Dec. 10, 1940. H. E. IMES 2,224,392

RECOVERY OF SPILLED MATERIAL

Filed Nov. 3, 1938

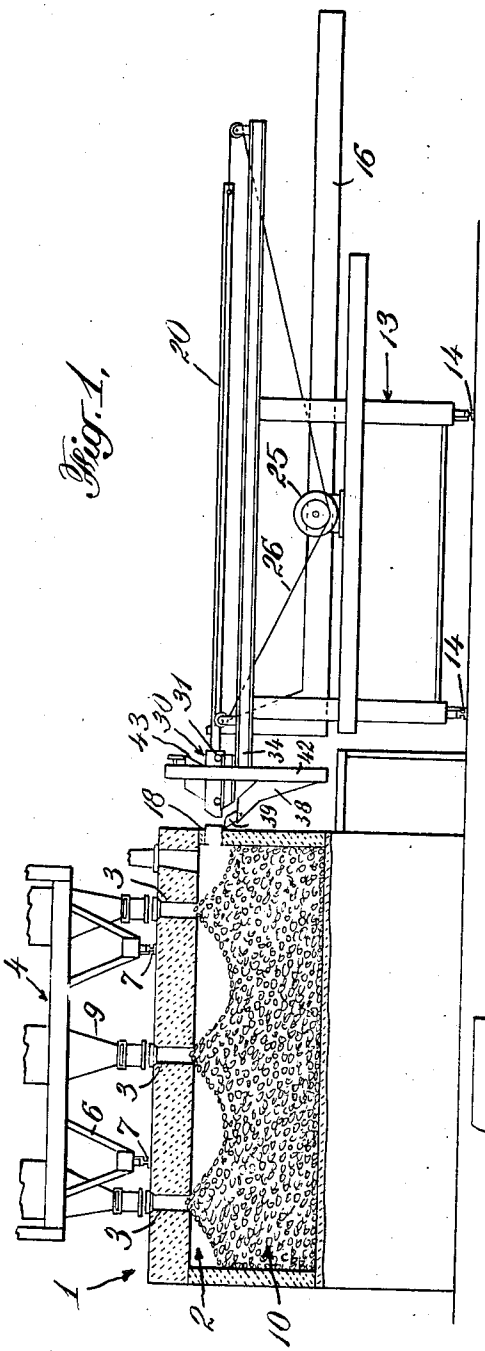


Fig. 1.

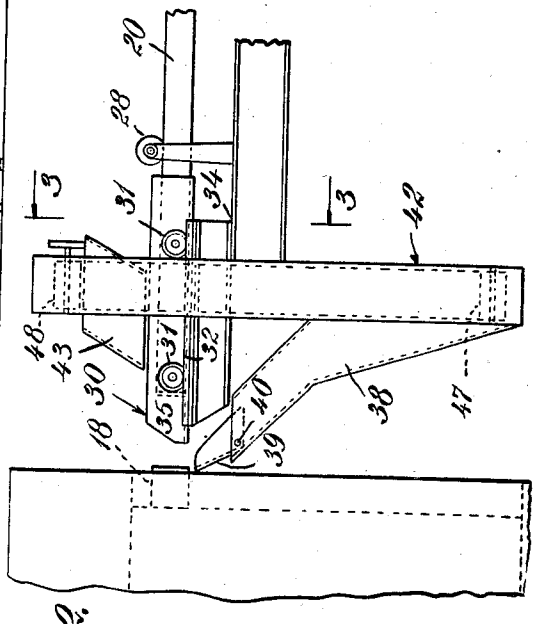


Fig. 2.

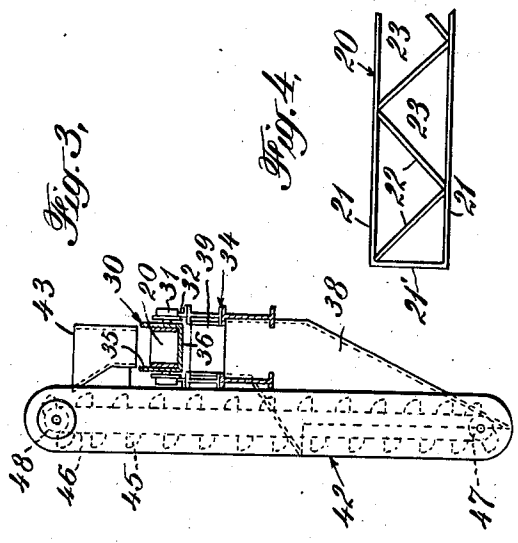


Fig. 3.

Fig. 4.

