

[54] APPARATUS FOR CHARGING COKE-OVEN CHAMBERS

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[51] Int. Cl..... **C10b 35/00; C10b 31/04**

[58] Field of Search **202/262, 263; 201/40; 214/16 R, 18 R, 21**

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Primary Examiner—Norman Yudkoff

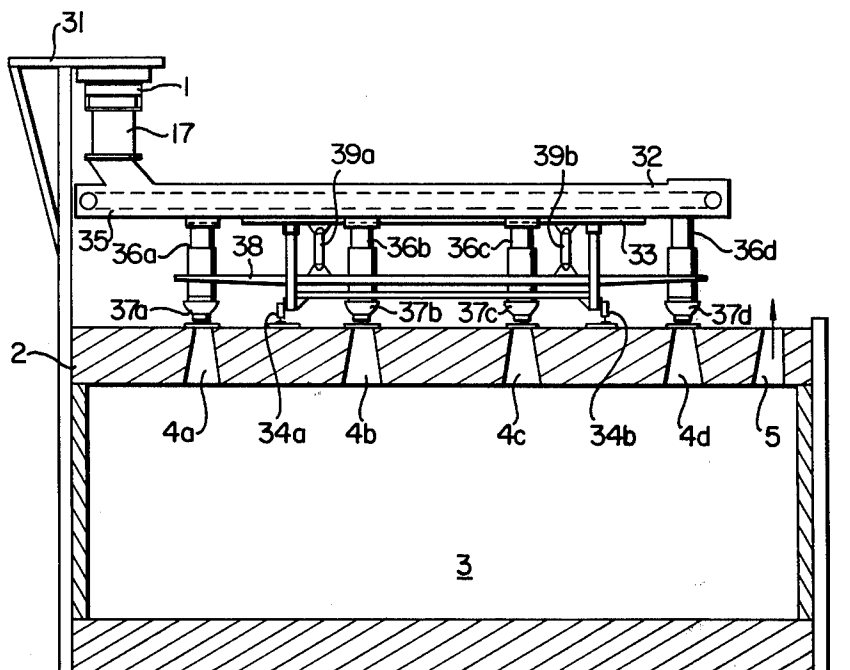
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[57] ABSTRACT

A longitudinal conveyer is mounted parallel to the longitudinal axis of a battery of coke-oven chambers and includes an endless belt selectively movable in the longitudinal direction. A discharge opening is formed in the bottom strand of the belt and a charging means including a funnel is fixed to the belt around the opening. The charging means also includes a connection device mounted on the funnel for selective vertical movement to connect the funnel with the charging openings of a selected chamber.

