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Schumacher et al.

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[54] **APPARATUS FOR CHARGING ELECTRIC FURNACES**

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[51] **Int. Cl.** **F27d 3/06**

[58] **Field of Search** ..... 214/18 PH, 35 R; 13/33

[56] **References Cited**

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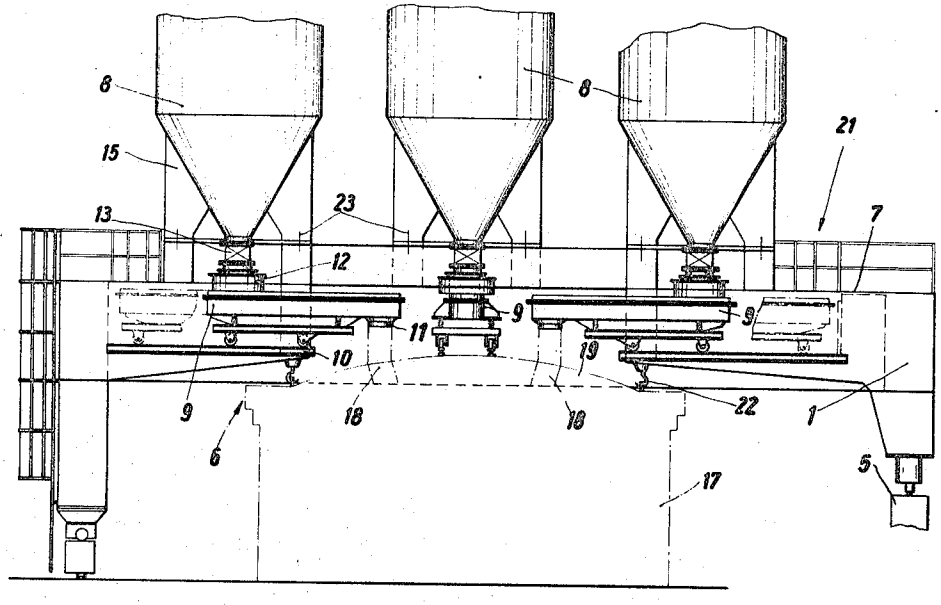
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[57] **ABSTRACT**

An apparatus for charging electric furnaces with a hot charge, e.g., iron sponge pellets, which apparatus is provided with a transportable container discharging the charge through a shuttle conduit into a furnace feed opening.