INVENTOR
Harold E. Imes
BY
Benjamin Sweedler
ATTORNEY

Patented Dec. 10, 1940 2,224,392

UNITED STATES PATENT OFFICE

2,224,392

RECOVERY OF SPILLED MATERIAL

Harold E. Imes, Ashland, Ky., assignor to Semet-Solvay Company, New York, N. Y., a corporation of New York

Application November 3, 1938, Serial No. 238,574

11 Claims. (Cl. 214—23)

This invention relates to coke ovens and more particularly to a novel process and apparatus for recovering coal spilled while leveling coke oven charges.

In the operation of horizontal coke oven batteries, coal is charged through the tops of the coking chambers and the tops of the charges are leveled by reciprocating a leveling ram located on the pusher machine running on tracks along the pusher side of the battery through a leveling ram opening adjacent the top of each chamber. During withdrawal of the leveling ram a considerable amount of the coal charge is withdrawn from the chamber. Heretofore, it has been customary to collect this coal in a hopper on the pusher machine and when the hopper becomes filled to discharge the coal into a coal collecting pit; the coal is transferred by a crane from the pit to a railroad car which transports it to the coal station supplying coal to the bins from which the chamber charging cars are filled. In practice such repeated handling of coal spilled while leveling the chamber charges has proved costly and necessitated expensive coal recovery and handling equipment. Furthermore, the return of batches of the spilled coal to the coal mix to be charged into the chambers has a tendency to change the perdetermined character of the mix.

It is an object of this invention to provide apparatus for efficiently collecting coal spilled from coking chambers while leveling the charge therein and reintroducing the spilled coal into the chambers.

It is a further object of the invention to provide a novel process for reintroducing into coking chambers the coal spilled while leveling the charges of coal in the chambers.

Other objects and advantages will appear hereinafter.

In accordance with the invention, I provide on the coke oven pusher machine a horizontally reciprocable leveling ram having open bottom coal-receiving pockets extending therethrough and a horizontally rolling receptacle through which the leveling ram moves as it is introduced into and withdrawn from the coking chambers during the charge leveling operation. Below the leveling ram is located a hinged chute, which may be positioned against the pusher side of the battery below the chamber leveling openings to catch the coal spilled through the openings during withdrawal of the ram or retracted out of contact with the battery when it is desired to move the pusher machine. The chute conducts the spilled coal to a conveyor which feeds it into a hopper discharging into the rolling receptacle and onto the ram. When a chamber has been charged with coal, the leveling ram alined with the chamber leveling opening and the hinged chute positioned against the chamber below the opening, the leveling ram is introduced into the chamber to level the charge therein; coal spilled through the leveling opening is caught by the chute. After the leveling operation is completed the spilled coal is discharged by the conveyor into the hopper and rolling receptacle and the leveling ram is alined with an empty chamber. The rolling receptacle is moved forward into contact with the empty chamber at a location contiguous to its leveling opening and the leveling ram is introduced into the chamber. The coal in the hopper and receptacle is carried forward by the ram into the chamber, the receptacle closing the bottoms of the coal-receiving pockets of the ram and maintaining the coal within the pockets until the pockets have moved within the chamber. When the spilled coal has been introduced, the ram is withdrawn, the rolling receptacle moved out of contact with the chamber, and the chamber is charged with coal. The hinged chute is positioned against the chamber below the leveling opening and the leveling ram is reintroduced into the chamber to level the charge therein. The spilled coal caught by the chute during the leveling operation is subsequently introduced into a coking chamber.

In the accompanying drawing forming a part of this specification and showing for purposes of exemplification an embodiment of the invention;

Fig. 1 is a side elevational view, partly in section, showing somewhat diagrammatically a coke oven battery equipped with apparatus in accordance with the invention;

Fig. 2 is an enlarged fragmentary side elevational view illustrating the invention;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; and

Fig. 4 is a top plan view of the leveling ram.

In the drawing reference numeral 1 designates a horizontal coke oven battery involving a series of coking chambers 2 equipped with charging openings 3 and charging apparatus 4 which may include a car 6 running on tracks 7 on top of the coke oven and coal-charging hoppers 9 for introducing charges of coal 10 into the chambers. The battery is equipped on its coke side, i. e. the left hand side of the battery as viewed in Fig. 1, with the usual coke side door machine and coke handling and quenching equipment (not shown).

On the pusher side of the battery is located a pusher machine 13 running on tracks 14 and equipped with pusher ram 16 operated by a motor (not shown) in a manner well known in the coke oven art for pushing coke from the chambers.

When charges of coal are introduced into the chambers they have a tendency to form heaps somewhat as illustrated in Fig. 1 and for the purpose of leveling the charges a leveling ram operated independently of the pusher ram is mounted on the pusher machine in a different vertical plane from that in which the pusher ram is mounted. The leveling ram is introduced into and withdrawn from the chambers through chamber leveling openings 18. In accordance with my invention, I provide a leveling ram 20 constituted of parallel side members 21, end member 21', and diagonally disposed cross members 22 connecting the side members; these members form open bottom coal-receiving pockets 23 extending vertically through the ram. The ram may be power actuated by any suitable means such as drum and cable connections 25 and 26 to reciprocate it into and out of the coking chambers and rollers such as illustrated at 28 in Fig. 2 may be employed to guide the movement of the ram.