9 Claims, 9 Drawing Figures



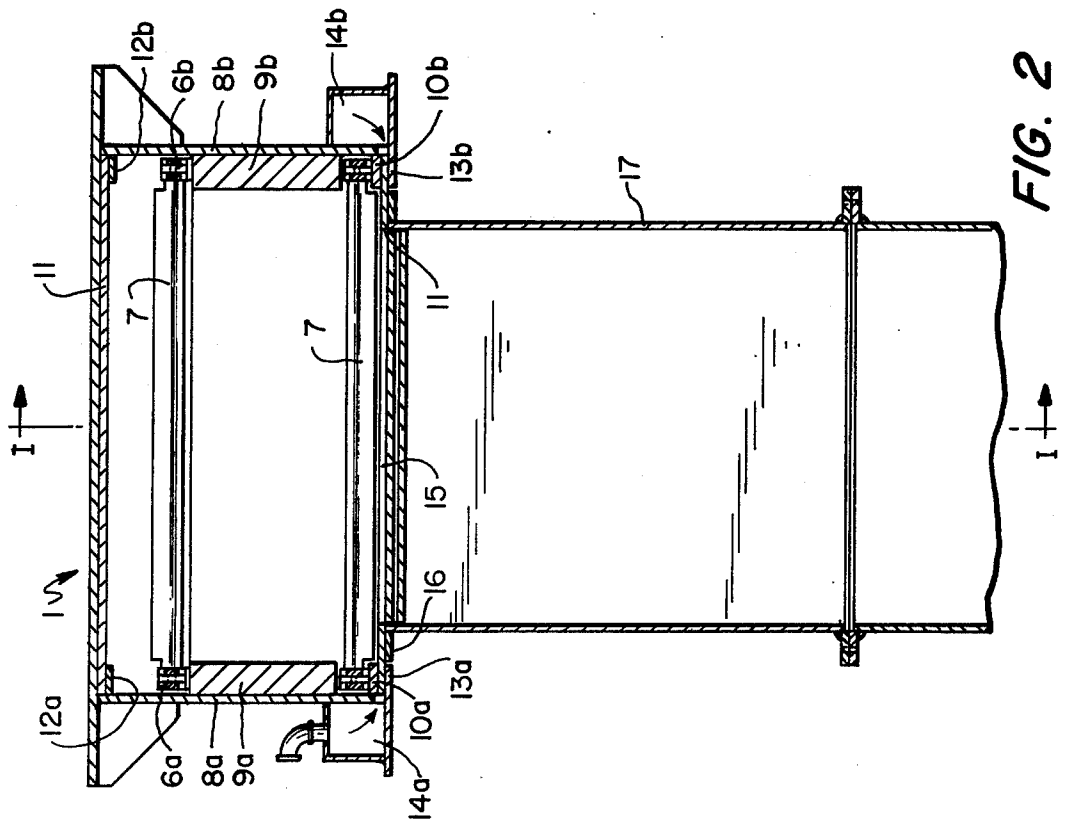


FIG. 1

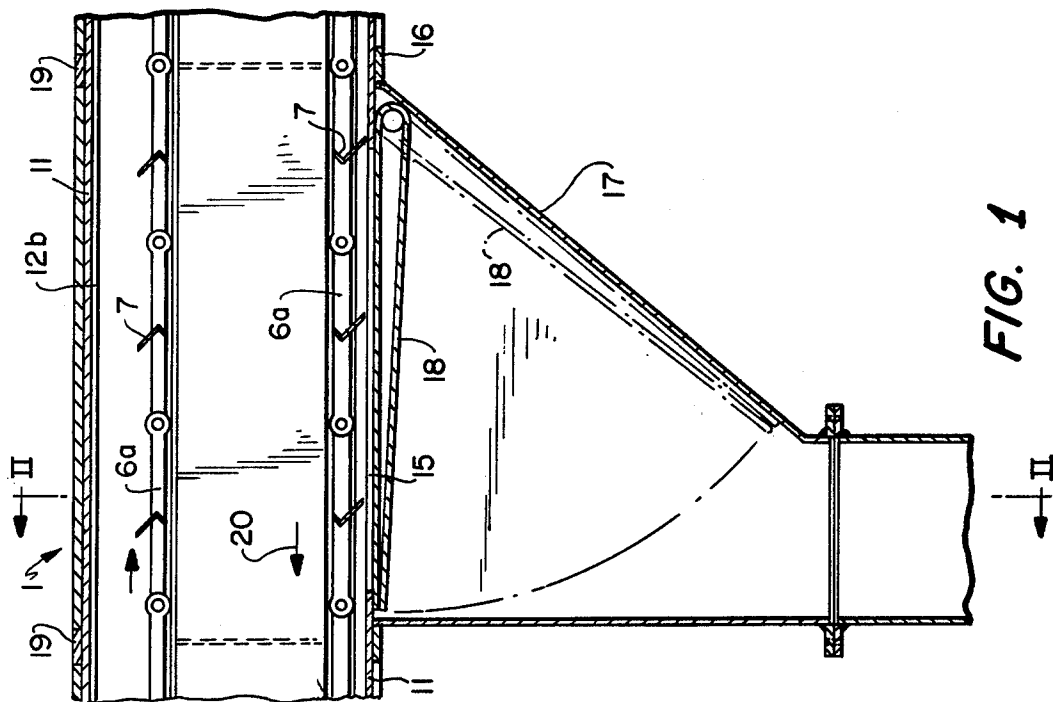


