

No. 617,663.

Patented Jan. 10, 1899.

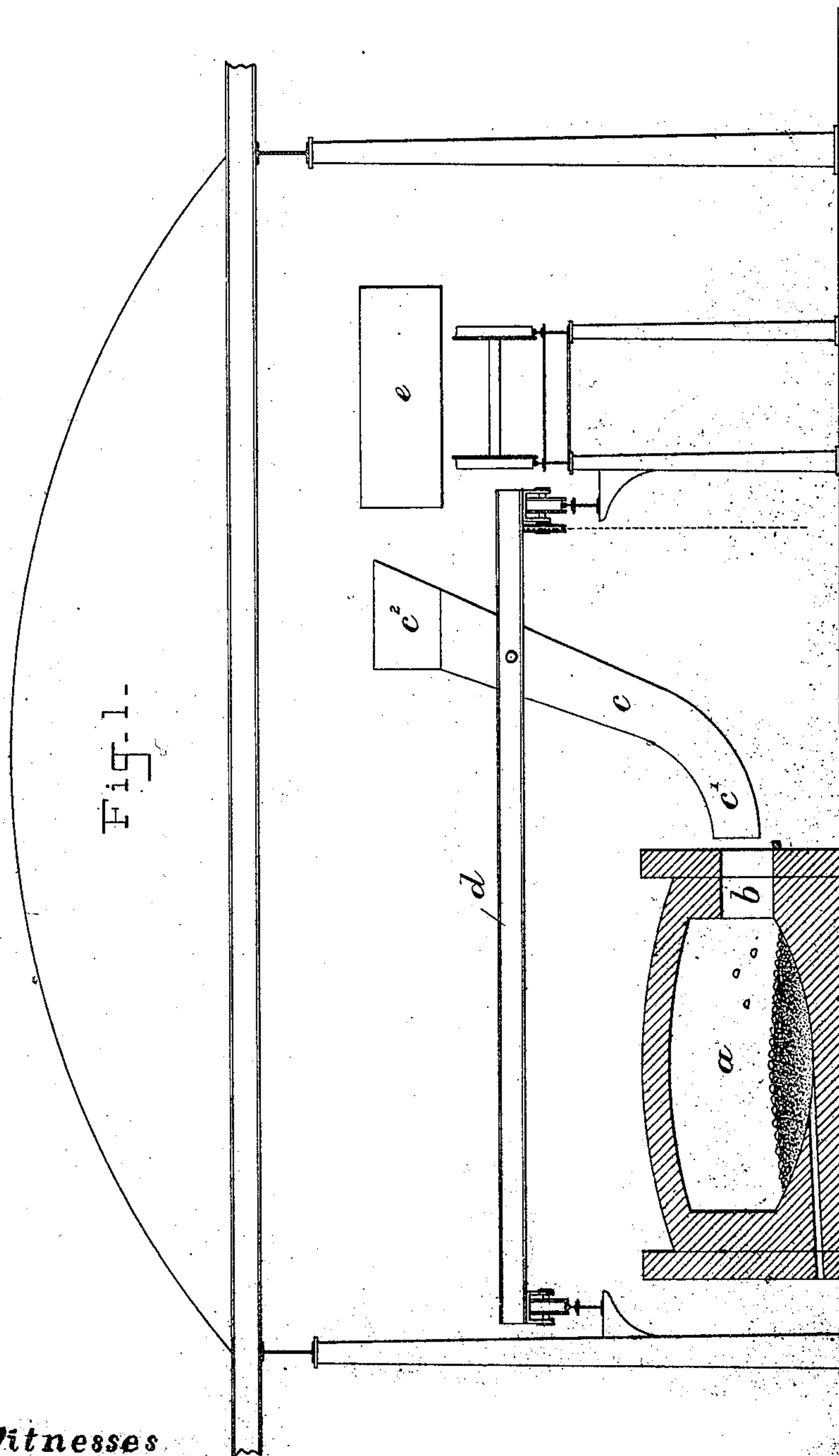
H. TOMKINS.

MEANS FOR CHARGING OPEN HEARTH FURNACES.

