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COKE HANDLING MECHANISM

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2 Sheets-Sheet 1

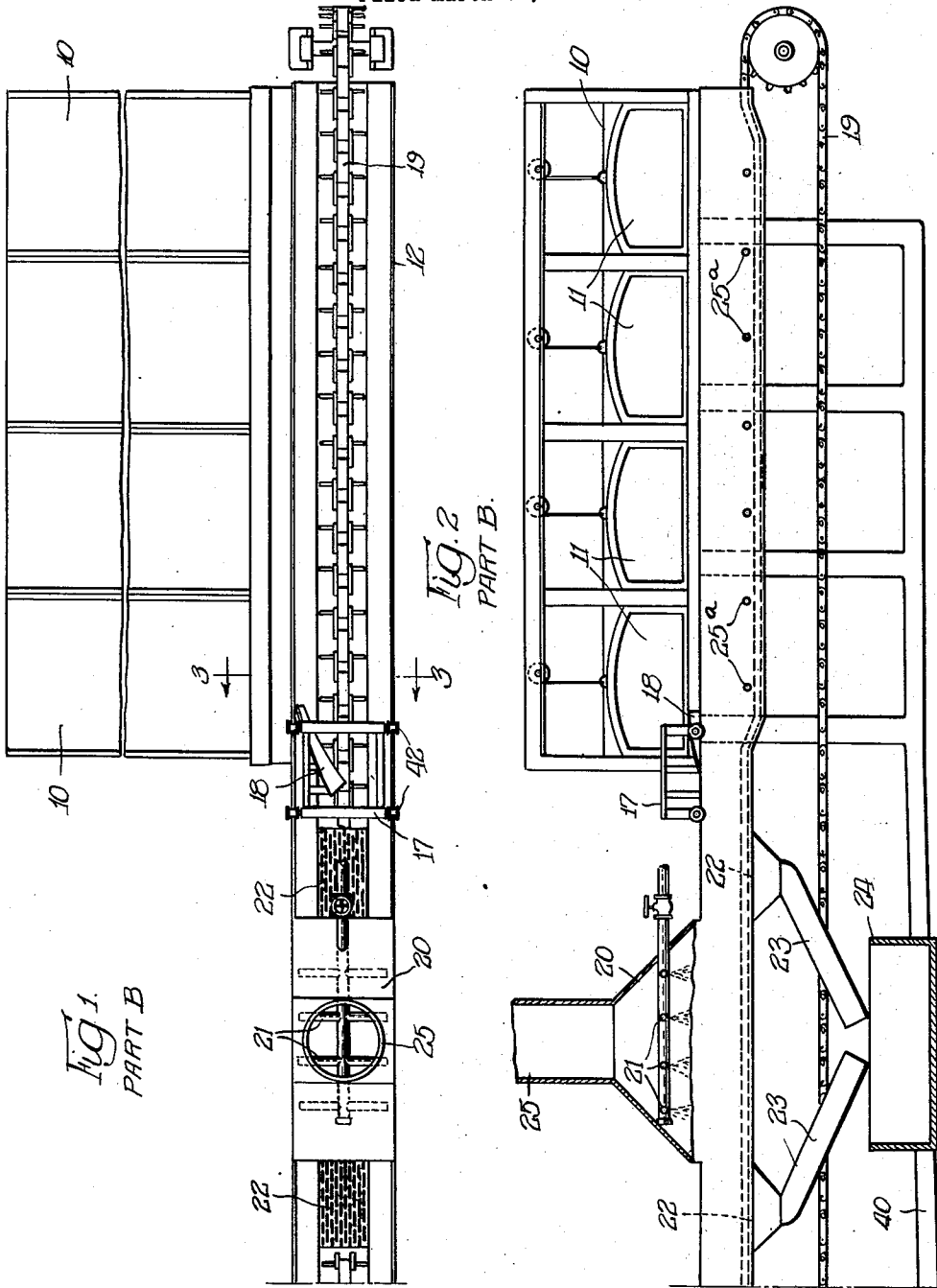


Fig. 1.  
PART B

Fig. 2.  
PART B.

