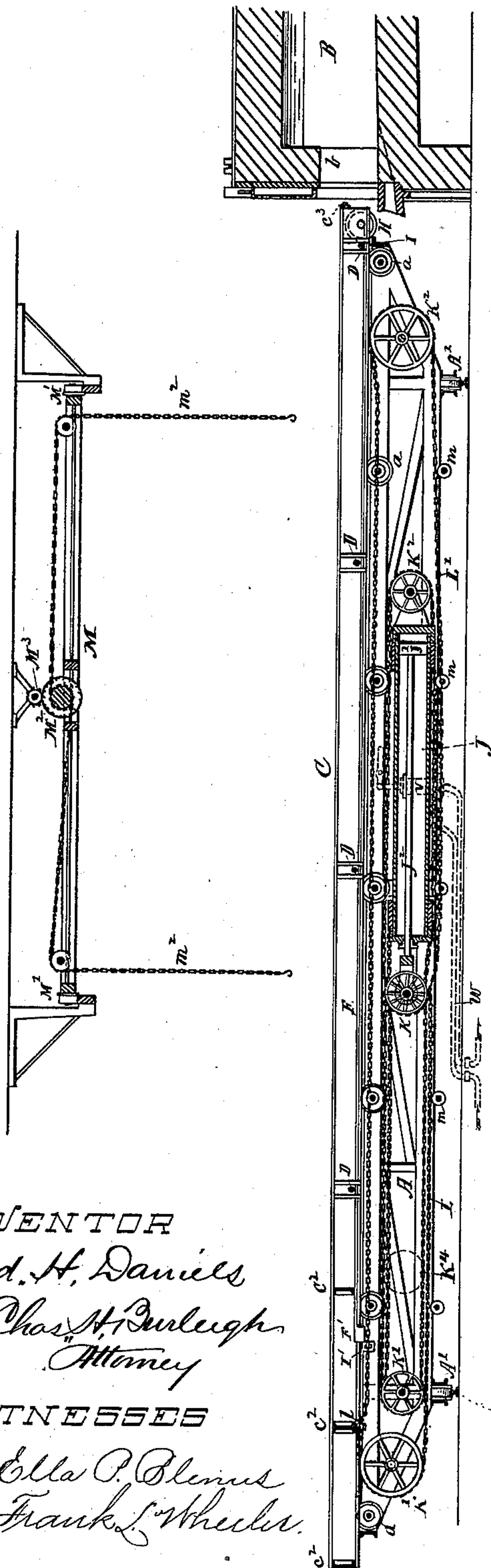
2 Sheets—Sheet 1.

F. H. DANIELS.

APPARATUS FOR CHARGING BILLETS, BARS, &c., INTO FURNACES.

No. 385,248.

Patented June 26, 1888.



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WITNESSES
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(No Model.)