FIG. 2

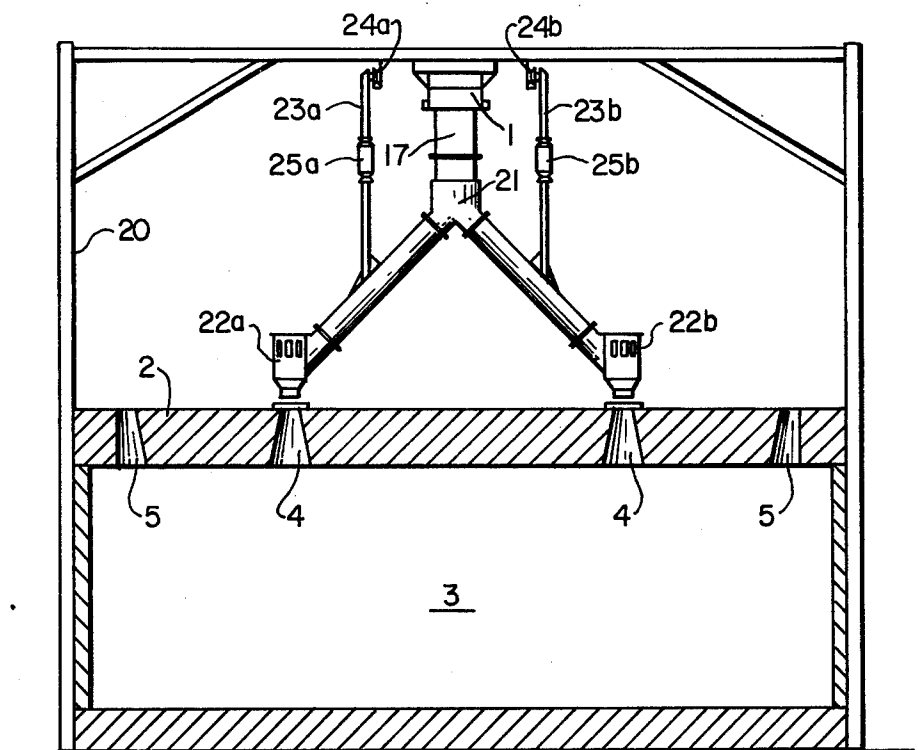


FIG. 3

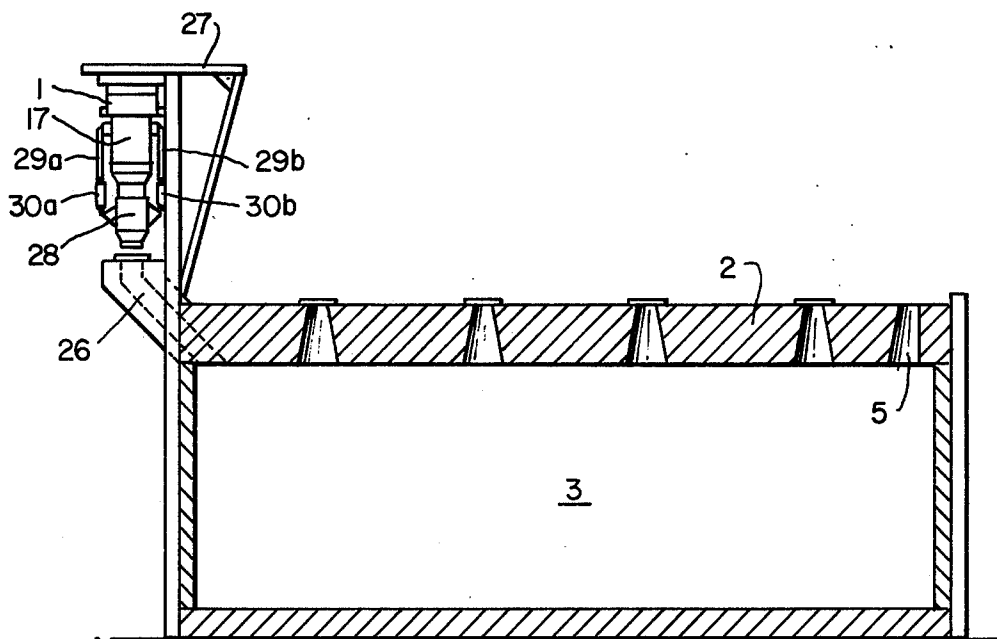