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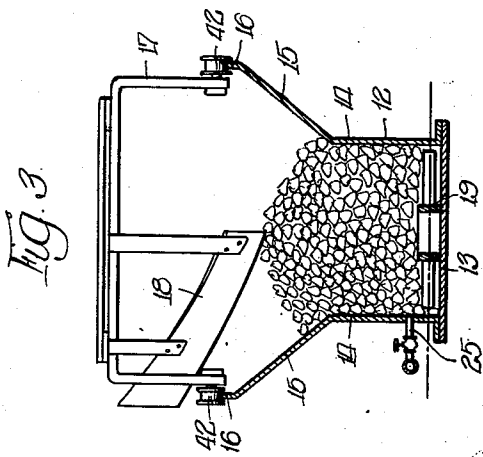
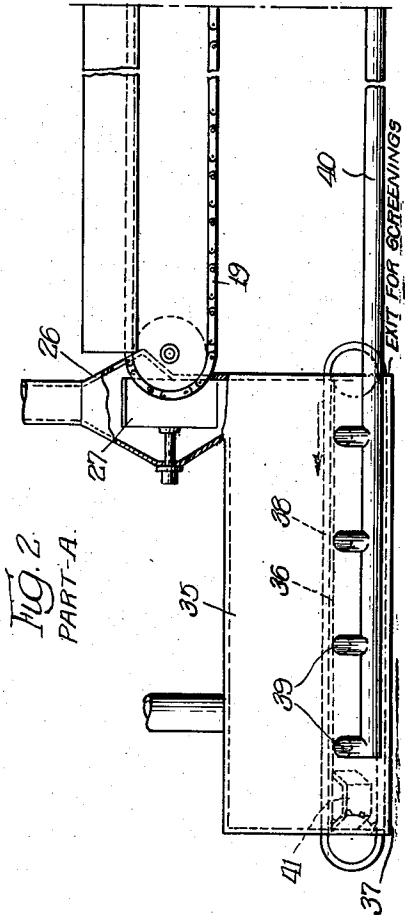
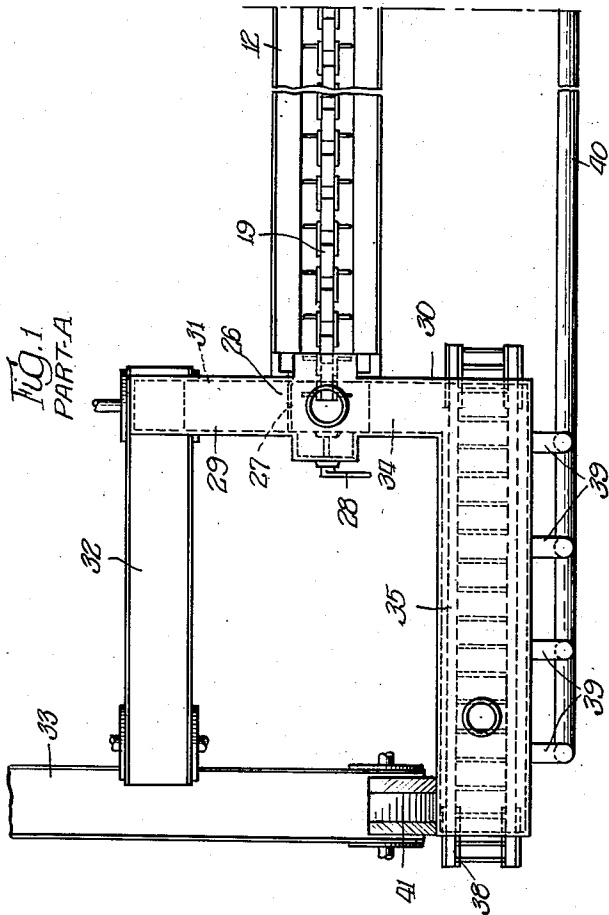
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## COKE HANDLING MECHANISM

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Application March 31, 1939, Serial No. 265,085

3 Claims. (CL 202—230)

The present invention relates to improvements in coke handling mechanism.