(Application filed Dec. 29, 1897.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses

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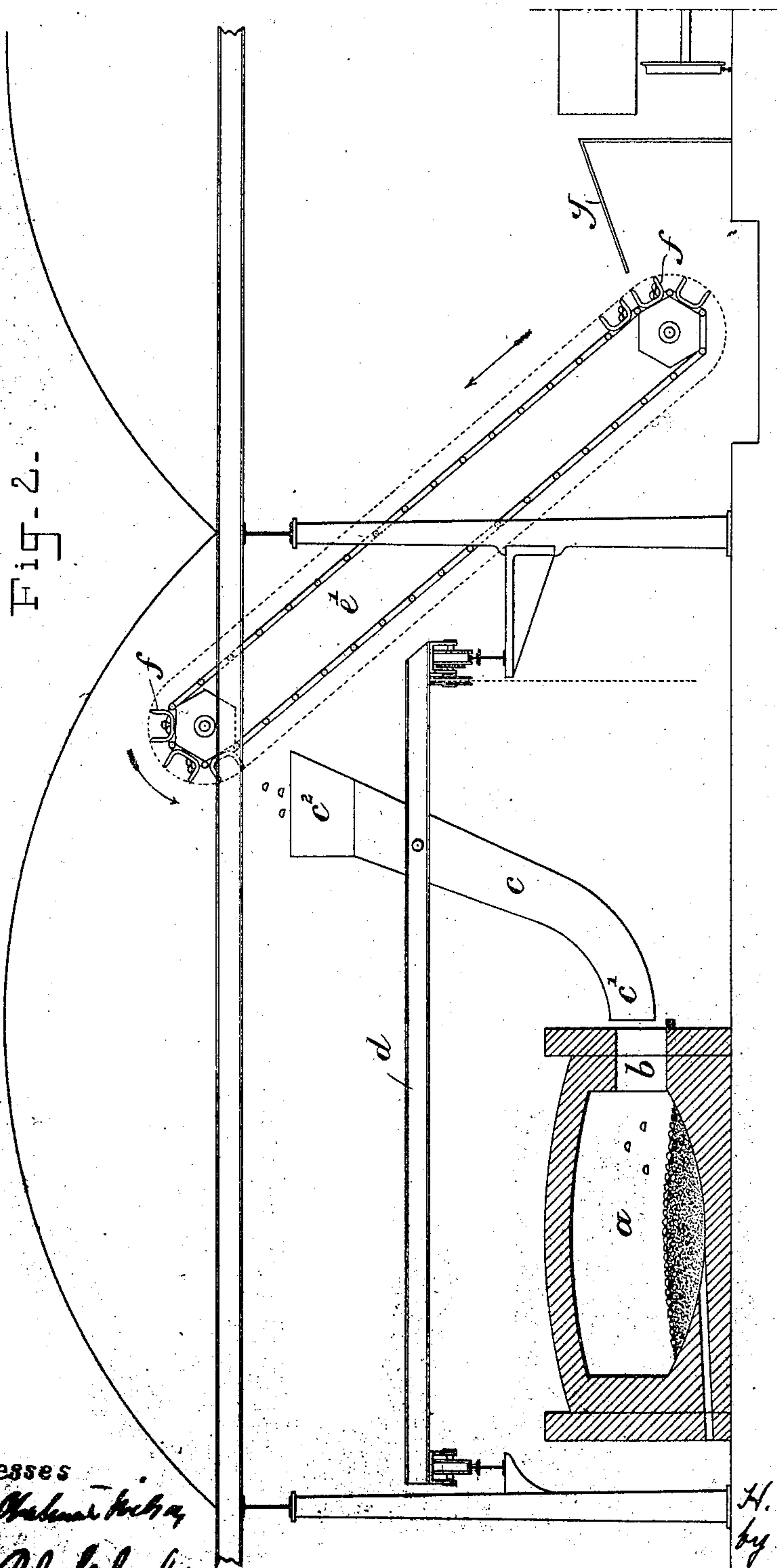
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4 Sheets—Sheet 2.