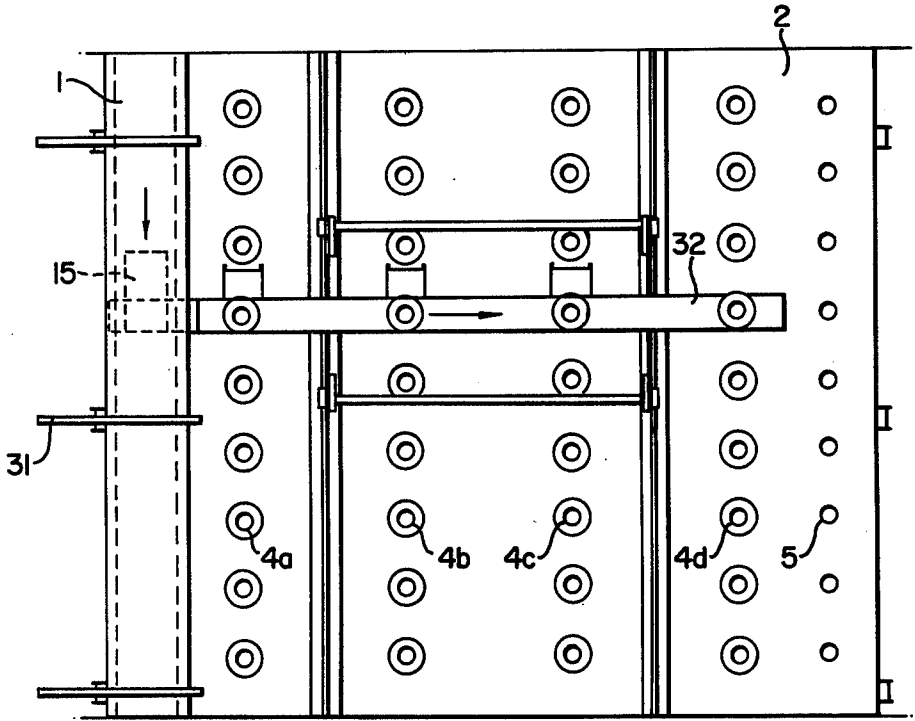
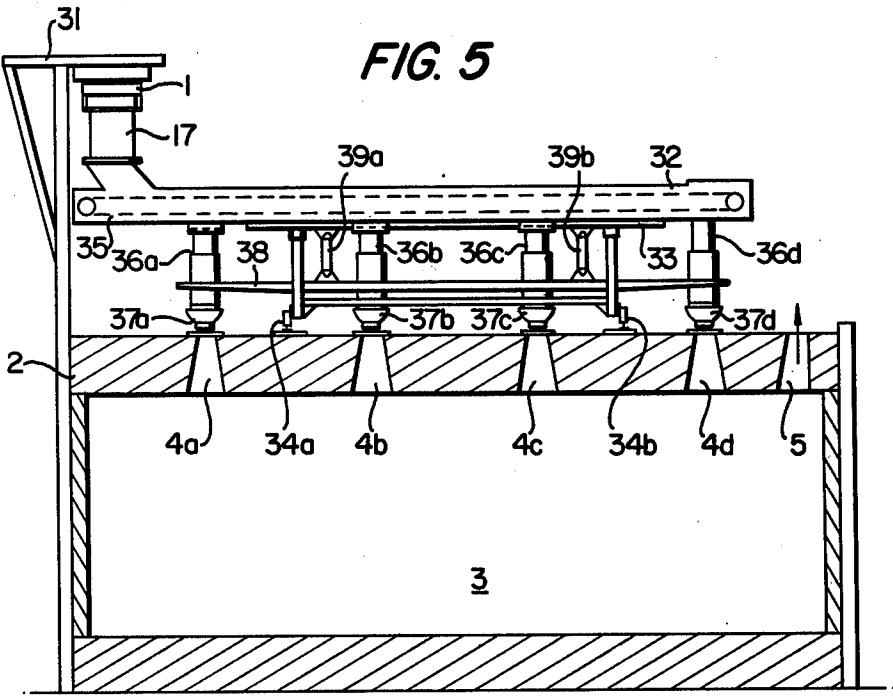


