ABSTRACT

A coal charging lorry car is provided with a combination lid lifting and drop sleeve apparatus that provides a gas-flow passageway from an oven to be charged with coal to another oven twice removed in which coal is coking. A reversible screw conveyor feeds coal into either oven as preferred.
3,791,320

POLLUTION-FREE COAL CHARGING APPARATUS

BRIEF SUMMARY OF THE INVENTION

The invention comprises a plurality of lid lifting devices mounted to a larry car in such a way that lids on one oven and on another oven twice removed from the one oven being charged are removable. Reversible screw conveyor means is provided to charge coal into the one oven and effluent gases that cannot escape through the ascension pipe of the oven being charged flow through the tubular element surrounding the screw conveyor into the other oven. These gases then flow through the ascension pipe into the collector main in the usual manner. An inert gas purge system is provided to clean the apparatus of effluent gases that may remain therein after charging.

For a further understanding of the invention and for features and advantages thereof, reference may be made to the following description and the drawing which illustrates a preferred embodiment of equipment in accordance with the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is an elevational view of a coke oven battery looking at a section transversely thereof and showing apparatus in accordance with the invention; and FIG. 2 is a view along line II-II of FIG. 1.

DETAILED DESCRIPTION

FIG. 1 shows a portion of two lid lifting apparatus 11, 13 each of which is like that shown and claimed in U.S. Pat. No. 3,709,387. The apparatus 11, 13 are connected together by tubular apparatus 15 located between the lid lifting apparatus 11, 13.

Each apparatus 11, 13 has a flange 17 to which is bolted in conventional manner a tubular element 19 having a flange at each end that coaxes with the flanges 17.

The tubular element 19 is cylindrical and within it there is located a screw flight 21 that has a shaft 22 that is journaled in a bearing 23 mounted at one end to a closure plate 25, and in a bearing 27 mounted at the other end to a closure plate 29; the shaft of the screw flight 21 extends beyond the bearing 27 and connects to a speed reducer 31 driven by an electric motor 33. The motor 33 is a conventional reversible electric motor. The tubular element 19, it will be noted, is larger in diameter than the screw flight 21.

The tubular element 19 is provided, at a location about mid-way of its length, with a flanged opening 35 to which is mounted a flanged coal hopper 37. At the bottom of the coal hopper there may be installed a sliding gate valve or a butterfly valve or any other type of flow regulating device. The top of the hopper 37 is provided with a removable lid 39 which is adapted to be made gas-tight and yet readily removable to pass coal into the hopper 37 to fill the same.

It is to be noted that in some instances, for example, when there is no valve or flow control device at the bottom of the coal hopper 37, as shown in FIG. 1, a pipe 41 carrying steam or other inert gas is connected to the top portion of the hopper and also to another pipe 43 that conveys the steam or other inert gas to the end portions of the tubular member 19. The steam, in this instance, serves as a purge for both the hopper 37 and the tubular member 19. When a flow regulating device, such as one of a known type of slide valve or other device is used, it is not necessary, though desirable as a safety feature, to install the steam purge lines 39, 43.

In operation, the larry or coal charging car is positioned over the oven 45 to be charged; a drop sleeve 47, as described in the aforementioned patent, is lowered to a position, as shown in FIG. 2, over a lid 49 (shown therein in the raised position). The steam purge lines are filled with steam by opening valve 51 to fill the void spaces in the hopper 37 and in the top void portion of the tubular element 19.

The vertical lid lifter portion 53 of the apparatus 11 is then activated to engage the lid 49 and to raise it to the position shown in FIG. 2. Simultaneously, similar lid lifting apparatus 13 is activated to raise the lid from oven 55 twice removed or spaced two ovens away from oven 45. In the intermediary oven 57, coal is being coked in a normal manner.

In a coke oven which has three or more charging holes per oven chamber, it is desirable to charge each oven in a prescribed sequence. Assume, for example, that oven 45 has four charging holes numbered (though not shown) A, B, C, and D, in the top of the battery. The lids on charging holes A, B, C, and D or oven 45 and the same lids on oven 55 are removed. Such lids may, of course, be removed with the apparatus 11, 13 suggested in FIG. 1 or they may be removed by a conventional other means such as a magnetic lid lifter.

After the lids have been removed, the steam purge system is activated to urge the flow of heat and gases toward the collecting main. Coal is charged then from hoppers B and D into oven 45. Gases which evolve from the oven as the coal contacts the hot walls flow through the usual ascension pipe into the collecting main. After a short period of time which may be as long as 10 to 15 seconds, coal is charged from hoppers A and C into oven 45, and the oven is filled with coal.

Gases which evolve from the coal that contacts the hot walls and the air displaced by the coal pass through the upper portion of the tubular element 19 into oven 55 from which they flow into the ascension pipe and collecting main.

After oven 45 is charged and leveled in the usual manner, the steam purge will have cleared the hoppers and screw conveyors of any smoke and fumes. Thereafter, the lids on both oven 45 and 55 can be replaced.

It should be noted that the motor 33 is reversible; wherefore, the coal in hopper 37 and the tubular member 19 may be charged either into oven 45 or into oven 55, as the case may be.

While the foregoing description of operation is related to the apparatus shown in the drawing, it will be understood by those skilled in the art that the invention may also be used equally well on coke oven batteries equipped with magnetic lid lifters, and even on batteries where the lids are removable manually.

From the foregoing description of one embodiment of the invention, those skilled in the art should recognize many important features and advantages of it, among which the following are particularly significant:

That the emission of gases from the coke oven chamber during charging is substantially eliminated save for any accidental emission, because the drop sleeves
are lowered before the charging hole lids are removed;

That the screw feeder is reversible in direction thereby permitting charging coal into either one of two interconnected ovens. This feature is of particular significance when charging of coal is carried out in the end ovens of a coke oven battery;

That the screw conveyor and gas passage are self-cleaning; whereas, other known systems for charging coal into coke oven chambers are not; and

That the steam purge system helps to cool the gas that flows in the tubular member.

Although the invention has been described herein with a certain degree of particularity, it is understood that the present disclosure has been made only as an example, and that the scope of the invention is defined by what is hereinafter claimed.

What is claimed is:

1. In a system for charging coal into the chambers of a coke oven battery, which system includes hoppers that are mounted to a larry car, charging hole lid lifting apparatus and drop sleeves adapted to surround the charging holes of such chambers, the improvement comprising:
   a. reversible means connected to each hopper for feeding coal from said hopper into either one chamber of two chambers of said battery and for carrying gases from said one chamber into the other chamber which is at least twice removed from said one chamber.
   2. The invention of claim 1 wherein:
   a. said reversible means is a tubular member in which there is a reversible screw conveyor.

4. In the invention of claim 1 wherein:
   a. a fluid purge system that is adapted to introduce an inert gaseous fluid into the tubular member for removing effluent gases therefrom.

5. In a system for charging coal into the chambers of a coke oven battery, which system includes hoppers that are mounted to a larry car, charging hole lid lifting apparatus and drop sleeves adapted to surround the charging holes of such chambers, the improvement comprising:
   a. a tubular member mounted to each hopper, such member having therein a reversible screw conveyor;
   b. means for regulating the flow of coal from each hopper into its respective tubular member;
   c. means connecting said tubular member to either one chamber of two chambers of said battery and for charging coal into said one chamber and for carrying gases from said one chamber into the other chamber which is at least twice removed from said one chamber; and
   d. a fluid purge system fitted to and adapted for introducing inert gaseous fluid into the oven being charged and into the tubular member.

6. In the apparatus of claim 5:
   a. means for regulating the flow of coal from said hopper. 

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