More particularly the present invention relates to mechanism for expeditiously handling coke after it has been discharged from the ovens in which it has been prepared. The coke is ordinarily discharged from the coke ovens at high temperature, and care must be taken to prevent the burning of this high temperature coke. The present invention contemplates the provision of means for handling the coke as it is being discharged from the coking ovens, whereby said coke will be quenched, will have the braise removed therefrom, and may be delivered to storage either with a predetermined moisture content or in substantially anhydrous condition, as preferred.

An object of the present invention is to provide mechanism for accomplishing the desired results immediately above referred to.

A further object is to provide conveying and quenching mechanism which is simple in construction and operation and which may be advantageously associated with coking ovens as now commonly provided.

A further object is to provide coke handling apparatus for handling coke discharged by coke ovens which will be efficient in operation and which will prevent undesirable breakage of the coke.

A further object is to provide coke handling mechanism having simple and efficient means for preventing access of air to the incandescent coke discharged from coke ovens.

A further object is to provide coke handling mechanism whereby the coke may be handled in a continuous stream of uniform contour, whereby coke of uniform moisture content may be efficiently obtained.

A further object is to provide coke handling mechanism whereby the newly discharged coke may be quenched in a minimum of time with a minimum amount of water.

A further object is to provide an improved coke handling mechanism in which the coke braise may be efficiently separated from the remainder of the coke by means of the water used in quenching.

A further object is to provide coke handling mechanism for disposing of the coke discharged from coke ovens, which will be economical both with respect to installation cost and cost of operation.

A further object is to provide coke handling

mechanism well adapted to meet the needs of commercial operation.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figure 1 is a plan view comprising part A and part B, illustrating coke handling mechanism embodying the principles of the present invention;

Figure 2 is an elevational view comprising part A and part B, corresponding, respectively, to part A and part B of Figure 1; and

Figure 3 is a sectional view taken along the plane indicated by the arrows 3—3 of Figure 1, part B.

The numerals 10—10 indicate coke ovens arranged in a battery, each of said ovens having a gate 11 at its discharge end past which the coke may be pushed from the ovens. The numeral 12 indicates an elongated trough disposed transversely with respect to the lengths of the ovens 10—10. Said trough is located in position to receive coke pushed from said ovens 10—10. The general contour of the trough 12 is shown in Figure 3, in which a bottom wall 13 is shown having connected thereto the vertical walls 14—14 forming a channel. At the tops of said vertical walls 14—14 are flaring walls 15—15 provided with the upstanding portions 16—16. Said upstanding portions 16—16 provide tracks for a movable carriage, indicated as a whole by the numeral 17, which carriage carries a plow 18. Said carriage 17 and plow 18 will be referred to more in detail presently.

The trough 12 extends across one end of the battery of ovens 10—10 and beyond said battery, as clearly indicated in Figure 1, parts A and B. The bottom wall 13 of said trough 12 at the region thereof underlying the region of the ovens 10—10 is depressed slightly with respect to the remainder of said bottom portion, whereby to provide a basin for receiving a shallow pool of water. Cooperating with the bottom wall 13 is an endless conveyor 19. The details of the conveyor 19 form no part of the present invention. However, said conveyor should be capable of conveying coke from the ovens 10—10 along the trough 12 in a left-hand direction as the parts are viewed in Figures 1 and 2. Any preferred means (not illustrated) may be provided for communicating movement to the conveyor 19.

