Dec. 1, 1925. 1,563,949

D. BAKER

METHOD AND MEANS FOR FURNACE CHARGING

Filed Dec. 7, 1923 4 Sheets-Sheet 1

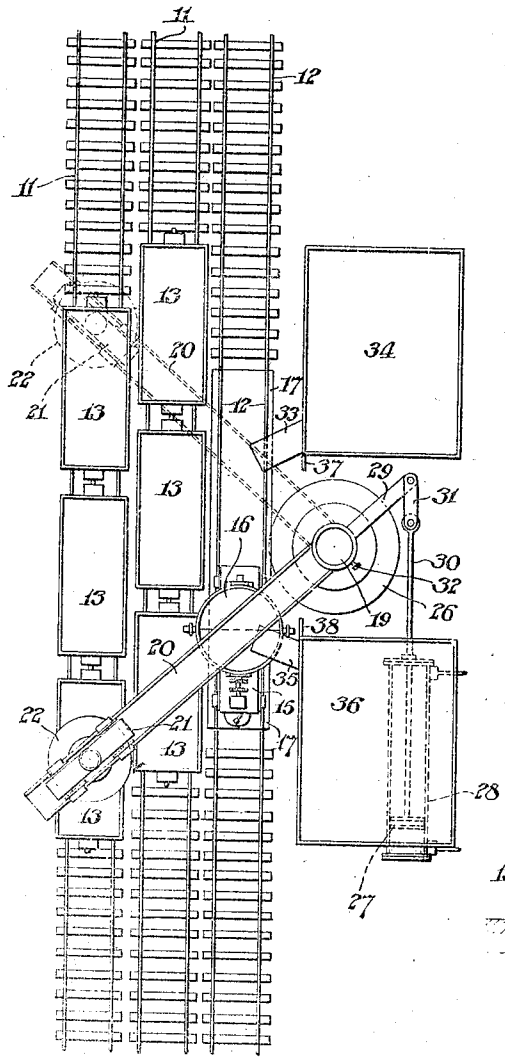


Fig. 1.

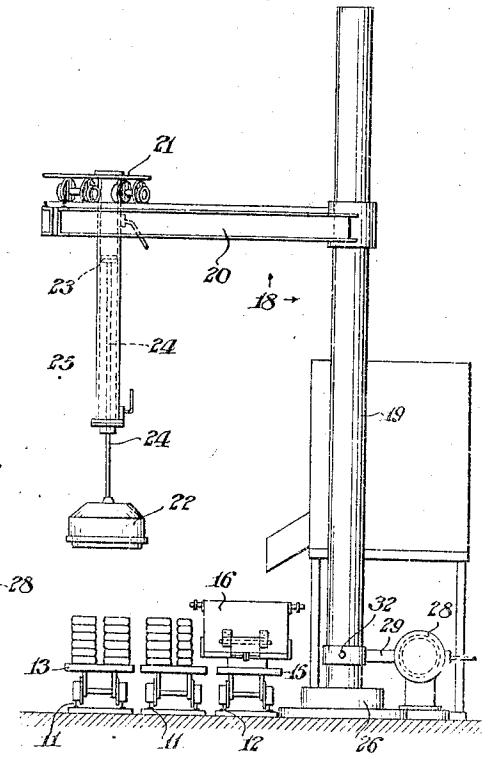


Fig. 2.

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Filed Dec. 7, 1923 4 Sheets-Sheet 2