8 Claims, 4 Drawing Figures



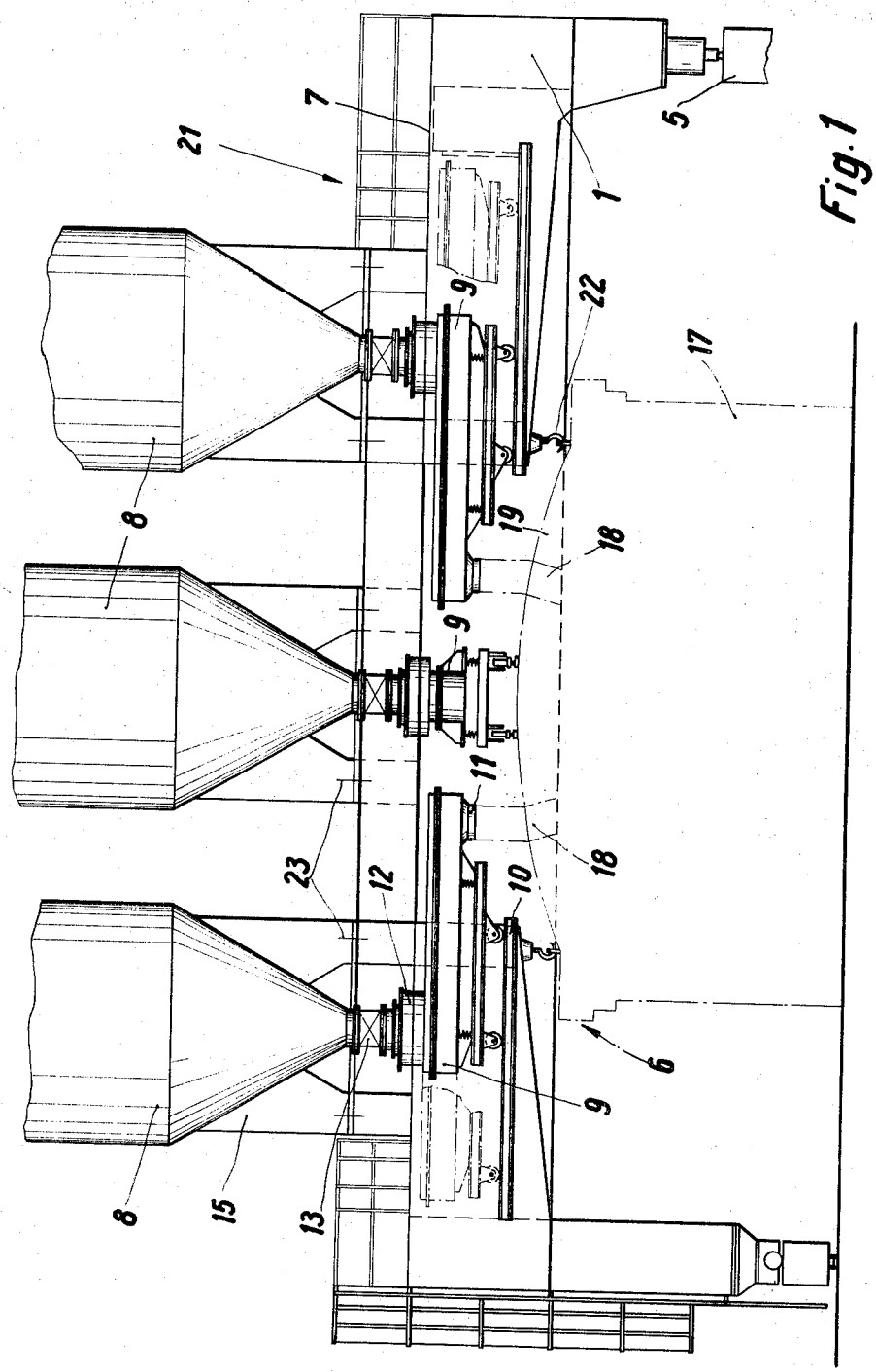


Fig. 1

