

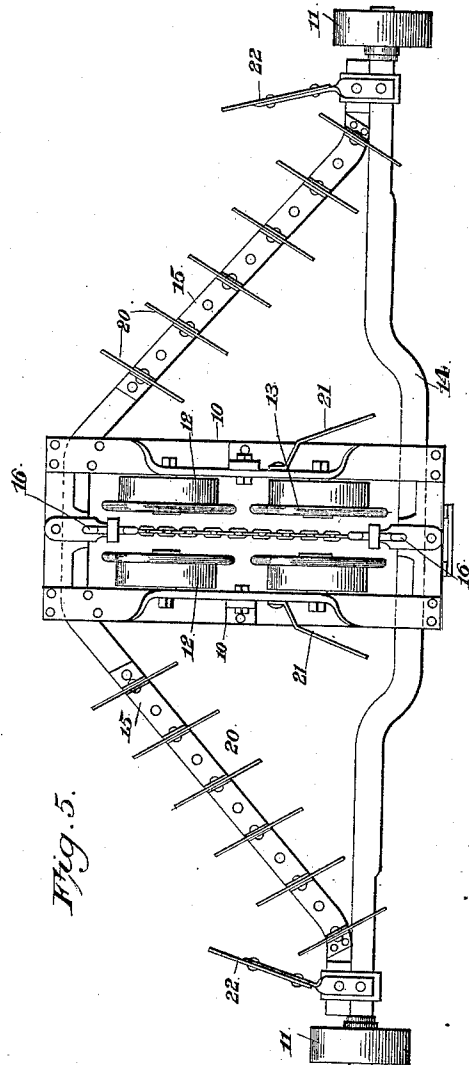
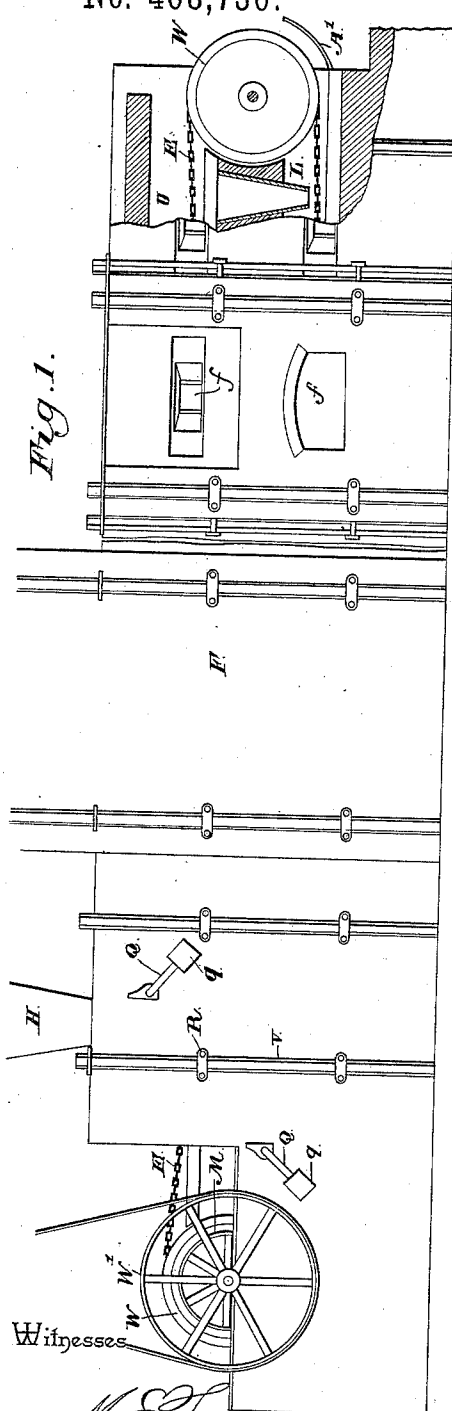
(No Model.)

4 Sheets—Sheet 1.

C. M. ALLEN.  
FURNACE FOR ROASTING ORES.

No. 468,736.

Patented Feb. 9, 1892.