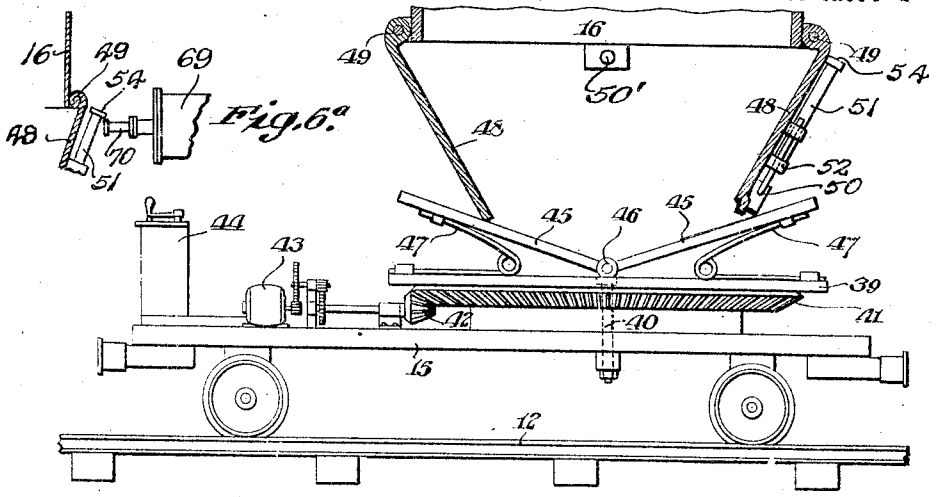


Fig. 3.

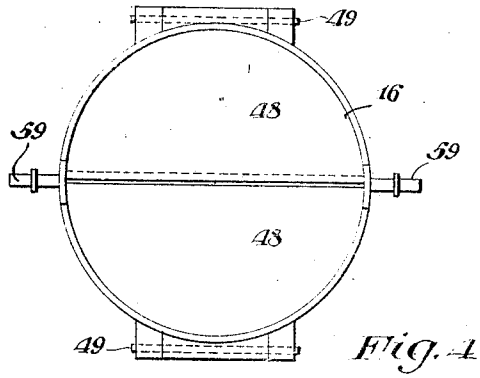


Fig. 4.

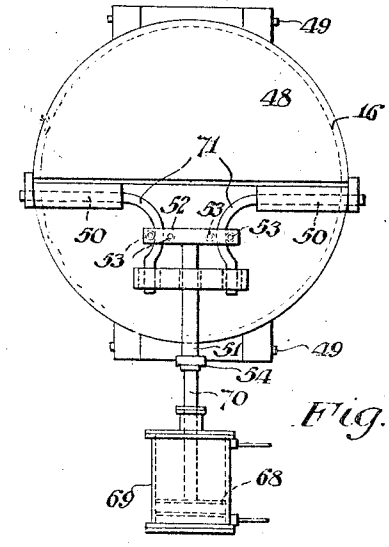


Fig. 5.

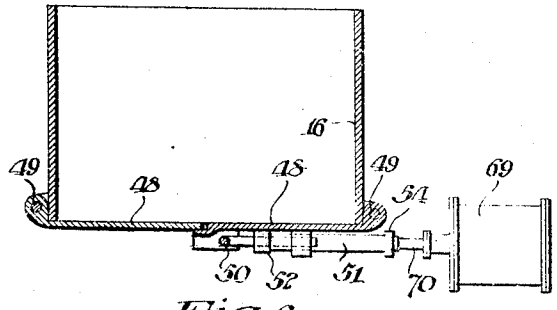


Fig. 6.

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Dec. 1, 1925. 1,563,949

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METHOD AND MEANS FOR FURNACE CHARGING