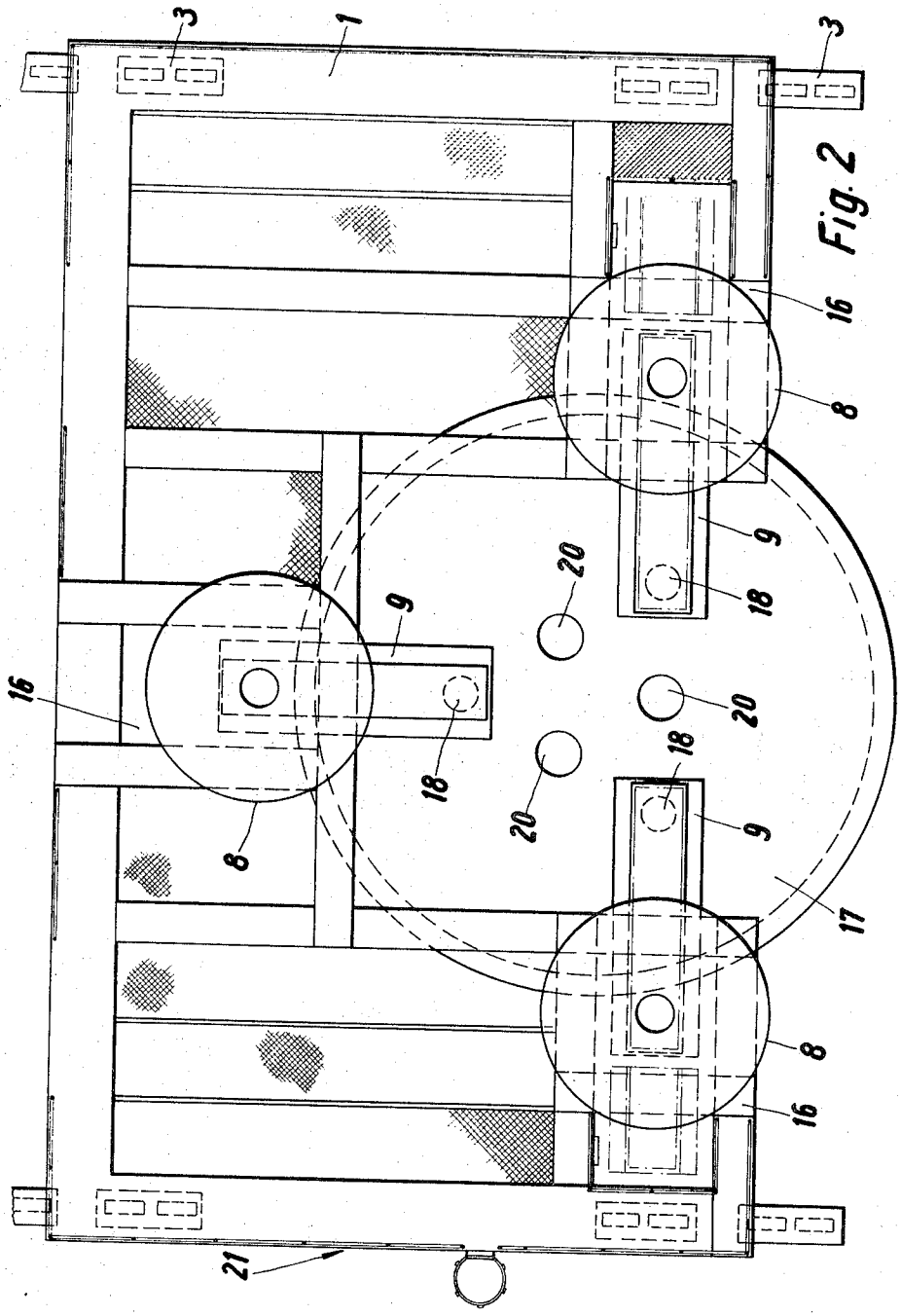
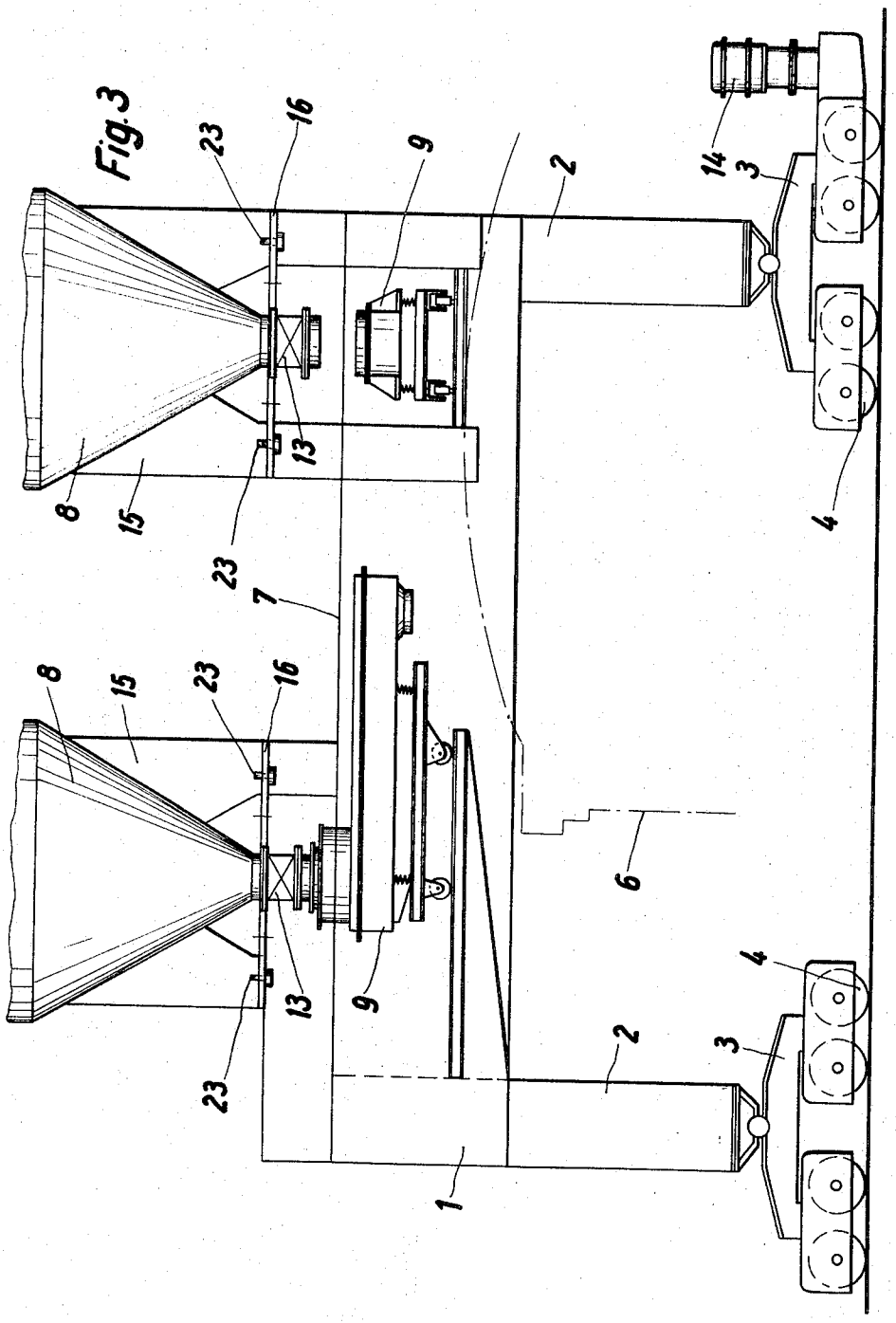