*M. Fowler*  
*N. L. Colman.*

By his Attorneys,

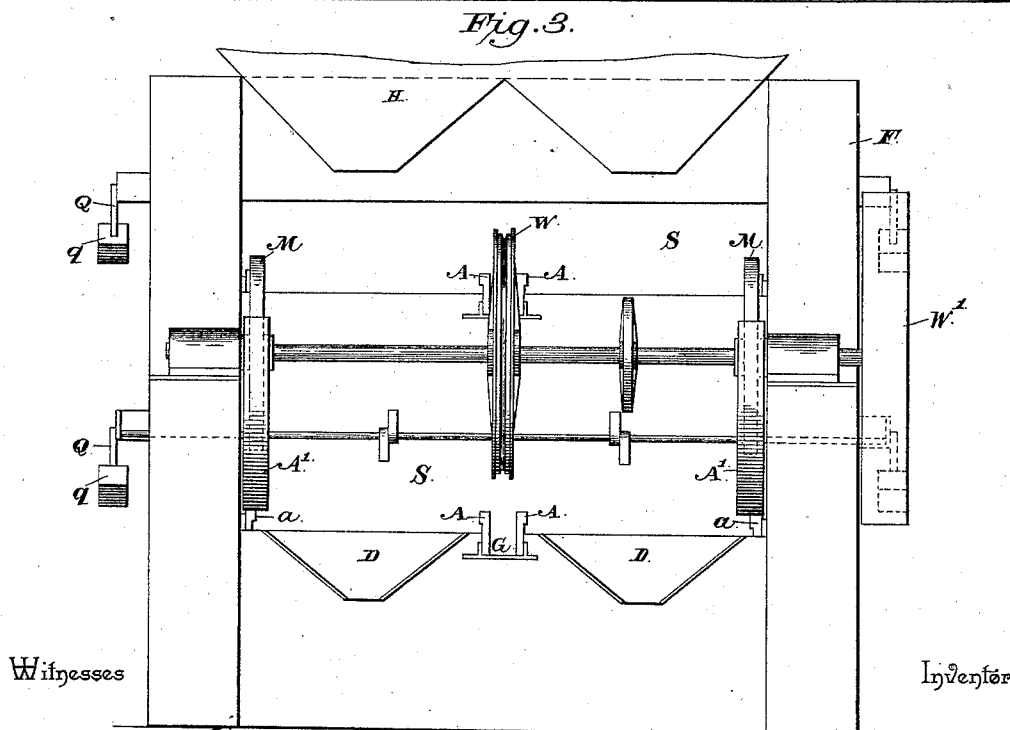
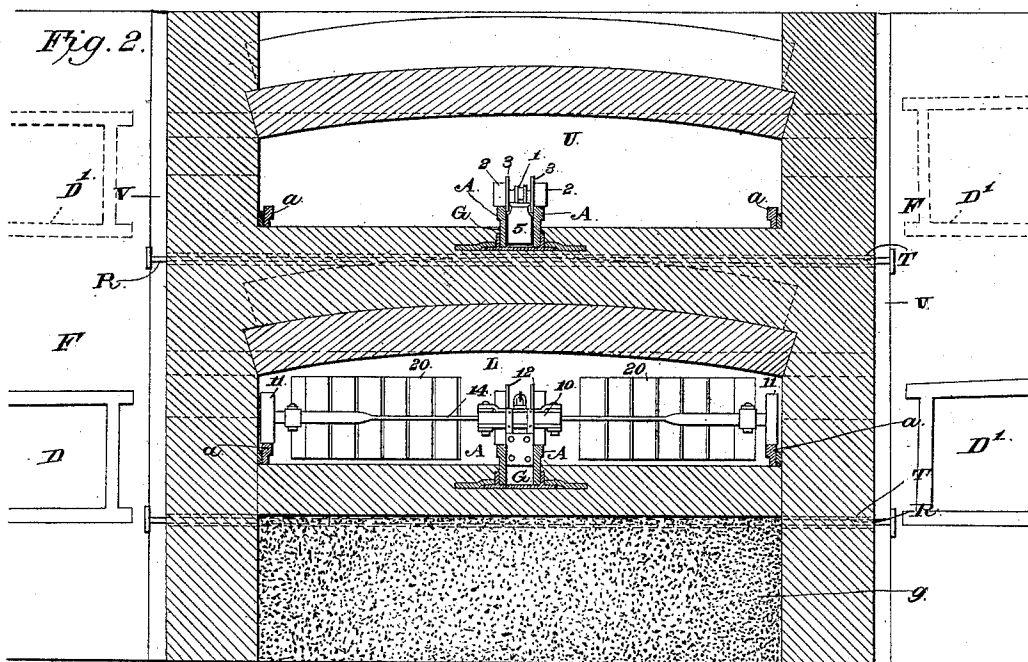
*C. A. Snow & Co.*

Inventor  
*Charles M. Allen*

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Witnesses

Inventor

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Fig. 4.