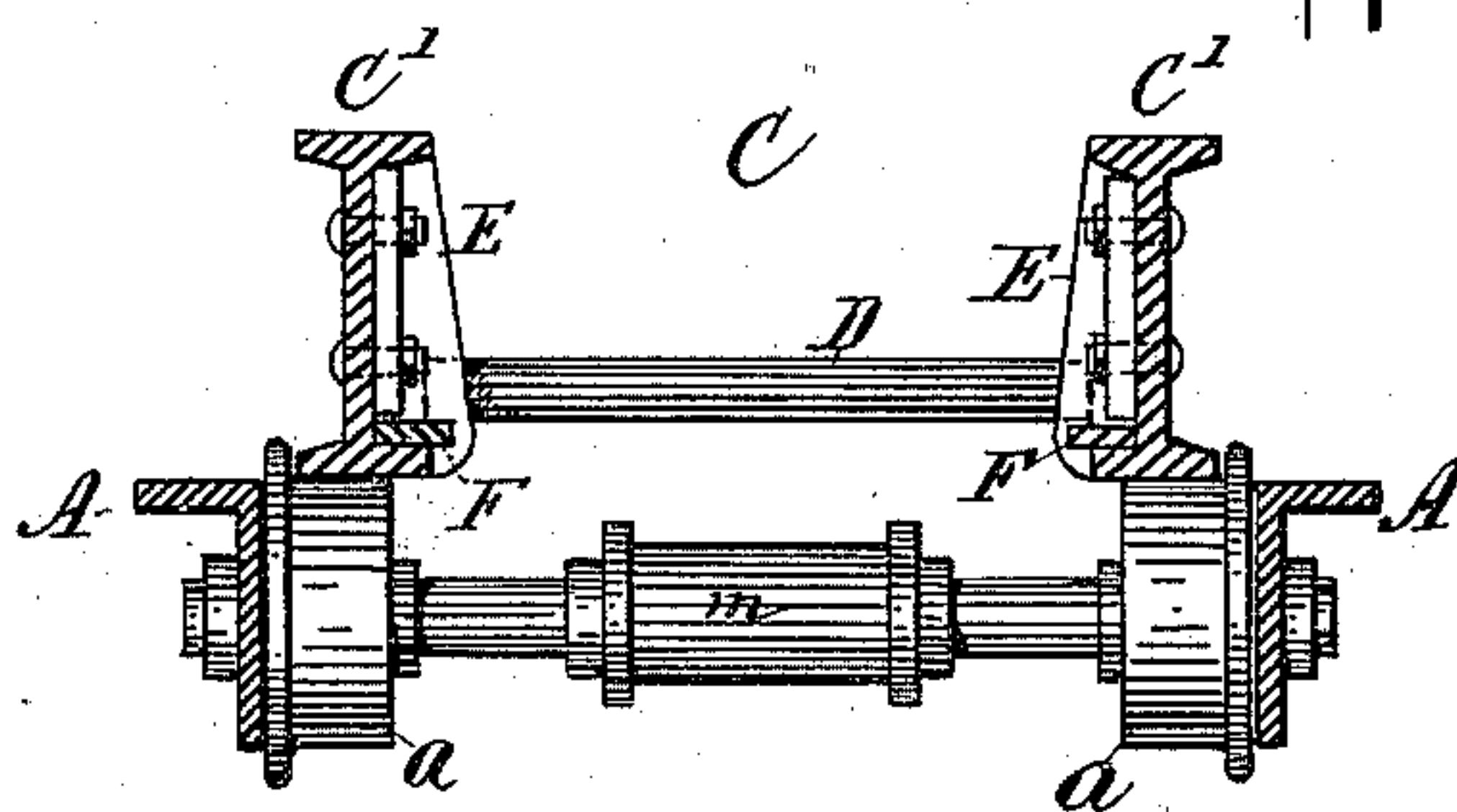
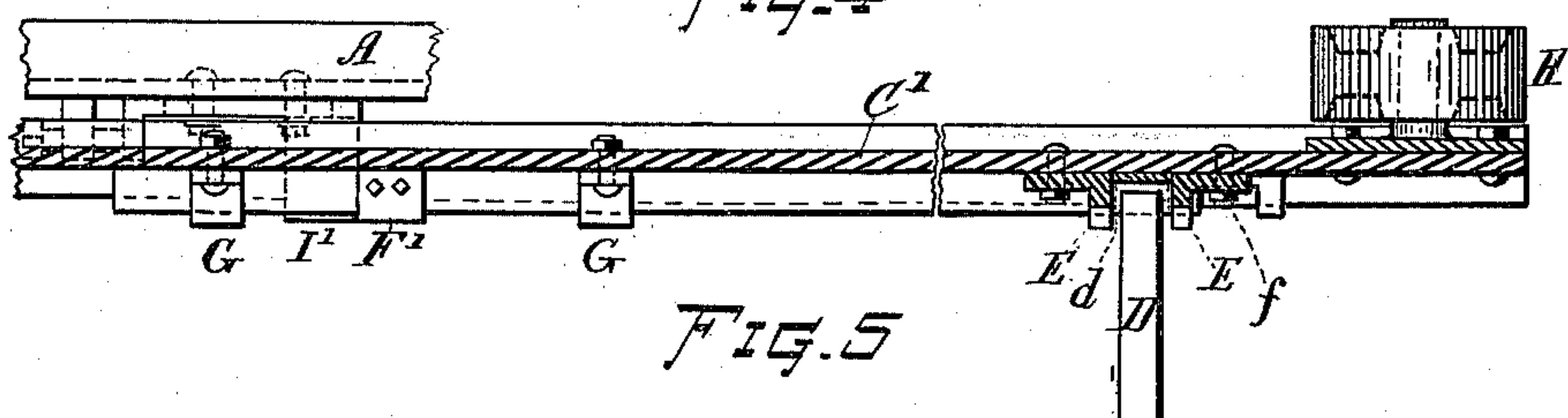