FIG. 4



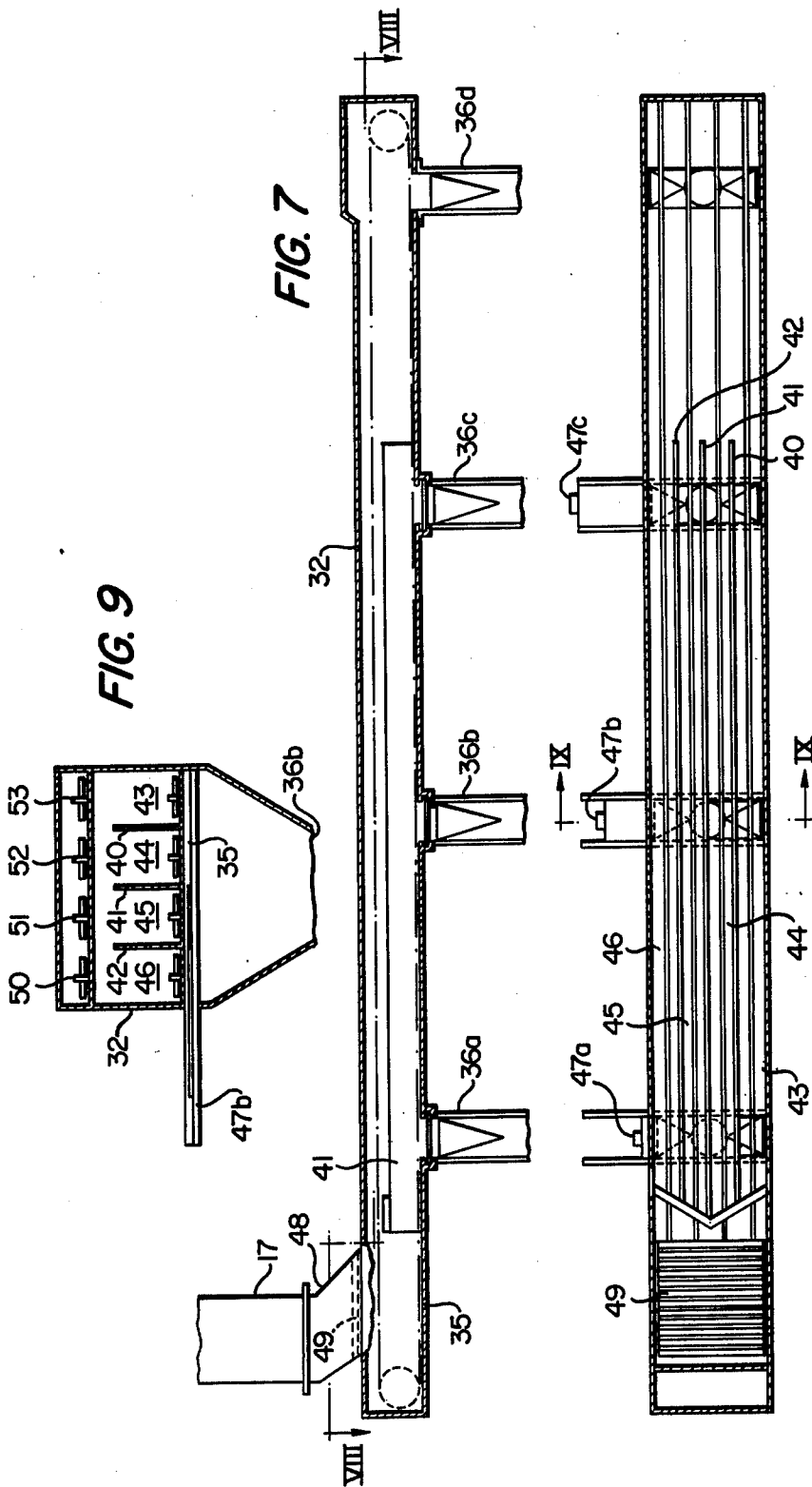


FIG. 8

FIG. 9

FIG. 7

APPARATUS FOR CHARGING COKE-OVEN CHAMBERS

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for charging coke-oven chambers combined in batteries and to which coal is supplied through a charging or filling device from at least one longitudinal conveyer having a conveying surface and arranged in parallel with the axis of the battery of oven chambers.

In charging coke-oven chambers combined in batteries, it is desirable to avoid the common use of charging wagons that are driven on the cover of the battery and which transport the coal from a supply bin to the oven chambers. These wagons, which are still in general use, are heavy and expensive in regard to costs and personnel expenditures. Accordingly, there has already appeared a number of publications that deal with the problem of charging coke-oven chambers without employing charging wagons. Basically, two systems have emerged until the present time.

According to a first system, which is treated for example in German patent No. 1,162,807, preheated coal is blown through a charging pipe and branch lines into the oven chambers. Steam, coke-oven gas or an inert gas are used as a carrier gas in this system. Such apparatus is disadvantageous in that it requires a complex pipe switch, which is susceptible to failure, for each oven chamber in order to draw off coal from the main supply bin.

The second prior art system employs scraper, chain or similar type longitudinal conveyers arranged in a conduit of box-type cross-section to feed the coal over a conveying surface to the oven chamber to be filled. The coal is branched off from the longitudinal conveyers to the oven chamber through a stationary filling device provided on each oven chamber. Alternatively, a single filling device is provided, which device can be transported to separate chambers and connected to closable connections of the longitudinal conveyers. In each case, a number of shutting-off elements is required between the longitudinal conveyer and the filling device, which number corresponds to the number of oven chambers.

SUMMARY OF THE INVENTION

It is an object of the present invention to improve the connection between the conveying surface of longitudinal conveyers and a transportable charging device.