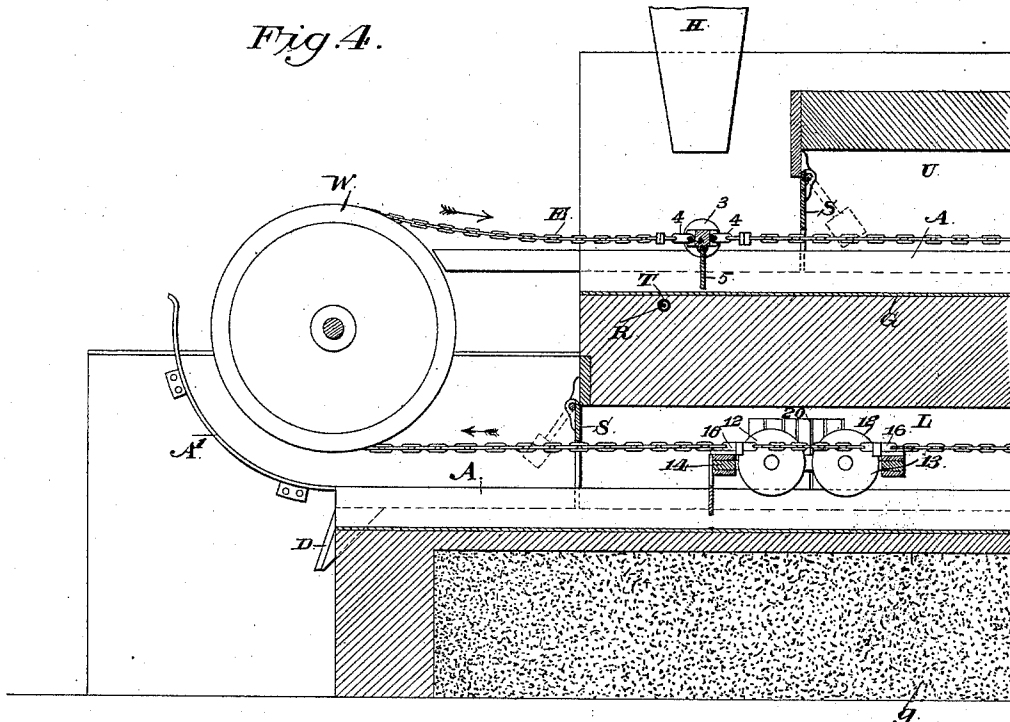


Fig. 6.

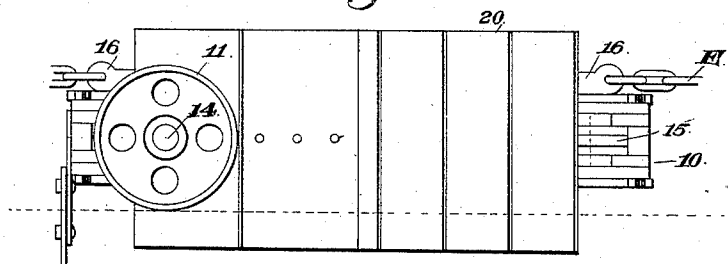
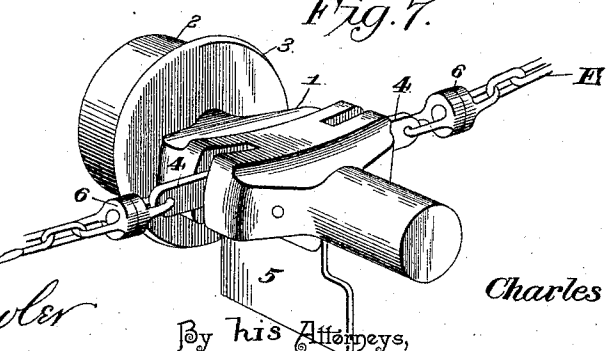


Fig. 7.



Witnesses

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*A. L. Collier*

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*Chas. M. Allen*  
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(No Model.)