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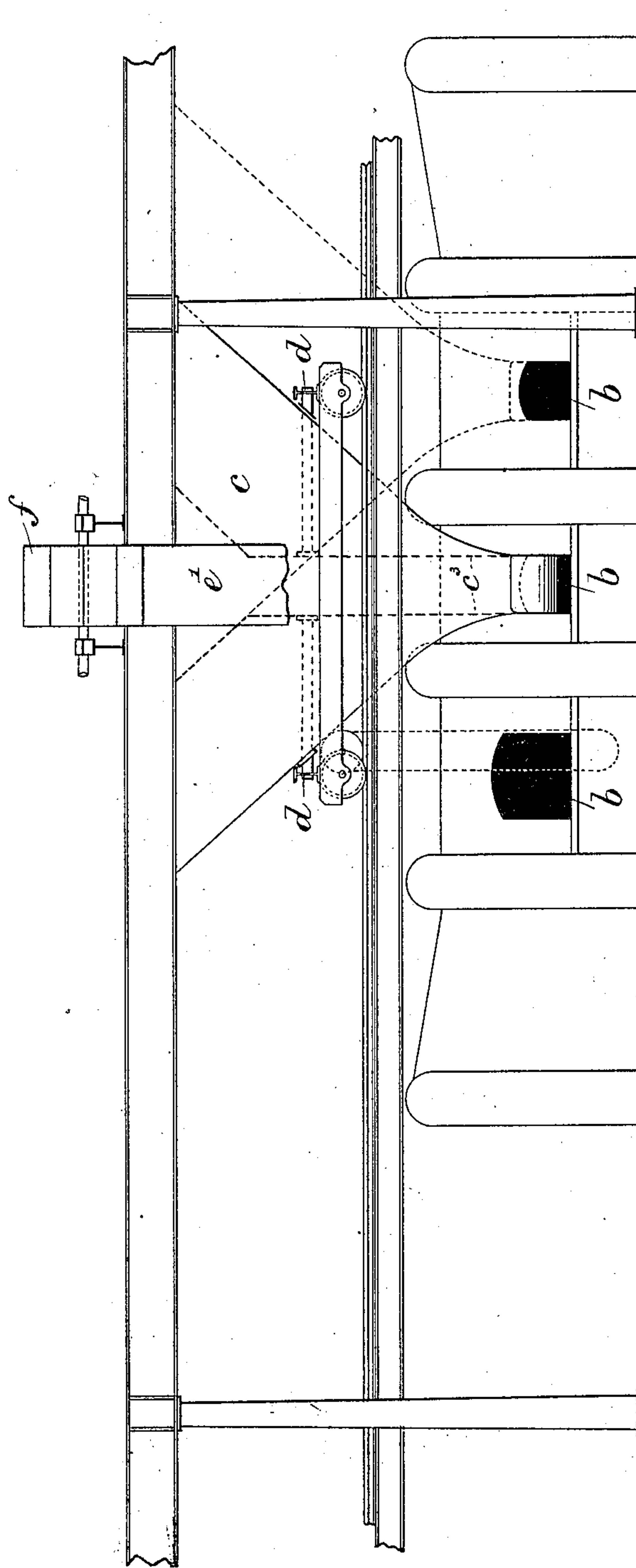
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4 Sheets—Sheet 3.