This object is achieved in accordance with the present invention by employing a belt displaceable in the longitudinal direction and which has a discharge opening as the conveying surface of the longitudinal conveyer. A filling or charging device connectable to the charging openings of the oven chambers is coupled to the discharge opening. In this manner, the connection between the longitudinal conveyer and the charging device remains closed throughout every phase of operation, that is, the connection is closed during the transportation of the charging device from an oven chamber just filled to another oven chamber to be filled. This reduces considerably the complexity of the operating means, and the operation can be effected with simple control means from a central control station.

In accordance with the invention, the structure of the longitudinal conveyer is such that the inner surface of the lower strand of an endless belt is employed as the

conveying surface of the longitudinal conveyer. The upper and the lower strands of the belt extend into guides that are arranged on the inner sides of the side walls that limit the belt laterally and form a closed conveying channel with the belt. Accordingly, the endless belt forms simultaneously the upper and the lower walls of a gas-tight channel, wherein the coal is conveyed without a stress to the environment. Since the connection between the longitudinal conveyer and the charging device is always maintained, the escape of coal dust or coal is prevented. Accordingly, while being of simple construction, the longitudinal conveyer meets all the requirements that are placed on the modern coke-oven operation with regard to the protection of the environment.

The guides of the endless belt may be sealed by means of a housing attached to the side walls of the longitudinal conveyer. At the coal-feed end, the side walls are provided with charging openings that communicate with a coal supply bin or a coal drying vessel through distribution devices.

Channels conducting inert gas and comprising connecting openings to the guides of the endless belt are suitably provided on the outer sides of the side walls of the longitudinal conveyer. This prevents soiling of the belt guides and secures the continuous operational capability of the belt.

The charging device, which advantageously includes a funnel having a shutting-off element, is coupled to the discharge opening of the endless belt. The charging device has vertically movable connections for the charging openings of the oven chambers, and may differ in design depending on the specific nature and the preliminary treatment of the coal to be conveyed into the oven chambers.

In the case of predried or preheated coal that possesses a relatively good fluidity, the longitudinal conveyer can preferably be arranged along the longitudinal axis of the battery on the cover of the battery, and the charging device can possess a tube-type distribution element that branches off to the central charging openings of each chamber and which is connected to the funnel in a telescoping manner. The distribution element comprises charging opening connections and is suspended from roller paths arranged in parallel with the longitudinal conveyer by means of rods having connected thereto lifting and lowering devices.

According to the invention, use may be made of a charging device which is of a particularly simple construction and which is employed for highly preheated coal powder, which levels automatically in the oven chambers in the same manner as liquid. The longitudinal conveyer is arranged on a longitudinal side of the battery cover, and the funnel of the charging device has a charging opening connection that can be placed in position and removed by means of lifting and lowering devices.

For comminuted wet coal, the invention provides a charging device wherein the longitudinal conveyer is arranged on a longitudinal side on the battery cover, and the funnel of the charging device is connected to a transverse conveyer consisting of a scraper conveyer that has vertical pipes and which extends transversely over the battery to the charging openings of an oven chamber and can be transported on rails along the longitudinal axis of the battery. The vertical pipes carry

filling opening connections that can be displaced by means of a common lifting and lowering device.

The conveying surface of the transverse conveyer is preferably subdivided into conveying paths and connected to the vertical pipes by means of surface slides adjustable across the width of the transverse conveyer. The surface slides on the vertical pipes can be used for shifting the surfaces to the conveying paths that lead to more distant vertical pipes.

The invention will be explained in more detail by means of the following detailed description taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section through a portion of a longitudinal conveyer, in the area where the charging device is connected, along the line I—I of FIG. 2;

FIG. 2 is a section along the line II—II of FIG. 1;

FIG. 3 is a section of a first embodiment of a charging device situated above an oven chamber;

FIG. 4 is a section, similar to that of FIG. 3, of a second embodiment;

FIG. 5 is a section, similar to those of FIGS. 3 and 4, of a third embodiment;

FIG. 6 is a plan view of the device shown in FIG. 5;

FIG. 7 is a side view of a portion of the charging device of FIG. 5, on an enlarged scale;

FIG. 8 is a section taken along line VIII—VIII of FIG. 7; and

FIG. 9 is a section taken along the line IX—IX of FIG. 8.

DETAILED DESCRIPTION OF THE INVENTION

N numeral 1 used in the drawings indicates a main longitudinal conveyer arranged on a roof 2 of a battery of oven chamber 3. As seen in FIG. 6, the longitudinal conveyer extends along the entire longitudinal length of the battery and conveys the coal from a coal bin bunker directly to separate oven chambers 3 or through drying and measuring vessels (not shown). The charging or filling openings of the oven chambers are designated by numeral 4 and the standpipe openings thereof by numeral 5.