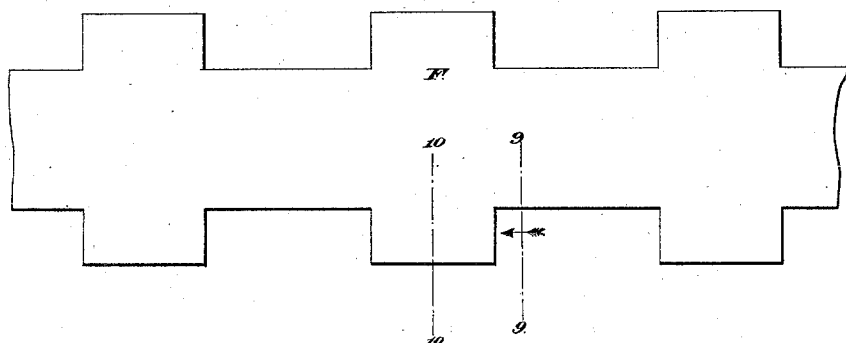
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C. M. ALLEN.  
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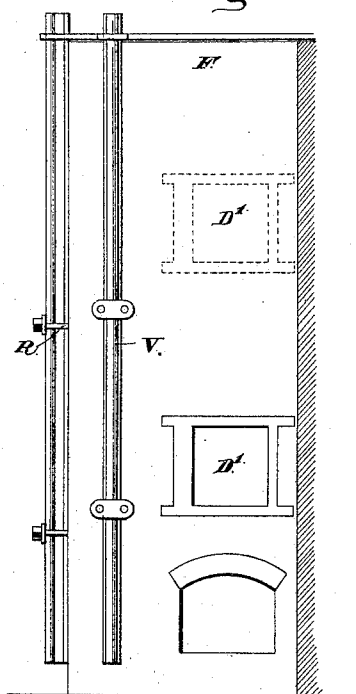
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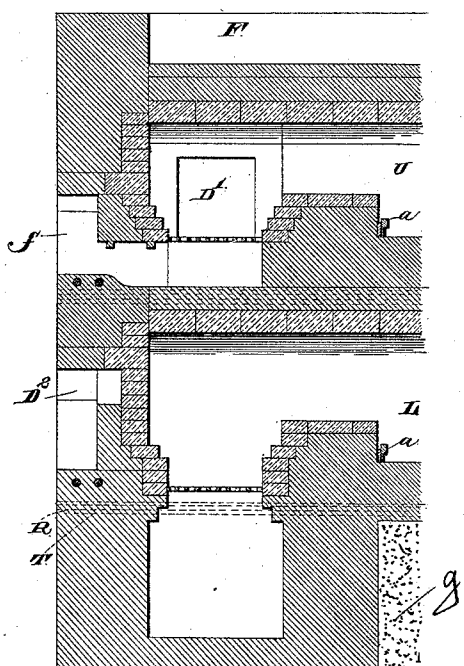
*Fig. 8.*



*Fig. 9.*



*Fig. 10.*



Witnesses

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# UNITED STATES PATENT OFFICE.

CHARLES M. ALLEN, OF BUTTE CITY, MONTANA, ASSIGNOR OF ONE-HALF  
TO GEORGE LABRAM, OF SAME PLACE.

## FURNACE FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 468,736, dated February 9, 1892.

Application filed February 28, 1891. Serial No. 383,199. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES M. ALLEN, a citizen of the United States, residing at Butte City, in the county of Silver Bow and State of Montana, have invented a new and useful Furnace for Roasting Ores, of which the following is a specification.

This invention relates to furnaces for drying, desulphurizing, and chloridizing ores; and the object of the same is to effect certain improvements in furnaces of this character.

To this end the invention consists in the details of construction hereinafter more fully described and claimed, and as illustrated in the drawings, wherein—

Figure 1 is a side elevation, partly in section, of this improved furnace. Fig. 2 is a cross-section of the same. Fig. 3 is a front end elevation of said furnace. Fig. 4 is a central longitudinal section of said front end of the furnace, showing the same, the feed-hopper, and the discharge-chute. Fig. 5 is a plan view of the plow. Fig. 6 is a side elevation thereof. Fig. 7 is a perspective view of the chain-carrier. Fig. 8 is a diagrammatic plan view of a portion of my furnace. Figs. 9 and 10 are sections on lines 9 9 and 10 10 of Fig. 8.

Referring to the said drawings, the letter F designates, generally, the masonry of which my furnace is built, the same being of any suitable length (preferably fifty feet or over) and of about rectangular cross-section, as seen in Fig. 2, with an upper chamber U and a lower chamber L, extending throughout its length. At various points throughout the length of this masonry are arranged fire-boxes *f*, as well known in the art, and by means of which various degrees of heat may be imparted to the upper and lower chambers at different points. But one pair of these fire-boxes is shown in Fig. 1; but Fig. 8 shows that they project slightly beyond the sides of the furnace proper, and Figs. 9 and 10 give sectional views through the fire-boxes to show how the heat from the fire is passed over and across the chambers to the chimneys.