Filed Dec. 7, 1923 4 Sheets-Sheet 3

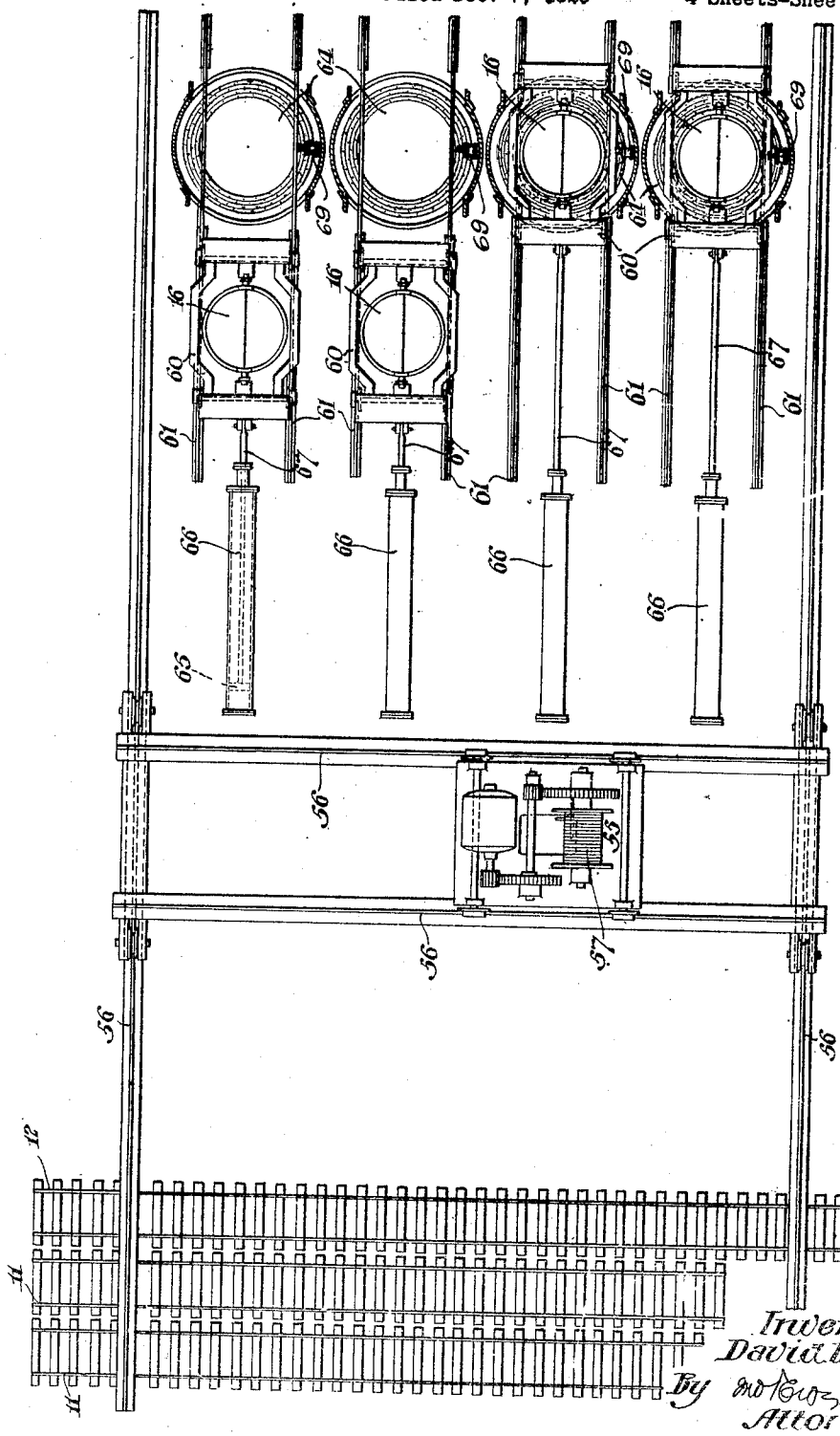


Fig. 7.

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Dec. 1, 1925. 1,563,949

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METHOD AND MEANS FOR FURNACE CHARGING