According to FIGS. 1 and 2, longitudinal conveyer 1 is a scraper-type conveyer and possesses an endless conveyer consisting of two chains 6a and 6b having coal driving bars 7 arranged between the chains. On its sides, the endless conveyer is flanked by side walls 8a and 8b that are provided on the inner sides thereof with box-type longitudinal bars 9a and 9b. The upper strands of chains 6a and 6b are guided on the upper narrow surfaces of bars 9a and 9b, while the lower strands of the chains are guided in the spaces defined by the lower narrow surfaces of bars 9a and 9b and longitudinally extending bars 10a and 10b spaced from bars 9a and 9b and extending parallel thereto.

An endless belt 11 is arranged around the endless conveyer and is guided at the longitudinal sides of the upper and lower strands thereof respectively in guides 12a and 12b and 13a and 13b attached to the inner sides of side walls 8a and 8b. Gas ducts 14a and 14b are situated on the outer sides of side walls 8, the ducts communicating through bores with guides 13a and 13b of belt 11.

The inner surface of the lower strand of belt 11 is employed as the conveying surface for the coal and for driving bars 7 of the endless conveyer. For the purpose

of coal delivery, belt 11 in the lower strand thereof possesses an opening 15 to which a funnel 17 is attached by means of a frame 16, the funnel being a part of the filling or charging device to be described in more detail below. Belt opening 15 can be closed by means of a lid 18 arranged in funnel 17. If necessary, endless belt 11 can be reinforced by means of crosspieces 19 as seen in FIG. 1.

When scraper conveyer 1 operates, coal is conveyed by driving bars 7 in the direction of arrow 20 shown in FIG. 1 on the upper surface of the lower strand of belt 11 to opening 15 and is discharged there into funnel 17 while lid 18 is opened, funnel 17 being connected to an oven chamber by means of a suitable charging device. Belt 11 is stationary at this time, and is displaced only for the purpose of bringing opening 15 and filling device funnel 17 attached thereto to the particular oven chamber 2 to be charged. In order to be able to perform the displacement of opening 15 without friction, guides 13a and 13b of the belt are flushed, e.g. with an inert gas that prevents the penetration of coal particles. Belt 11 is formed of steel or another material that meets obvious operational requirements.

The filling or charging devices discussed in the following exemplified embodiments can be connected to opening 15 of belt 11.

According to FIG. 3, longitudinal conveyer 1 is carried by a framework 20. The charging device connected to belt opening 15 consists of funnel 17 and a tubular distributing element 21 that slides in a telescoping manner on the pipe-shaped portion of funnel 17. The leg ends of the distributor element carry connections 22a and 22b for charging openings 4. Distributor element 21 is suspended by means of rods 23a and 23b from rollers that run on rails 24a and 24b attached on either side of longitudinal conveyer to framework 20. Rods 23a and 23b are provided with lifting and lowering devices 25a and 25b, by means of which connections 22a and 22b can be placed on and removed from charging openings 4 of oven chambers 3. A charging device of this type is particularly suitable for predried coal.

FIG. 4 shows a charging device for well dried, finely ground coal that levels automatically in the oven chamber, i.e., coal which due to its fluidity does not form pouring cones. Oven chambers 3 of the battery are provided with special charging openings 26, and longitudinal conveyer 1 is arranged above these openings on a framework 27. The charging device again consists of funnel 17 having a pipe-shaped portion onto which a charging opening connection 28 slides in telescoping manner. Funnel 17 and connection 28 are joined together by means of rods 29a and 29b including lifting and lowering devices 30a and 30b.

The embodiment shown in FIGS. 5-9 illustrates a charging device used especially for wet coal. Longitudinal conveyer 1 is attached to a framework 31 on a longitudinal side of the oven battery above the battery cover. A transverse conveyer 32 is connected to the pipe-shaped portion of funnel 17, the conveying distance of the transverse conveyer being sufficient for charging opening 4a-4d of each chamber 3. Transverse conveyer 32 rests on a carriage frame 33 that can be transported on rails 34a and 34b, which are placed on the battery cover parallel with longitudinal conveyer 1. Downwardly from a conveying surface 35 of transverse conveyer 32, which is constructed as chain or scraper

conveyer similar to longitudinal conveyer 1, there extend vertical pipes 36a-36d. These vertical pipes have charging opening connections 37a-37d guides thereon in a telescoping manner.