Fig. 2

Fig. 3



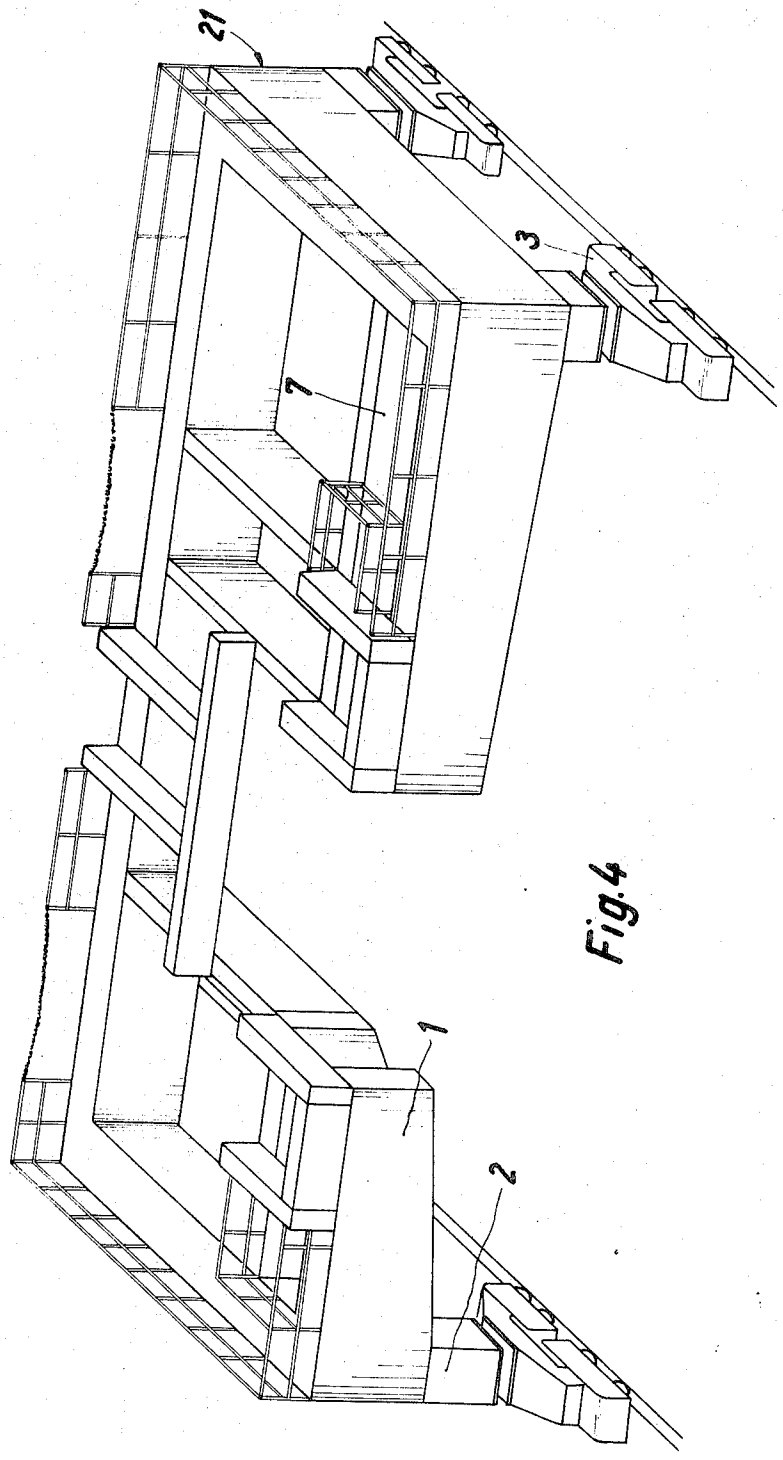


Fig. 4

APPARATUS FOR CHARGING ELECTRIC FURNACES

BACKGROUND AND SUMMARY OF THE INVENTION

Heretofore, the charging of electric steel furnaces with hot pellets, particularly iron sponge, has not been satisfactorily optimally effected. It is known that during the process of charging, contact of the charge with ambient air should be avoided in order to prevent undesirably rapid oxidation of the pellets and to prevent unnecessary heat losses for maximization of conservation of energy.

When charging furnaces, it is known to use combined conveyor systems located between stationary bunkers and the furnace, which systems have comprised, essentially, chutes and conveyor channels or lorries.

The use of these known devices, however, has not prevented contact of the charge with the ambient air, when the material is in transit from one conveyor system to another.

Accordingly, an object of the invention is the development of an apparatus which provides for the feeding of hot charge, e.g. pellets, into a plurality of zones of a furnace after the charge has been as effectively as possible isolated from ambient air during its transit from a storage tank to the furnace.

In accordance with the principles of the invention, this objective is achieved by providing a mobile platform having a number of movable and essentially horizontal, totally enclosed, "shuttle" conduits sealed from ambient air, which shuttle conduits correspond in number to the number of furnace feed openings. When the platform is moved into its charging position at the furnace, filling sleeves associated with the outer end of each shuttle conduit are connected to the outlets of one common or several single and interchangeable containers on the platform. The discharge ends at the inner ends of the shuttle conduits are directed to each of the furnace feed openings. Thus, the hot charge is conveyed from the storage containers into the furnace without substantial contact with ambient air in a manner which eliminates undesirable chemical changes or energy losses during the furnace charging process.

It has been found expedient to use a mobile platform having a U-shape, which platform surrounds the furnace on three sides when positioned for feeding. According to another detail of the invention, three interchangeable containers are mounted on each of the three arms of the U-shaped platform. As will be understood, the mobile platform constitutes an "operating platform".