Fig. 3-



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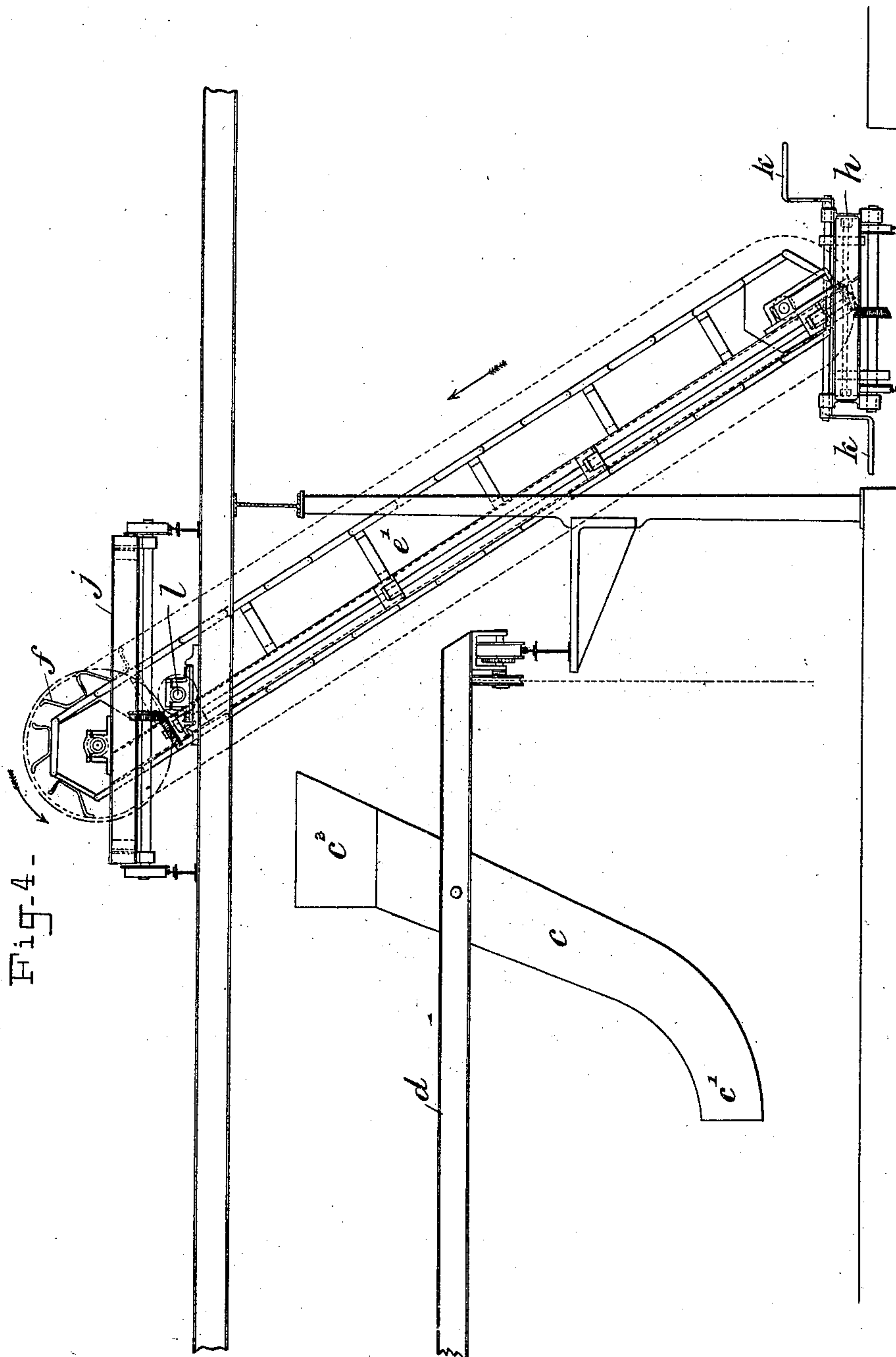
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MEANS FOR CHARGING OPEN HEARTH FURNACES.

(Application filed Dec. 20, 1897.)

(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

HENRY TOMKINS, OF STOCKTON-ON-TEES, ENGLAND.

MEANS FOR CHARGING OPEN-HEARTH FURNACES.

SPECIFICATION forming part of Letters Patent No. 617,663, dated January 10, 1899.

Application filed December 29, 1897. Serial No. 664,306. (No model.)

To all whom it may concern:

Be it known that I, HENRY TOMKINS, a subject of the Queen of Great Britain and Ireland, residing at Stockton-on-Tees, in the county of Durham, England, have invented certain new and useful Improvements in Means or Appliances for Charging Open-Hearth Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention comprises means or appliances for charging open-hearth furnaces by the agency of gravity as a substitute for the slow and laborious process of charging furnaces of this kind by hand and peel.

For the purposes of this invention a hollow shaft is suspended in front of the furnace-breast to serve as a duct or chute through which the material is delivered into the furnace by the force of gravity. The upper part of this chute is in the form of a hopper, and the lower part thereof terminates in a spout by which the downward motion of the charge is deflected into the furnace.

I will in describing the invention refer to the annexed drawings, in which the duct or chute is shown in position for charging the furnace, together with machinery or appliances of a kind intended to illustrate, by way of example, convenient ways of conveying the charging materials to the requisite elevation for dropping them into the chute.

In Figures 1 and 2 an open-hearth furnace is shown in transverse section, taken in line of a charging-door, together with a corresponding transverse elevation of the charging appliance and other structural accessories, as hereinafter described. Fig. 3 is a corresponding elevation showing a furnace-front with its several charging-doors. Fig. 4 shows a modification of the invention.

a is the chamber of the furnace, and *b* the charging-door.

c is the charging-chute, into which pig-iron, scrap, and ore are thrown to be carried down the chute *c* by gravity and discharged into the furnace *a*. In its simplest mode of installation the chute is a fixture and adapted to charge one furnace only and always through the same charging-door; but as furnaces are

so constructed and placed that a series of charging-doors are brought into line, like openings in a wall, the utility of the charging appliance is greatly extended by being mounted on an apparatus of the traveling-crane type, such as the girder-beams *d*, mounted on wheels, as shown in Figs. 1, 2, and 4, so as to be carried along from one charging-door to another, as required. The charging appliance *c* is also mounted on trunnions. If it is required to vary the incline thereof and if adjustment in the cross direction is also required, the bearings are carried on a monkey like the hoisting-gear of a traveling crane; otherwise the charging appliance is fixed to the girder-beams *d*.