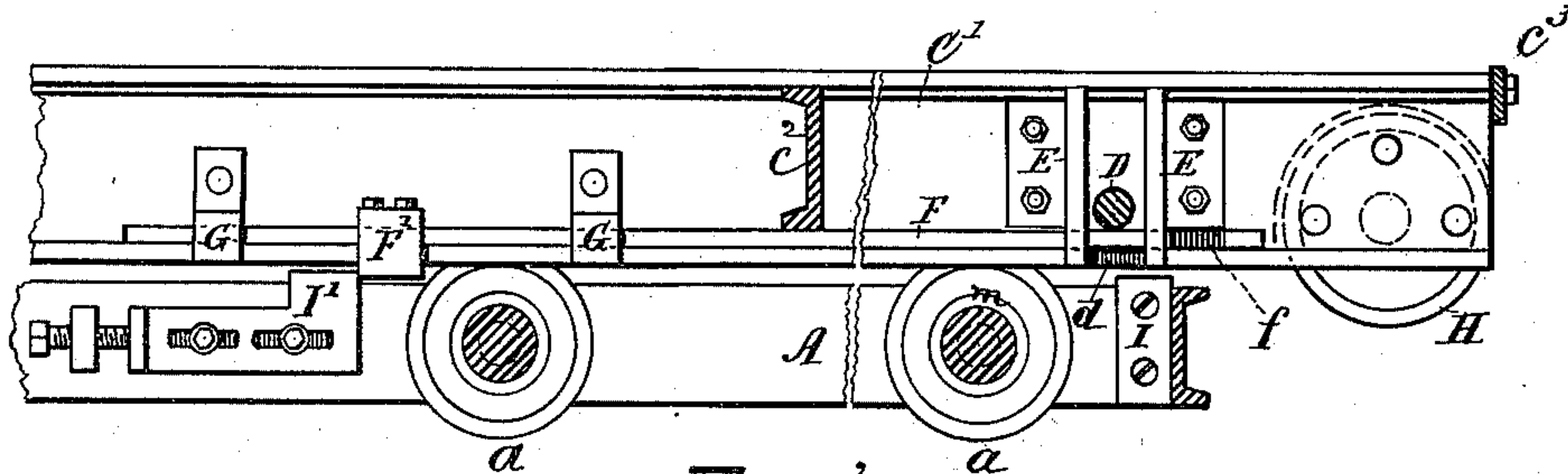
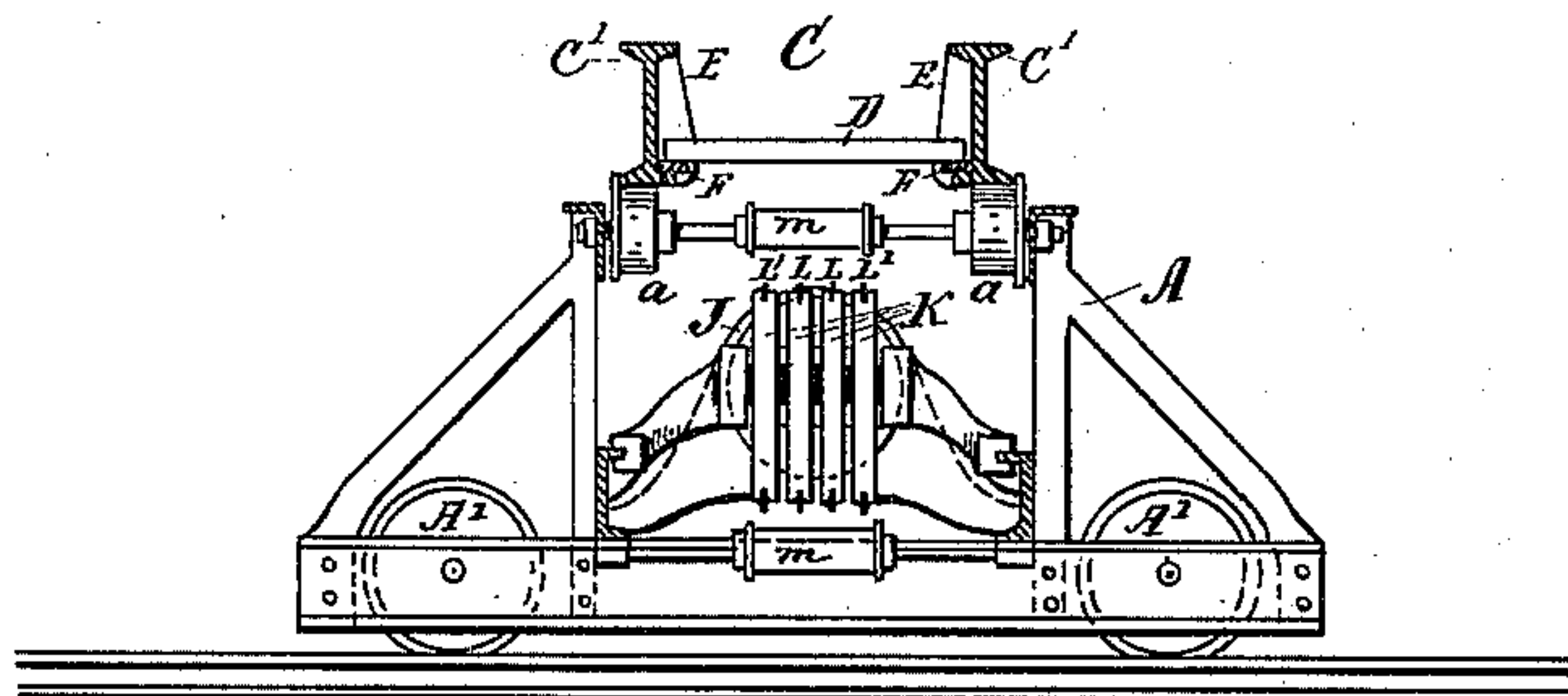
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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