D' represents fuel-openings for the fire-boxes, and D<sup>2</sup> openings or hand-holes closed by the fire-brick, which latter may be removed for giving access to the interior of the fire-boxes for the purpose of repair. The masonry

is preferably braced by vertical rails V, connected by truss-rods R, extending through tubes T in the masonry, whereby the truss-rods are not subjected to varying degrees of temperature, which would cause them to expand and contract, nor to the sulphurous fumes, which would tend to destroy their strength. In other respects the details of construction of the furnace are not essential, except that the body of the furnace below the lower chamber is preferably filled with gravel *g*. Along the outer sides of each chamber are arranged rails *a*, and along the center of each chamber a pair of higher rails A, which, however, are set in a groove G in the bottom of the chamber, so that their treads are in the same horizontal plane with the side rails *a*, and all these rails, especially the center ones, may have suitable ties or other supports within the masonry, as shown in Fig. 2.

At each end of the furnace is a large wheel W, mounted in suitable bearings, and over these wheels passes an endless chain E, which normally travels above the grooves G of the two chambers in opposite directions, as indicated by the arrows, motion being imparted thereto through a power-wheel W' upon the shaft of one of these wheels. Thus it will be seen that this chain passes into the feed end of the furnace, slowly down the upper chamber U to the rear end of the furnace, over the wheel W at that point, slowly back within the lower chamber L, out the front end of the furnace, and over the forward wheel W to the point of starting. With a chain of considerable length, as this one must be, it will be at once obvious that parts thereof remote from the wheels W will travel in the bottoms of the grooves G, the result being that the links of the chain (or the strands of the wire-rope, if one be used) will become rapidly worn, and in order to avoid this I provide the chain-carrier best seen in Fig. 7. This consists of a small carriage 1, upon which are journaled wheels 2, having flanges 3, and to which carriage is also connected links 4, which are attached by swivels 6 to the chain E. Depending from the carriage 1 is preferably arranged a scraper or shovel 5, which thoroughly cleans out the groove G in the lower chamber L at each passage of the chain-carrier and leaves

the groove clear for the succeeding length of chain. Several of these carriers are located within the chain throughout its length and at suitable intervals, their number depending upon the length of the chain and the distance between them upon the weight of the chain and the degree of tension imparted to it. At certain points throughout the length of the chain are also located plows, each of which is of the construction best seen in Figs. 5 and 6—that is to say, 10 is a rectangular frame in which are arranged wheels 12, having flanges 13. 14 is a cross-bar connected at its center to said frame, and 15 are oblique bars connected to the front end of the frame 10 and to the outer ends of the cross-bar 14. At said outer ends are located wheels 11, preferably having smooth faces.

16 are eyes connected to the frame 10, to which the chain E is attached, and when this chain moves the wheels 12 travel on the tracks A, while the wheels 11 travel on the tracks a, the flanges 13 of said wheels 12 preventing lateral displacement and derailment of the plow.

Connected to and carried by the oblique bars 15 are blades 20, which are set each at a slight angle to the direction of movement of the plow, and hence when the plow progresses in the direction of the arrow in Fig. 5 these blades will move the ore from each side toward the center of the chamber, whereas if the plow were moved in the opposite direction the ore would be caused to move outwardly. Said ore is fed into the feed-hopper H at the front end of the furnace and falls onto the floor of the upper chamber U. One of the plows in the chain E, then passing into this end of this chamber, the blades thereof pass the ore forward slightly, and at the same time either toward the outside or the center of the chamber, according as the blades of this plow are set, and the next following plow moves the ore in the opposite direction, while it also moves it forward. In this manner the ore moves forward in the upper chamber until it reaches the rear end thereof, when it drops through the chute onto the floor of the lower chamber, and the plows moving therein in the opposite direction move the ore backward toward the front end of the furnace, and it finally drops through the discharge D into a suitable receptacle. It will be understood that the chain and the chain-carriers and plows thereon move through the length of one chamber around the wheel W, and then through the length of the other chamber, as above described.