Filed Dec. 7, 1923 4 Sheets-Sheet 4

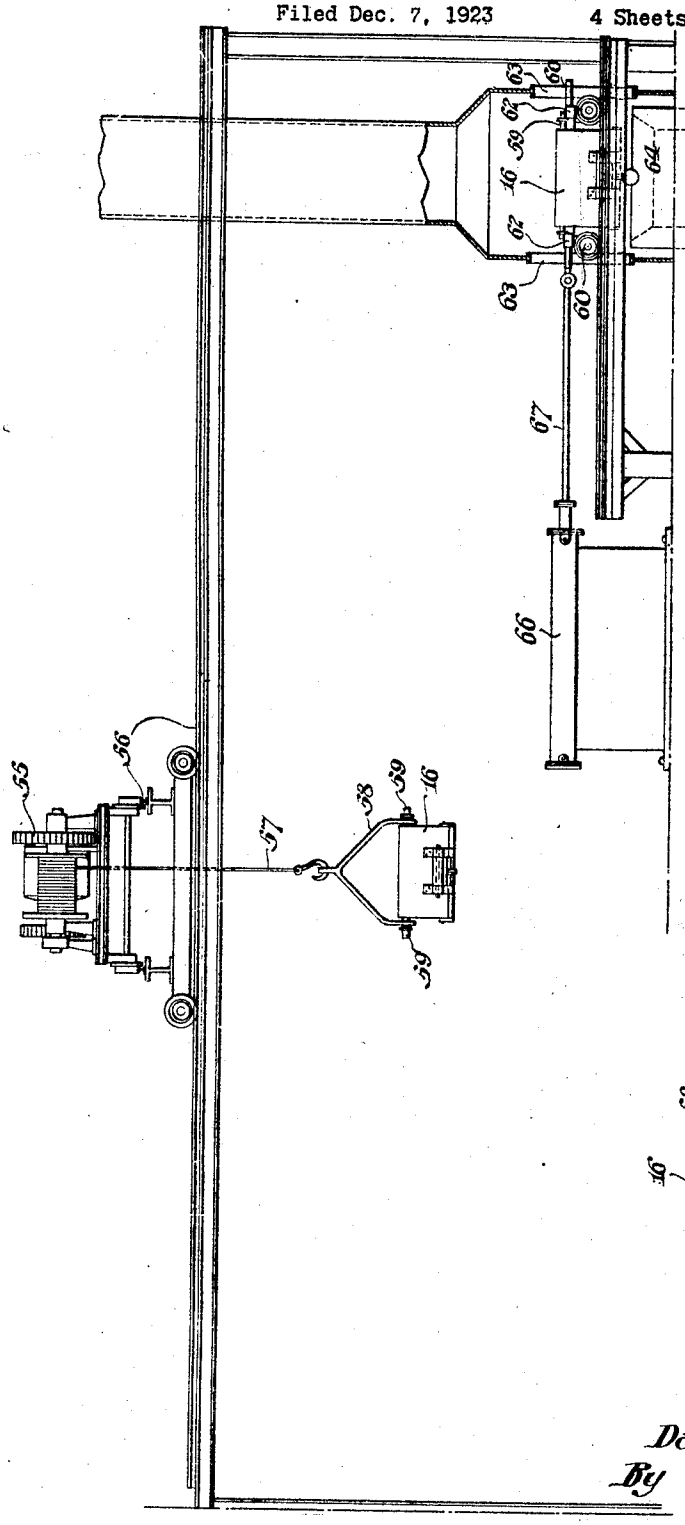
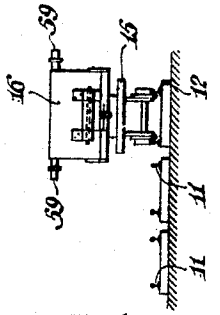


Fig. 8.



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Patented Dec. 1, 1925. 1,563,949

UNITED STATES PATENT OFFICE.

DAVID BAKER, OF NEW CASTLE, NEW SOUTH WALES, AUSTRALIA.

METHOD AND MEANS FOR FURNACE CHARGING.

Application filed December 7, 1923. Serial No. 679,104.

To all whom it may concern:

Be it known that I, DAVID BAKER, a citizen of the United States, residing at New Castle, New South Wales, Australia, have invented a new and useful Method and Means for Furnace Charging, of which the following is a specification.

The invention relates to furnace charging. The object is to provide improved method and means for charging furnaces with several materials in exact and required proportions and in even layers. The invention comprises method and means whereby the materials are assembled in evenly distributed layers and in required proportions, and then delivered in a body as a unit into the furnace, such as a cupola furnace, while maintaining said evenly distributed layers intact or undisturbed, which greatly facilitates the smelting operation.

The invention comprises improved method and means for assembling the materials from different sources of supply, into a common receiver or hopper and weighing each material as it is delivered to the receiver in order to secure an exactly measured mass or quantity thereof, and distributing said materials in even layers in the receiver and then delivering the entire assembled body of material into the furnace, while maintaining said even layer distribution of the said materials within the furnace.

Referring to the drawings, which illustrate merely by way of example, suitable means for effecting my invention:—

Fig. 1 is a plan view.

Fig. 2 is an elevation of means for delivering and assembling the several materials in the receiver or hopper.

Fig. 3 is an elevation on an enlarged scale of the car for supporting the hopper during the loading operation, showing means for closing the bottom elements of the hopper and also means for rotating the hopper.

Fig. 4 is a top plan of the hopper.

Fig. 5 is an underside plan of the hopper showing the latching means for the bottom elements.

Fig. 6 is a fragmentary section of the hopper and means for releasing the bottom elements.

Fig. 6ª is a fragmentary detail in part section and part elevation.

Fig. 7 is a plan view of the crane, transfer cars and a battery of furnaces.

Fig. 8 is an elevation of the same.

Similar numerals refer to similar parts throughout the several views.