APPARATUS FOR CHARGING BILLETS, BARS, &c., INTO FURNACES.

SPECIFICATION forming part of Letters Patent No. 385,248, dated June 26, 1888.

Application filed January 24, 1887. Serial No. 235,284. (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 Apparatus for Charging Billets or Bars into Heating-Furnaces, 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.

In the usual practice, when rolling wire rods, hoop-iron, and other small shapes, it is customary to use bars or billets from sixteen to thirty feet long and about one to one and one-fourth inch square, more or less. These bars are charged into the heating-furnace one at a time by hand, requiring two attendants therefor, one attendant placing the forward end of the bar in at the door of the furnace, when the second attendant, holding the rear end of the bar, runs it forward and guides it in at the furnace door, pressing down on the end of the bar, so that the forward end will clear the bottom or hearth of the furnace as it is projected thereinto. This is quite a laborious and exhaustive operation, especially with long bars or billets, as the labor of holding and guiding the billet increases proportionally as the leverage of its length and weight is increased.

The objects of my present invention are, first, to provide a charging apparatus whereby the billet or bar is charged or introduced into the furnace mechanically or by a power-operated mechanism, as hereinafter described; second, to provide a mechanism whereby several bars or billets can be simultaneously projected into and deposited within the heating-furnace; third, to provide a movable billet-charging apparatus supported or mounted on wheels or traveling devices, which permit of the charging apparatus being conveniently shifted from one position or furnace to another, or for transporting billets from the place of reception to the furnace; fourth, to provide a billet-charging mechanism adapted for carrying or projecting into a furnace a load of billets, and for releasing, dropping, or discharging said load of billets, and thereby depositing them upon

the hearth of the furnace; fifth, to provide a billet-charging mechanism having a reciprocating carrier adapted for supporting and conveying a billet or a series of billets into the furnace, and a hydraulic or equivalent mechanism for advancing and retracting said carrier, and means for releasing or discharging the billets therefrom while in the furnace; sixth, to provide, in a billet-charging mechanism, a combustible support or bearing bars for sustaining a billet or series of billets while advancing them into the furnace; seventh, to provide, in a billet charging mechanism, a carrier for supporting and guiding a billet or series of billets into a heating-furnace, having combustible devices for sustaining the billets and means for releasing or discharging said supporting devices for delivering the billets upon the hearth. These objects I attain by mechanism the nature, construction, and operation of which are illustrated in the accompanying drawings and explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the construction and adaptation of my invention to the purpose of charging billets singly or in groups into a heating-furnace I employ a mechanically-actuated carrier, or means for projecting or carrying forward the billet, and means for guiding and directing the course of the billet as it is carried forward, either singly or in series, so that the billet or billets will be deposited within the furnace in suitable order or arrangement to be handled or drawn out as they are required for passing to the rolling-mill.

The construction and arrangement of the charging mechanism may be modified to meet the special requirements of the particular classes, or for different kinds of billets or bars to be charged into the furnaces, as for working long or short billets, for charging the billets singly or in groups, loads, or series, for charging billets in hot or cold condition, or for receiving and charging them from an automatic delivery.

In some instances it is desirable to charge billets in groups or loads of thirty to forty, more or less, simultaneously, especially when the billets are cold, and it is desirable to keep

the door of the furnace open only for as short a time as possible. In this case I prefer a charging mechanism constructed substantially as shown in Figures 1 to 6, inclusive, the apparatus being mounted on wheels, or movable in its relation to the furnace.

In the drawings, Fig. 1 is a longitudinal vertical sectional view showing my invention as adapted for the simultaneous introduction of a number or series of billets or bars into a heating-furnace and as mounted for shifting movement from one position to another, also showing a portion of the furnace and a transfer mechanism for placing the load of billets upon the charger. Fig. 2 is a plan view of the same without the transfer mechanism. Fig. 3 is a transverse vertical section at line *w w*, Fig. 2. Figs. 4 and 5 are detail views showing the construction of devices for discharging the load by dropping the transverse supporting-bars. Fig. 6 is a transverse section of the carrier and top frame.

In referring to parts, A denotes the supporting-frame, which is preferably provided along its upper part with a series of rollers or guides, *a*, on which the carrier C moves as it is advanced and retracted.

B indicates the furnace, only a portion of which is herein shown, owing to limit of space on the drawing-sheet; but it will be understood that said furnace may be made and fired in the ordinary form and manner, or such as heretofore employed in rolling-mill works for heating bars and billets preparatory to their reduction by rolling into hoop-iron, wire rods, or other shapes or products.

The charging apparatus is preferably made self-portable, or so as to be capable of being shifted or transferred from one place or position to another, the frame A being mounted upon wheels A', as indicated in Figs. 1, 2, and 3.