One advantageous embodiment of the new apparatus uses totally enclosed, shuttle conduits to convey the charge. Moreover, in order to achieve a gas-tight connection between the material container outlets and the shuttle conduits, the junctions therebetween are sealed with protective gas or sand packings.

As a further aspect of the invention, the platform is supplied with suspension and hoisting devices into which the furnace top may be hooked, in order to use the operating platform for both lifting and moving of the furnace top. This arrangement does not require the usual gantry to remove the furnace top, as will be understood.

For a more complete understanding of the present invention and a greater appreciation of its attendant advantages, reference should be made to the following detailed description and to the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of the apparatus in furnace charging position;

FIG. 2 is a plan view of the apparatus of FIG. 1;

FIG. 3 is a side elevational view of the apparatus of FIG. 1; and

FIG. 4 is a perspective view of the apparatus of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF INVENTION

As shown in the drawings, the major part of the new and improved furnace apparatus of the invention consists of movable operating platform 21 having a generally U-shaped frame 1. An electric furnace 6 is surrounded on three sides by the legs of the platform 21 when the apparatus is in charging position. Multiple supports 2 for the frame 1 include carriages 3 with wheels 4. Track rails 5 are located on both sides of the furnace. The operating platform 21 is provided with an appropriate driving component 14, such as an electric motor.

Three elevated vertical storage containers 8 for the hot charge, e.g., iron sponge pellets, are arranged above a deck 7 and have base junction plates 16. The containers 8 include welded claws 15 resting on base plates 16. When the operating platform 21 is moved, the vertical containers 8 are secured on base plates 16 by means of supports 23.

Beneath the deck 7 three closed shuttle conduits 9 are provided, each having its own driving components and each movable towards the furnace center on guide rails 10 attached to the frame construction. During the charging process, protective gas may be blown into the conduits 9 in order to prevent any chemical reduction of the charge.