As shown in Figs. 1 and 2 a plurality of tracks 11 and 12 are provided. The tracks 11 are for cars 13 containing materials, such as pig iron, if desired of different varieties or grades. The track 12 is for the car 15 which supports the hopper 16. This track 12 has a section supported on the scale 17. A crane 18 is also shown comprising the upright or standard 19 and the horizontal arm 20. Upon the latter is mounted the car 21 supporting the magnet 22. The magnet 22 is raised and lowered in the present example by the piston 23 connected by the piston rod 24 and operating in cylinder 25 to which is delivered as required a suitable fluid pressure in the well known manner. The trolley 21 is moved to and fro on the arm 20 in any desired manner, which forms no part of the present invention, as such methods are well known in the art. The upright or standard 19 is pivotally seated in a suitable foundation as at 26 and is rotated by the piston 27, operating in cylinder 28 connnected to the arm 29 by means of rod 30 and link 31. The arm 29 is adjustably but rigidly secured to the standard 19 by any suitable means as for example by one or more set screws 32. It will thus be seen that the magnet 22 has a substantial range of movement from the supply cars 13 to the hopper 16 as indicated by the full and dotted lines, Fig. 1, and the necessary vertical movement by the means shown in Fig. 2, so that pigs may be lifted from any car 13 by the magnet 22 and deposited in the hopper 16, until the required charge of pig has been accumulated in the hopper.

As above stated the hopper 16 is supported on the car 15 running on track 12, a section of track 12 is supported on the scale 17, so that as the pig is loaded into the hopper the scale 17 indicates when the proper amount by weight has been received. It will be noted that the section of track 12 which is supported by the scale 17 is of sufficient extent to permit the travel of the car 15, into different positions; one, to receive the discharge from chute 33 of bin 34 which

contains material such as coke, and one to receive the discharge from chute 35 of bin 36, for material such as stone, so that several materials may be delivered to the hopper 16, in required order and in required quantities, as indicated by the scale 17. The car 15 is moved to proper positions on scale 17 by motor or any other of the usual ways The discharge from the bins 34 and 36 is controlled by suitable gates as at 37 and 38.

The scale may of course be incorporated with the car if preferred.

In order to secure an even distribution of the different layers of material, the hopper 16 is adapted to be rotated periodically by the arrangement shown in Fig. 3, in which the car 15 supports a table 39 pivoted as at 40 and carrying the annular rack 41 which meshes with the pinion 42, which is driven by the motor 43, controlled by the controller 44. This platform 39 is also provided with the two arms 45 pivoted at 46 and normally supported by the springs 47. The bottom elements 48 of the hopper 16 are eccentrically hinged as at 49 so that while opening completely under the weight of material discharging they will normally hang at an inclination to the perpendicular. When the hopper 16 is lowered toward the table 39, the bottom elements 48 engage the arms 45, so that the same are moved into the closing position, in which position they are locked by the bolts 50 engaging the lugs 51 secured to the lower opposite edges of hopper 16, shown in Fig. 5. These bolts 50 are moved into the locking position by the movement of the rod 51 connected to the yoke 52 provided with the rollers 53. This rod 51 is usually actuated manually, to lock the bottom elements 48 in closed position, by a suitable handle or lever not shown, which engages the head 54 on said rod 51. When suitably charged with the several elements as just described, the hopper 16 is raised from the platform 39 of car 15 by the traveling crane 55, traveling on the tracks 56, as shown in Fig. 8; this crane being provided with the chain or rope 57 having the yoke 58, engaging the trunnions 59 of hopper 16. The crane 55 deposits the hopper 16 on a car 60 supported on the tracks 61. The car 60 is in the form of an open frame provided with seats, as at 62, for receiving the trunnions 59, so that the hopper projects downwardly between the wheels of the car 60. When the hopper 16 is suitably hung on its trunnions in car 60, as shown in the two upper cars of Fig. 7, the car is then pushed through suitable doors 63 over the furnace 64, so that the hopper 16 will register accurately with the open top of the furnace 64 and in close proximity thereto, as shown in Fig. 8. The movement of the car 60 into and away from the position over the furnace is secured by the operation of piston 65 operating in cylinder 66 and connected to the car 60 by the piston rod 67. These cylinders 66 are supplied, in the usual way, with fluid pressure.