The apparatus is illustrated with the traversing wheels running on tracks or guides *g*, which extend laterally in relation to the furnace, so that the charging apparatus can be shifted to bring the carrier or charging-way into line with either door *b* of the furnace B, as I consider it the best practice to charge one half the furnace and then the other half alternately, the heated bars being withdrawn from one side while those at the other side are being charged and heating, and vice versa; hence the convenience of a movable charging apparatus. It is also sometimes desirable to transfer the apparatus from one furnace to another. This charging apparatus, when mounted on wheels or other equivalent carryable supports, can in some instances, if desired, be employed as a truck or carriage for transporting the billets from the place of storage to the heating-furnace, the wheels and their connection with the frame being modified to meet the requirements of the special service for which they are required in any particular case.

The carrier C consists of two long beams, C',

supported parallel to each other, as indicated, with their rear ends framed rigidly together, as at *c*², or in other equivalent manner, and their front ends are connected by a loosely-attached link, *c*³, or in a manner to permit a slight upward and downward springing action independently of each other, while they are confined for separating or spreading apart.

At intervals along the carrier are transversely-disposed bearers D, or supports for the load of billets. If for charging cold billets, the bearers D are preferably made of wood or other combustible material, sticks of suitable size and strength for supporting a load of billets being used. The ends of said bearers are confined in a manner to be dropped or released for depositing the load of billets upon the bottom of the furnace. The releasing mechanism is indicated in Figs. 3, 4, 5, and 6. Flanged lugs or fenders E are secured to the inner surfaces of the side bars, the flanges thereof being sufficiently far apart to admit the end of the bar D. A slide or plate, F, is arranged along the lower flange of the carrier-beam C', upon which plate the bars D rest. The lower flange of the beam C' is recessed or cut away at a position corresponding with the spaces between the fender-flanges E, which confine the transverse bars D, while the slide F is also provided with corresponding recesses, *f*, which, when the slide F is back to its rearmost position, coincide with the recesses *d* in the beam-flange, and thus give an opening through which the end of the bearer D can drop, but when the sliding plate F is at its forward position the recesses *f* and *d* offset, and the plate forms a support for the bearer D to rest upon.

The fender-flanges E extend down and form guides for the slide-plate F; or said plate may be provided with especial guides, as at G. A lug, F', is formed upon or attached to the slide-plate F in position to be engaged by stop-dogs I and I', fixed to the supporting-frame A, for moving said slide-plate as the carrier approaches the limit of its forward or backward movement.

The billets are placed upon the carrier between the side beams, C', resting upon the transverse bearers D. The space between the side beams is preferably adapted to contain a sufficient number of billets to charge one-half of the furnace—say thirty to forty billets, more or less—which billets are simultaneously projected into the furnace by advancing the carrier forward on its supporting-frame or guiding-rolls *a*, which rolls are flanged, so as to guide the carrier and its load of billets as they enter the furnace.

H H indicate rolls or trucks journaled on suitable bearing-studs fixed to the forward end of the respective carrier-beams C'. Said rolls run upon the bottom of the furnace for supporting the carrier when the carrier has advanced to such position within the furnace that the weight of the beams and billets de-

presses the forward extremity of the carrier sufficiently to cause said rolls to strike the bottom of the furnace.

J indicates the motor or operating device for imparting motion and power for advancing and retracing the carrier into and from the furnace. Said motor preferably consists of a cylinder containing a piston, J' , and rod J^2 , to be operated by hydraulic pressure. Steam or pneumatic pressure may be employed, if preferred. The piston-rod J^2 connects with a series of pulleys, K, at its outer end, which pulleys are connected by ropes or chains L and L', that work in connection with the pulleys K' K² in the manner of tackles, and are attached to the carrier at I, so that the carrier is moved forward and back when the pressure is let on at one end or the other of the cylinder J under control of the valve V. The connections, w, for supplying pressure to the cylinder are preferably made flexible to permit the shifting of the carriage or frame A without disconnecting or breaking the connection. Spools or rolls m are arranged for supporting the chains L L' where required. When the piston is moved so as to carry the rolls K to the position indicated by dotted lines at K⁴, Fig. 1, the chain L is let out and the chain L' taken up by the action, and the carrier or charging-way C, with its load of billets, is projected forward into the furnace. Then, when the piston is reversed and roll K drawn back to the position indicated by full lines, the chain L is taken up and chain L' let out, and the carrier is thereby retracted from the furnace.