While moving the platform 21 to and positioning it over the furnace 6, the shuttle conduits 9 are retracted to leave sufficient room for clearance of the furnace electrodes 20 and their supports. Once the platform 21 reaches an operating or charging position over the furnace, the shuttle conduits 9 are moved towards the furnace center and stopped. The outlets 11 of the conduits 9 are then positioned above each of the feed openings 18 in the furnace top 19, and the filling sleeves 12 of the conduits 9 are located in registry immediately below the outlets 13 of the storage containers 8. Filling sleeves 12 of the conduits 9 and outlets 13 of containers 8 are joined in a gas-tight manner by means of appropriate sealing. To that end and if necessary, sand packing may be employed.

The feed openings 18 provided in the furnace top 19 are situated in the apices of an imaginary equilateral triangle on the midpoints of the sides of which are horizontal projections of three electrodes 20. This assures optimum distribution of the charge within the range of the electrodes.

As a further aspect of the invention, the mobile platform 21 may also be used advantageously for lifting and moving the furnace top 19, e.g., when charging with scrap or during repairs. For this purpose, platform 21 is also equipped with suspension and hoisting devices 22, thus eliminating the need for a separate gantry

crane or the like to lift and move the furnace top 19.

The new charging apparatus of the invention may be operated as follows: The storage containers 8 filled with the charge, by means of a crane, are initially set onto the base plates 16 arranged on platform supports 1, and the containers are locked in position by supports 23. The vertical container outlets 13, of course, point downward. The shuttle conduits 9 are stopped in their outermost or "outboard" positions near the exterior platform periphery.

Thereafter, the platform 21 is moved to and positioned directly over the furnace crucible 6. Then the shuttle conduits 9 are moved inwardly toward the center of the furnace. In this "inboard" position, the outlets 13 of the containers 8 and the filling sleeves 12 of the shuttle conduits are precisely registered, and they may be joined in a gas-tight fashion by means of appropriate sealing, e.g., sand packing.

Finally, the outlets 13 are opened, allowing the hot charge to enter the conduits 9 and to flow through the outlets 11 and the feed openings 18 into the furnace chamber 17.

Upon termination of charging, the shuttle conduits 9 are retracted to their original outboard positions on the platform 21, which itself is then removed from the vicinity of the furnace 6 along tracks 5. The empty storage containers 8 are then replaced by new, filled containers, and, as will be appreciated, the apparatus is then prepared for a new cycle of operation.

We claim:

1. Apparatus for charging electric furnaces, comprising

a. a mobile platform comprised of an elevated deck supported by at least four legs, each of which legs is mounted on a carriage supporting a plurality of wheels;

b. track means definitive of a predetermined path between a furnace and a source of heated charge material;

c. the wheels of said carriage being movable along said track means to move said mobile platform along said predetermined path;

d. a plurality of hot charge storage containers supported adjacent the periphery of said mobile platform, each of said containers having an outlet at the lower end thereof;

e. shuttle conduit means associated with each of said storage containers and supported on said platform for reciprocation between a predetermined inboard position and outboard position;

f. filling sleeves carried by each of said conduits adapted to be connected to each of said outlets when said shuttle conduit means are in their inboard positions; and

g. conduit outlets disposed in the inner end of said conduits for discharging conveyed hot charge into a furnace.

2. The apparatus of claim 1, further characterized in that

a. said deck is generally U-shaped and is adapted to substantially surround a furnace for charging the same.

3. Apparatus in accordance with claim 2, further characterized in that

a. a single one of said storage containers is disposed on each of said legs of said U-shaped deck.

4. Apparatus according to claim 1, further characterized in that

a. said filling sleeves of said conduit means are provided with junctions sealed with protective gas for the connection of said conduit means with said container outlets.

5. Apparatus according to claim 1, further characterized in that

a. said filling sleeves of said conduit means are provided with junctions sealed with sand packings for the connection of said conduit means with said container outlets.

6. Apparatus in accordance with claim 1, further characterized in that

a. suspension and hoisting means adapted to handle the top of an electric furnace are mounted on said platform.

7. Apparatus in accordance with claim 1, in which

a. said conduit means comprises an elongated closed channel means having a generally trapezoidal cross section;

b. the upper surface of said filling sleeve being mounted on the rear upper surface of said conduit means;

c. said conduit outlet being mounted on the lower innermost surface of said conduit means;

d. said conduit means being supported on a multiwheeled carriage;

e. track means supported by said movable platform and adapted to support and guide said shuttle conduit for travel between said inboard and outboard positions.

8. The apparatus of claim 1, further characterized in that

a. said movable platform constitutes an operating platform for an electric furnace.

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