When a loaded hopper is positioned over the top of the furnace 64, as shown in Fig. 8, the rod 51 is operated by a piston 68 operating in fluid pressure cylinder 69 and provided with the piston rod 70 adapted to engage the head 54 on rod 51. By pushing this rod 51 inwardly, the rollers 53 engaging the curved portions 71 of the bolts 50, cause the withdrawal of the bolts and the release of the hopper bottom elements 48, so that the same fall to a substantially vertical position, as indicated in Fig. 6ª, and permit the discharge of the entire load into the furnace 64 in substantially vertical lines of travel, and so that the even layers or strata of material are delivered to the furnace without impairment or disarrangement.

It will be noted that cylinder 69 is provided with fluid pressure pipes, one connected to each end of the cylinder (see Fig. 5). The preferred arrangement and operation, is to connect therewith the usual reversing valve, not shown, whereby the actuation of the piston 68 is similar to the pneumatic hammer actuation. In other words the rod 51 is given a hammer blow by piston rod 70, and the rod 70 is immediately withdrawn after said blow, to permit the end of rod 51 to pass the end of rod 70, as the bottom elements 48 fall to open position, upon the disengagement of bolts 50.

When a hopper is thus discharged, it is withdrawn from over the furnace into the position shown with respect to the two upper cars of Fig. 7; from which position the hoppers are lifted by the crane 55, and delivered back to a car 15, to repeat the cycle.

What I claim is:

1. The method of charging a furnace which consists in assembling a mass, consisting of a plurality of materials, in required proportions and in evenly distributed horizontal layers, and then depositing said mass into the furnace in substantially vertical lines of travel while maintaining the layer formation of the mass as assembled.

2. The method of charging a furnace which consists in assembling a mass, consisting of a plurality of materials in required proportions by weight, and in evenly distributed horizontal layers, and then depositing said mass into the furnace in substantially vertical lines of travel and reducing the distance of travel to a minimum while maintaining intact the layer formation of the mass as assembled.

3. The method of charging a furnace which consists in assembling a mass, consisting of a plurality of materials in required proportions by weight, and in evenly distributed horizontal layers, and then depositing said

mass into the furnace in substantially vertical lines of travel while maintaining the substantial shape and layer formation of the mass as assembled.

4. The method of charging a furnace which consists in assembling a mass, consisting of a plurality of materials in required proportions and in evenly distributed horizontal layers, and then depositing said mass into the furnace in such manner that the entire mass shall move in substantially vertical lines.

5. The method of charging a furnace which consists in assembling a mass, consisting of a plurality of materials in required proportions and in evenly distributed horizontal layers, and then depositing said mass into the furnace in such manner that the entire mass shall move through an unobstructed path corresponding in cross-section to the horizontal cross-sectional areas of the mass and of the furnace.

6. In a furnace charging system, the combination of a hopper, means for delivering charges of pig thereto, means for delivering other materials to the hopper in required proportions and in evenly distributed layers, means for transporting the hopper to the furnace, and means for delivering the hopper contents to the furnace through a substantially vertical path of travel corresponding in cross-section to the full horizontal cross-sectional areas of the hopper and of the furnace in order that the charge may be deposited in the furnace without disturbing its even layer formation.

7. In a furnace charging system, the combination of a hopper, means for delivering charges of pig thereto, comprising a magnet and means for moving the same, means for moving the hopper to different points of material discharge, means for rotating the hopper in order to secure even layers of material delivered thereto, means for transporting the hopper to the furnace, and means for delivering the hopper contents to the furnace through a substantially vertical path of travel of shortest possible length, said hopper corresponding in horizontal cross-section to the full horizontal cross-sectional interior area of the furnace in order that the charge may be deposited in the furnace without disturbing its even layer formation.

8. In a furnace charging system, the combination of a hopper, means for delivering charges of pig thereto, means for moving the hopper to different points of material discharge, means for rotating the hopper in order to secure even layers of material delivered thereto, means for weighing the hopper during the delivery of material thereto, means for transporting the hopper to the furnace, and means for delivering the hopper-contents to the furnace through a substantially vertical path of travel, said hopper corresponding in horizontal cross-section to the full horizontal interior cross-sectional area of the furnace, in order that the charge may be deposited in the furnace without disturbing its even layer formation.

DAVID BAKER.