Located on the side of the pusher machine adjacent the battery is a rolling receptacle 30 through which the leveling ram travels; the receptacle is mounted on rollers 31 disposed on tracks 32 supported by supporting structure 34 so that the receptacle may be moved from the position shown in Fig. 2 into contact with the battery. It will be observed that the receptacle 30 involves two sides 35 of greater height than the side members 21 of leveling ram 20 and a bottom 36 which provides a closure for the bottoms of the coal-receiving pockets 23 of the ram.

Mounted below the rolling receptacle 30 is a chute 38 equipped with a hinged upper portion 39 pivoted at 40 so that it may be tilted into and out of engagement with the ends of the chambers below the chamber leveling openings 18. The lower end of the chute 38 communicates with an elevating conveyor 42 which discharges into hopper 43 located above the rolling receptacle 30 and the leveling ram 20. Conveyor 42 may be of the well-known endless type equipped with coal receptacles 45 secured to endless members 46 running on rollers or sprockets 47 and 48 and may be power driven through suitable driving connections (not shown) to the rollers. The conveyor housing and connected chute 38 are fixed to the pusher machine.

The apparatus may be operated as follows:

After a charge of coke has been pushed from a chamber and a charge of coal introduced through charging openings 3, the hinged chute 39 is tilted into engagement with the battery below the leveling opening 18 and the ram 20 is reciprocated through the leveling opening to level the charge in the chamber. Coal spilled through the leveling opening 18 is caught by chutes 38, 39. After the leveling operation is completed, the elevator 42 is operated to discharge the coal caught by the chutes into hopper 43 and movable receptacle 30, which hopper and receptacle are of sufficient capacity to hold the coal spilled while leveling a charge. When it is desired to charge an empty chamber, the pusher machine is moved to aline ram 20 with the leveling opening 18 of the chamber and the rolling receptacle 30 is moved forward into contact with the battery so it partially surrounds the leveling opening; the ram 20 is then moved forward into the chamber. The coal in hopper 43 and receptacle 30 is carried forward by the ram into the chamber, the bottom 36 of receptacle 30 preventing discharge of the coal from the ram pockets without the confines of the chamber. When the coal has been introduced into the chamber, ram 20 is withdrawn, the receptacle 30 is moved out of contact with the battery, i. e. moved to the position shown in Figs. 1 and 2, and a charge of coal is introduced into the chamber through charging openings 3. Hinged chute 39 is placed in contact with the battery below the leveling opening and, after the charge has been introduced, the ram 20 is reciprocated through the leveling opening to level the charge; coal spilled through the leveling opening by the ram is caught by chutes 38, 39 and is subsequently introduced into an empty chamber as hereinabove described. In some cases it may be desirable to introduce the spilled coal into the chamber from which it was withdrawn before leveling another charge; in order to accomplish this, the rolling receptacle may be placed into contact with the chamber and the ram 20 reintroduced into the chamber while operating conveyor 42. Furthermore, the coal spilled while leveling the charge in one chamber may be introduced into another chamber while introducing the ram to level the charge therein.

It will be noted that in accordance with the invention the coal spilled while leveling the charges in chambers of a coke oven battery is reintroduced into the battery through the chamber leveling openings while introducing the leveling ram into the openings, thus avoiding the necessity of repeatedly handling the spilled coal. Furthermore, the apparatus of the invention is relatively inexpensive to construct and operate as compared with heretofore existing apparatus for recovery of coal spilled while leveling coke oven charges.

While the invention has been described in connection with the charging of the coking chambers of a coke oven battery, it will be understood that it is applicable to the charging of other coking, carbonizing and distillation chambers or retorts; the reference in the appended claims to chambers is therefore used in a broad sense to include such other chambers or retorts.

Since certain changes may be made in this invention without departing from the scope thereof, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In charging apparatus the combination comprising leveling means adapted to be introduced and withdrawn through openings in chambers to level the charges therein, means for catching material withdrawn from said chambers by said leveling means and means including said leveling means for introducing said withdrawn material through said openings into said chambers.

2. Coking apparatus comprising in combination a battery of coking chambers, means for charging the chambers with material to be coked, leveling means adapted to be introduced and withdrawn through openings in said chambers to level the charges therein, means for catching material withdrawn from said chambers during withdrawal of said leveling means and means including said leveling means for introducing said withdrawn material into said chambers.