M indicates an overhead lifting and transferring apparatus, whereby a load of billets can be elevated, conveyed to, and deposited bodily upon the charging-carrier. Said transfer mechanism is in the present instance provided with trucks M', which run on hanging tracks, and with a hoisting-drum, M², for winding up the lifting-chains m². A driving-shaft, M³, having a sliding gear or runner, serves for applying the power to said hoisting-drum. The gearing may be constructed and arranged in any well-known manner, and is not herein shown, as it forms no part of my present invention.

While I prefer a motor mechanism for advancing and retracting the carrier arranged substantially as illustrated, I do not desire to confine my invention to the particular construction shown, as any suitable arrangement of hydraulic or other operating mechanism may be employed for mechanically imparting the power to the carrier C in equivalent action.

When operating my improved charging apparatus, arranged as above described, the slide-plates F are set at their forward position. Sticks of wood are then placed in position for serving as bearers or transverse supports D. The billets are then placed on the carrier C between the side bars, C' C', in parallel order, or substantially so, and in such numbers as may be desired. When filled or ready for charging, pressure is let onto the motor J, and

the piston-rod is forced outward, moving the pulleys K to the position K⁴, thereby, through the action of the chains L L', projecting or advancing the carrier C and its load of billets into the furnace until the lugs F' strike the stops I at the forward end of the frame. This arrests the forward movement of the slide-plates F, and the further advance of the carrier C causes the recesses f to come into conjunction with the recesses d, thus permitting the bars D, together with the charge of billets or bars, to be deposited upon the furnace-bottom. The valve V is then shifted and the piston J' reversed to effect the retraction of the carrier. When said carrier reaches its limit of backward movement, the slide plates F are again moved for resetting them, or to throw the recesses f out of conjunction with the recesses d, by means of the lug F' coming into contact with the stop I'. A new set of sticks or bars D can then be placed in position to sustain the next charge of billets, the formerly-used sticks or bearers D having been left with the charge of billets within the furnace, where said combustible bearers will be consumed by the fire. The cost of providing sticks for the bearers or bars D is comparatively slight as compared with the convenience attained in the quick and easy discharge of the billets from the carrier when within the furnace.

In case the apparatus is employed for charging partially-heated billets, the transverse supports D, on which the billets are sustained, may, if desired, be made as bars or rods of metal or of some refractory material instead of wood or other combustible material, so that the heat of the billets will not cause said supports to ignite or become destroyed while placing the billets upon the carrier. In such case, however, the support-bars D would require to be withdrawn from the furnace, which could be done in any convenient manner.

The apparatus may be made for charging from one to forty billets at a time, as desired. The side bars, C, may be made of channel or I beams, or other suitable shapes of metal bars, of a size and strength suitable to meet the requirements of service in any particular case.

In cases where it is not desired to shift the carrier from one position to another the wheels A' may be omitted, the frame being supported directly upon the floor, ground, or platform in front of the furnace.

Being aware that I am not the first to employ a charging-carriage for mechanically charging material into a heating-furnace, I desire it to be understood that I do not herein make claim, broadly, to the combination, with a track at one end of the furnace, of a charging-carriage for supporting and carrying the materials to be charged, said carriage adapted to travel on said track and onto the furnace-hearth and deposit the charge therein, and mechanism for moving said carriage into and out of the furnace. In my invention, however, the charging-carriage and its accompa-

nying mechanism are of improved and different construction and operation, and embrace certain features not heretofore embraced in furnace-charging apparatus.

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

1. A charging mechanism having a reciprocating carrier composed of a pair of longitudinal supporters provided with removable transverse bearers adapted to receive, support, and
10 carry forward billets or bars of metal and deposit them in a heating-furnace, in combination with a power-operating mechanism whereby said carrier is advanced and retracted.