In Fig. 1, *e* represents a truck upon an elevated railway, from which the pig-iron, scrap, and ore are thrown into the chute *c*. When an elevated railway is not available, this charging material is thrown from the truck onto a foot-plate *g*, from which it slides into a succession of buckets *f* on an elevator *e'*, each of which buckets discharges its contents into the chute *c*. It will be understood that the momentum imparted to the material falling down the chute *c* must be adjusted in force to the dimensions and requirements of the furnace. For instance, with a furnace eleven feet in width across the hearth the chute should provide for a descent of the charging material a distance, taken vertically, of about seventeen feet, when the chute *c* takes the form shown in Figs. 1, 2, and 4. With this ratio between the width of furnace-hearth and vertical fall of the material the requisite momentum is acquired for the proper distribution of the charging material over the furnace-hearth. If the momentum is too small, the material does not get properly distributed over the furnace-hearth. If too great, the furnace is liable to be damaged by the impact of individual lumps and blocks of the charging material ejected from the chute with unnecessary violence. As the duct or chute *c* is intended by its shape and position to enable the charging material to acquire a certain momentum due to the action of gravity and then to divert the effect of the momentum to a direction in line with the charging-door of the furnace, the shape of the said duct or chute must be substantially or in effect the

same as that shown in the drawings, in which the momentum due to gravity is acquired in the part *c* and diverted by the curve or deflection (shown at *c'*) into line with the charging-door *b*. The upper part *c*² is conveniently in the form of a hopper for the more easy reception of the material thrown into it to be ejected in a continuous stream into the furnace; but in some cases this hopper is extended in the form shown in Fig. 3, because, as shown in dotted lines, the chute *c* can be changed in position to embrace any one of the three charging-doors shown without changing the line of fall of material charged into the chute, which in case of an elevator, as shown in Fig. 2, would save considerable time and trouble; and this arrangement is particularly adapted to short furnaces with a chute of this kind, which diverts the line of descent of the falling material as well as deflects it, as it is found in practice that a greater vertical fall of the material is required—say nineteen feet—where in the other form of chute shown in Figs. 1, 2, and 4 seventeen feet would be sufficient.

In the case of long furnaces instead of the elevator *e'* being fixed, as shown in Fig. 2, it is made to travel from door to door of the furnace, as shown in Fig. 4, so as to change the fall of material charged into the chute *c*, which in this case takes the parallel form shown in dotted lines *c*³ in Fig. 3, the chute traveling from door to door of the furnace in like manner to the elevator. Where the structural arrangement of the works admits of it, the chute and elevator may travel from furnace to furnace. The elevator is mounted at its lower end on a bogie-winch *h* and at its upper end on an overhead traveling bogie *j*, the whole being operated by the hand-levers *k* through suitable gearing. The buckets *f* of the elevator are driven from an overhead driving-shaft *l*, as shown.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an appliance for charging open-hearth furnaces the combination of a movable support, of a hopper mounted on trunnions on said support and terminating in a chute abruptly curved at its lower end to nearly a horizontal position, the said hopper being sufficiently flared at its upper end as to receive the charging material from an independently-movable source of supply when said support is moved along its track, substantially as described.

2. In an appliance for charging open-hearth furnaces the combination with a movable support, of a chute carried by said support, adapted to be moved across the face of the furnaces to occupy various charging positions, the said chute being provided with a hopper sufficiently flared to receive the charging material from a fixed source of supply when said movable support is shifted along its track, substantially as described.

3. In an appliance for charging open-hearth furnaces, the combination of a movable support, a chute pivoted thereto and being abruptly curved to nearly a horizontal position at its lower end, a hopper secured to the top of said chute; a second movable support mounted above said hopper and supporting the upper end of an endless elevator; a tram-car carrying the lower end of said elevator, with means provided for moving the same along its track, and means for imparting motion to said elevator, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY TOMKINS.

Witnesses:

GEORGE JAMES CLARKSON,
EDWARD THOMAS ELCOAT.