3. Coking apparatus comprising in combination a coking chamber adapted to be charged through its top with material to be coked, a leveling ram

adapted to be introduced into said chamber through an opening in the neighborhood of the top thereof to level the charge therein, means for catching material withdrawn from said chamber during withdrawal of said leveling ram, means including a conveyor for feeding said withdrawn material onto said leveling ram, means for retaining said withdrawn material on said ram while the ram is without a coking chamber and means for reciprocating said ram through said opening.

4. In coking apparatus the combination comprising a leveling ram adapted to be introduced into and withdrawn from coking chambers to level the charges therein, said leveling ram having coal-receiving openings therein, means for catching coal withdrawn from a chamber during withdrawal of the leveling ram, means for feeding said withdrawn coal into said openings and means for maintaining the coal in said openings while said openings are disposed exteriorly of a chamber.

5. Coking apparatus comprising in combination a battery of coking chambers adapted to be charged through the tops thereof with coal, a leveling ram adapted to be introduced into and withdrawn from said chambers through openings located in the neighborhood of the tops thereof to level the charges therein, said leveling ram comprising side members and a plurality of cross members connecting said side members and forming coal-receiving openings extending vertically through said ram, a receptacle through which said ram moves as it is introduced into and withdrawn from said chambers, said receptacle being movable substantially into and out of contact with said chambers, a hopper located above said ram, means including a chute and a conveyor for catching coal withdrawn from said chambers by said leveling ram and feeding the withdrawn coal to said hopper whereby the withdrawn coal may be deposited from said hopper into the coal-receiving openings of said ram and moved by said ram into said chambers.

6. Coking apparatus comprising in combination a leveling ram adapted to be introduced into and withdrawn from a coking chamber through an opening in the neighborhood of the top thereof, said leveling ram comprising spaced side members and cross members forming openings therethrough, a receptacle having a bottom and sides surrounding the bottom and sides of said leveling ram throughout a portion of the length thereof, the sides of said receptacle being of greater height than said ram, means for supporting said receptacle for movement substantially parallel to said ram into and out of contact with said coking chamber, a chute having a hinged portion adapted to be moved into engagement with said chamber below said leveling opening, an elevator adapted to receive coal from said chute, a hopper into which said elevator discharges, said hopper being located to discharge coal into said receptacle and onto said leveling ram, whereby coal withdrawn from a chamber during withdrawal of said leveling ram may be deposited into the openings of said ram and introduced into a chamber.

7. Coking apparatus comprising in combination a battery of horizontal coking chambers adapted to be charged through their tops with coal, a pusher machine mounted for movement along the pusher side of the battery, a leveling ram on said pusher machine, means for reciprocating said leveling ram through openings in said chambers to level the charges of coal therein, said leveling ram comprising parallel side members connected by diagonally disposed cross members forming openings through the ram, a receptacle including side members and a bottom extending around the bottom and sides but not the top of said leveling ram, the sides of said receptacle being of greater height than the side members of said ram, roller and track means for supporting said receptacle for movement into and out of contact with said battery, a hopper for discharging coal into said receptacle and the openings of said ram, a chute having a pivoted upper portion adapted to be positioned against said battery beneath said openings in said chambers and an elevator for receiving coal from said chute and discharging said coal into said hopper.

8. Coking apparatus comprising in combination a battery of horizontal coking chambers, means for charging said chambers through their tops with coal, a car mounted for movement along the pusher side of the battery, a leveling ram on said car, means for reciprocating said leveling ram through openings in said chambers to level the charges of coal therein, and means mounted on said car for catching coal discharged through said openings while leveling said charges and introducing said discharged coal into said chambers while leveling the charges in said chambers.

9. In a process of charging a coking chamber the steps comprising introducing coal into the chamber through a charging opening so as to form a pile of coal in the chamber, leveling the pile within the chamber by introducing and withdrawing a leveling ram through a leveling opening in the chamber, collecting the coal discharged from the chamber through said leveling opening while leveling the coal, and introducing the coal thus collected into a coking chamber, while leveling the charge therein, through the opening through which the coal is discharged during the leveling.

10. In a process of operating horizontal coking chambers the steps comprising introducing charges of coal into the chambers through the tops thereof, introducing and withdrawing a leveling ram through openings in the chambers to level the charges therein, catching the coal discharged through the openings, feeding the coal thus caught onto the leveling ram and introducing the leveling ram into the chambers to introduce the coal into said chambers.

11. Coking apparatus comprising in combination a battery of horizontal coking chambers, means for charging said chambers through their tops with coal, a car mounted for movement along the side of the battery, a leveling ram on said car, means for reciprocating said leveling ram through openings in said chambers to level the charges of coal therein, and means mounted on said car for catching coal discharged through said openings while leveling said charges and introducing said discharged coal into said chambers through said openings while leveling the charges in said chambers.

HAROLD E. IMES.