15 2. In a billet-charging mechanism, the combination of a carriage, A, a reciprocating billet-carrier supported and guided on said carriage, a hydraulic-motor mechanism, and connections upon said carriage for reciprocating
20 said billet-carrier into and from the interior of the heating furnace, substantially as set forth.

3. In a billet-charging apparatus, a reciprocating carrier-frame composed of side bars and
25 having transverse bearers adapted for supporting billets mounted upon a supporting-frame, in combination with mechanism for advancing and retracting said frame and means for releasing said bearers from the side bars for depositing the billets within the furnace, substantially as set forth.

4. In a charging apparatus, the combination, with the carrier whereby the billets or bars are projected or advanced into the heating-furnace, of supports or bearers formed of
35 combustible material, substantially as and for the purpose set forth.

5. A portable billet-charging apparatus having a reciprocating carrier composed of a pair
40 of long beams connected at their rear ends and furnished at intervals with bearers upon which the billets to be charged are supported, in combination with a supporting frame or carriage mounted on traveling wheels and provided with a guideway or series of rolls that
45 direct the movement of the carrier thereon, and an operating cylinder and piston supported on said carriage with connections for moving said carrier, substantially as set forth.

50 6. A billet-charging apparatus provided with a carrier or charging-way for containing a series of billets, in combination with a lifting and transferring mechanism, substantially such as described, for depositing thereon a
55 load of billets preparatory to charging said billets into the heating-furnace, substantially as set forth.

7. In a charging apparatus, the combination, with the billet-carrier, of a wheel or
60 truck disposed at or near the forward end of said carrier for supporting said carrier upon the furnace-bottom, substantially as set forth.

8. In a charging apparatus, the combination, with a carrier adapted for projecting or

advancing a billet or series of billets into the
65 heating-furnace, of combustible supports or bearing-bars for sustaining said billet.

9. In a charging apparatus, the combination, with the carrier and adjustable supports or bearing-bars for sustaining billets while advancing them into the furnace, of means for
70 releasing said supports for depositing the billets within the furnace, substantially as set forth.

10. In a furnace-charging apparatus, the
75 combination of a supporting-frame mounted on wheels and provided with a series of guiding-rolls, a reciprocating carrier supported and guided on said frame and guide-rolls, a hydraulic cylinder and piston with tackle
80 chains and pulleys for imparting backward and forward movement to said carrier, and means for varying the pressure in said cylinder under control of the attendant, substantially as set forth.

11. In a billet-charging mechanism, the combination of a carrier composed of side bars or beams, a series of transverse supporting-bars sustained by adjustable plates provided with
85 engaging-lugs, and stop-dogs for shifting said plate and releasing said transverse bars when the carrier approaches its forward limit of movement, substantially as and for the purpose set forth.

12. In a billet-charging mechanism, the combination of a carrier composed of side bars or
95 bearers, C', having recesses *d*, a series of transverse supporting-bars, adjustable plates for sustaining said support-bars, provided with engaging-lugs and recesses *f*, stop-dogs for
100 shifting said plates and releasing the transverse bars when the carrier has reached its forward limit of movement, and stop-lugs for readjusting said plates when the carrier has reached its backward limit of movement, substantially as set forth.

13. In a billet-charging mechanism, the combination, with a supporting-frame, of a carrier consisting of side beams rigidly framed together at their rear ends and having their forward ends linked or connected to each other
110 in a manner to permit upward and downward springing action, while confining them for spreading apart laterally, and transverse supports or bearers for sustaining a load of billets, substantially as set forth.

14. The combination, with a carrier having the side bars, C', of upright fenders E, for confining the transverse bearers or support-bars and protecting the releasing plates and
120 flanges from the descending billets when the support is released.

Witness my hand this 21st day of January, A. D. 1887.

FRED H. DANIELS.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.