When the plow, Fig. 5, is moving in the direction of the arrow, deflectors 21 are secured to the sides of the frame 10, and as the plow moves these deflectors take the ore from just outside the tracks A and move it to a point where the blades 20 will successively engage it, and as these blades are arranged properly the blades of one plow will engage the furrows of the plow that has gone in front. Of course the blades are deep enough to scrape

the bottom of each chamber, and yet when the plow is turned other side up, as necessarily results from its going around the wheel W, the other ends of the blades will be available in the other chamber. When the plow is moving in the other direction, however, the deflectors 21 are removed and other deflectors 22 are attached near the outer ends of the cross-bar 14. These deflectors gather the ore which is adjacent the side tracks a and move it inwardly, as will be understood. The chain-carriers between the plows not only support the chain, but clean out the groove G in the lower chamber. As they pass over the end wheels and come into the other chamber it will be obvious that their scrapers 5 will be inverted, and hence I occasionally invert one of the chain-carriers before it enters the upper chamber, so that its shovel will clean out the upper groove and restore it to its normal position at the rear end of this chamber, the swivels 6 permitting. It will be understood that the upper groove does not so soon become choked with the ore and its cleaning out is not so often necessary. Hence this inversion may occur once or twice a day, the shovels on the chain-carriers projecting normally downward and cleaning out the lower groove each time they pass through the chamber. The wheels on the chain-carriers as well as on the plows are preferably lubricated with graphite, because oil would dry out too soon under the heat to which it is subjected.

In Fig. 3 is shown in side elevation the shaft which carries the driving-wheel W' and the chain-wheel W. Upon this shaft are also arranged smooth-faced wheels M, over which the end wheels 11 of the plows travel as the plows pass around said shafts. In addition I preferably provide curved tracks A', arranged around a portion of these wheels M, between which tracks and wheels said end wheels 11 pass. At the ends of the two chambers are preferably arranged doors S, hinged at their upper edges, and extending from said hinged edges at proper angles are arms Q, carrying weights q. As the plows or the carriers move under these doors they are opened, but the weights return them normally to their closed positions, and by this means the chambers are kept closed as much as possible and the draft as little interrupted as is necessary.

What is claimed as new is—

1. In a furnace of the character described, the combination, with the furnace-body having a longitudinal chamber provided with a groove along its center, a chain above said groove, and means for moving the chain, of tracks secured along the sides of said groove and rising above the bottom of said chamber, plows and chain-carriers secured to the chain and having supporting-wheels traveling on said tracks, and scrapers depending from said carriers and adapted to clean out the groove, as set forth.

2. In a furnace of the character described,

- the combination, with the furnace-body having upper and lower longitudinal chambers provided with grooves in their bottoms, a wheel at each end of said body, means for revolving one of said wheels, and an endless chain passing through both chambers and around both wheels, of tracks secured along the sides of said grooves and rising above the bottoms of said chambers, plows and chain-carriers secured to the chain and having supporting-wheels traveling on said tracks, swivels in the chain on both sides of each carrier, and scrapers depending from said carriers and adapted to clean out the grooves, as set forth.
3. In a furnace of the character described, the combination, with the furnace-body having upper and lower longitudinal chambers, an endless chain moving through said chambers, tracks along the sides of the latter, and plows secured to the chain and having wheels moving on said tracks, of a shaft journaled across each end of the furnace, a grooved wheel mounted on said shaft and over which said chain passes, smooth-faced wheels upon said shaft near its ends, and stationary curved tracks adjacent said smooth-faced wheels, the supporting-wheels on the plows moving between these parts as the plows pass around the grooved wheels, as set forth.
4. In a furnace of the character described, the combination, with the furnace-body having a longitudinal chamber provided with a

groove in its body, a chain moving above said groove, tracks secured along the sides of the groove and rising above said bottom, and other tracks along the sides of said bottom, of a plow secured to said chain and comprising a frame-work, flanged wheels journaled therein and traveling along the center tracks, other wheels journaled thereon and traveling on the side tracks, and blades carried by said frame-work and scraping the floor of the chamber, as set forth.

5. In a furnace of the character described, the combination, with the furnace-body having a longitudinal chamber and a feed-hopper and delivery-chute at the opposite ends thereof, of a plow within said chamber, the same comprising a frame having oblique bars, blades secured thereto and set at angles to the length of the chamber, and detachable deflectors secured to the frame near the sides of the chamber with their free ends extending beyond the lines of movement of certain of said blades, and means for moving said plow in either direction, as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

CHARLES M. ALLEN.

Witnesses:

H. C. BELLINGER,  
W. C. THOMAS.