Connections 37a-37d are joined together by a spar 38 that is engaged by lifting and lowering devices 39a and 39b attached to the frame of transverse conveyer 32 or to carriage 33 and which are employed for lowering and lifting connections 37a-37d.

As shown in FIG. 8, conveying surface 35 of transverse conveyer 32 is subdivided by means of partitions 40-42 into four conveying paths 43-46, on which coal is separately conveyed to vertical pipes 36a-36d. The areas of vertical pipes 36a-36c to which the coal is conveyed are controlled by displaceable surface slides 47a-47c. Path 43 leads to pipe 36a, path 44 to pipe 36b, path 45 to pipe 36c and path 46 to pipe 36d. The receiving or feed end of transverse conveyer 32 is connected to funnel 17 by means of a connecting pipe 48, in which there are arranged transverse rods 49 that prevent the formation of a cone as the coal falls into the transverse conveyer. The coal is transported in conveying paths 43-46 over conveying surface 35 by means of endless chain conveyers 50-53 that are provided with driving elements.

It is to be understood that various specific structural features of the above embodiments may be modified without departing from the spirit and scope of the invention.

What is claimed is:

1. An apparatus for charging coal into the chambers of coke ovens arranged longitudinally in a battery, said apparatus comprising:

- a main longitudinal conveyer fixedly positioned to extend longitudinally above said battery, said longitudinal conveyer being connectable to a coal supply and including:
 - a conveying surface having therein a discharge opening, said conveying surface being movably mounted within said longitudinal conveyer for selective movement longitudinally thereof; and
 - scraper means for moving coal received from said coal supply longitudinally along said conveying surface within said longitudinal conveyer; and
 - a charging means for selectively discharging coal through said discharge opening into charging openings of selected of said chambers.

2. An apparatus as claimed in claim 1, wherein said main longitudinal conveyer further includes an endless belt movably mounted within said longitudinal conveyer for selective movement longitudinally thereof, said endless belt having an upper strand and a lower strand, said lower strand having therein said discharge opening, the upper surface of said lower strand comprising said conveying surface.

3. An apparatus as claimed in claim 2, wherein said longitudinal conveyer further comprises longitudinally extending side walls having upper and lower guides on the inner surfaces thereof; said upper and lower strands of said endless belt extending into said guides; said side

walls and said upper and lower strands forming a closed conveying channel.

4. An apparatus as claimed in claim 3, further comprising gas ducts extending through said side walls into said guides.

5. An apparatus as claimed in claim 2, wherein said charging means comprises a downwardly extending funnel rigidly connected to said belt surrounding said discharge opening; shut-off means positionable in said funnel for selectively blocking and unblocking communication between said discharge opening and said funnel; and connection means mounted on said funnel for selective vertical movement for connecting said funnel to said charging openings of said selected chamber.

6. An apparatus as claimed in claim 5, wherein said longitudinal conveyer is positioned above the longitudinal axis of said battery; and further comprising longitudinal rails mounted parallel to said axis above said battery; said connection means comprises a distributing element having an upper portion telescopingly attached to said funnel and a lower portion having branches leading to said charging openings, charging connections fixed to the lower ends of said branches for connection to said charging openings; and means connected to said distributing element for adjustably supporting said distributing element for longitudinal movement along said rails.

7. An apparatus as claimed in claim 5, wherein said longitudinal conveyer is positioned above a longitudinal side of said battery; and said connection means comprises a charging connection telescopingly attached to said funnel; and means for selectively raising and lowering said charging connection into and out of connection with said charging openings.

8. An apparatus as claimed in claim 5, wherein said longitudinal conveyer is positioned above a longitudinal side of said battery; and said connection means comprises a transverse conveyer positioned to extend transversely across and above an oven of said battery, said transverse conveyer having means for selective longitudinal displacement thereof, a plurality of vertical pipes extending downwardly from said transverse conveyer toward said charging openings, charging connections telescopingly attached to each of said vertical pipes, means for selectively raising and lowering said charging connections into and out of connection with said charging openings, and means for selectively conveying coal received from said funnel to said vertical pipes.

9. An apparatus as claimed in claim 8, wherein said transverse conveyer has a conveying surface divided into a plurality of conveying paths, each of said conveying paths leading to one of said vertical pipes; and further comprising a plurality of surface slides mounted for adjustable movement in the transverse direction of said transverse conveyer for providing selective communication between said conveying paths and said vertical paths.

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