Disposed to the left of the region of the ovens 10—10 as the parts are viewed in Figures 1 and 2 is a canopy 20, under which are disposed a plurality of water sprays 21—21 for spraying

the coke as it is conveyed along the trough 12. At regions adjacent to the canopy 20, the bottom wall 13 of the trough 12 is provided with a plurality of screens or gratings 22—22, which provide communication to the drain pipes 23—23, through which water and screenings may be conducted to the receptacle 24. The screens or gratings 22—22 will have openings of definite size, whereby braise of a size up to certain predetermined dimensions will be carried off through said screens or gratings with the water which has been delivered from the sprays 21—21. The water may be drawn off from the receptacle to any preferred point of disposal, and the braise may be removed from the receptacle 24. Steam or vapor resulting from the spraying of the coke under the canopy 20 will pass off through the vent 25 at the top of the canopy 20. Either or both of the side walls 14 of the trough 12 will be provided with water inlets 25a—25a for admitting water to the trough 12 at the region thereof adjacent to the ovens 10—10, whereby the basin provided by the depressed bottom portion of the trough 12 may be supplied with water. The water in the basin referred to will be kept at a substantially uniform level for the reason that any water above said level will drain off through the gratings or screens 22.

The trough 12 with its conveyor 19 extends to a region to the left of the canopy 20, where it communicates with a transverse chamber 26. Said chamber 26 is provided with the gate 27 operable by means of the crank 28, and said gate 27 has the function of directing coke from the conveyor 19 selectably toward one end or the other of the chamber 26. The portion 29 of the chamber 26 located at one side of the gate 27 is provided with the conveyor 31 adapted to convey coke to the conveyor 32, which in turn deposits said coke upon the conveyor 33, which may lead to a loading tippie or a storage bin. The portion 30 of the chamber 26 located at the other side of the gate 27 is provided with a conveyor 34 adapted to conduct coke to the drying box 35. Said drying box 35 is provided with the false bottom 36 and with the real bottom 37. An endless conveyor 38 is provided, adapted to scrape along the false bottom 36 in the direction indicated by the arrow and to scrape along the upper surface of the real bottom 37 in the opposite direction.

Communicating with the drying box 35, preferably below the false bottom 36, are a plurality of inlets 39—39 adapted to conduct inert high temperature gas to said drying box 35. Said inlets 39—39 are supplied by the conduit 40, which, as indicated in part B of Figure 2, is supplied from the ovens 10—10. Gases entering the drying box 35 through the inlets 39 are waste gases from the ovens. The action of these waste gases is to dehydrate the coke, producing metallurgical anhydrous coke. The temperature of these gases will be well above the boiling point of water, and, being substantially a mixture of water vapor, nitrogen and carbon dioxide, will dehydrate the coke in an atmosphere substantially free of oxygen. The coke which has been scraped off from the false bottom 36 in the drying box 35 will be delivered through the chute 41 to the conveyor 33. The purpose of the gate 27 is, of course, to permit the delivery of either domestic coke having a certain definite water content to the conveyor 33, or to deliver coke to the drying box 35, from which anhydrous

metallurgical coke approximately free of water is delivered to said conveyor 33.

Inasmuch as one of the objects of the present invention is to deliver coke having a predetermined moisture content, it is desirable to maintain an approximately uniform cross section of coke in the trough 12. For this purpose the plow 18, previously referred to, is provided. Said plow extends from that side of the trough adjacent to the ovens 10—10 toward the mid section of said trough. As will be apparent from Figure 3, the plow 18 has the function of spreading the coke more or less uniformly across the trough 12, overcoming the tendency of the coke to deposit itself on that side of the trough adjacent to the ovens. The plow 18 may be fixed in position relative to the length of the trough 12, but it is at present preferred to have the plow movable longitudinally of said trough, whereby it may be positioned to control the flow of coke from each oven as that particular oven is being discharged. For this purpose the movable carriage 17 is provided, having a plurality of wheels 42 which ride along the upstanding portions 16—16 of the side walls of the trough 12. The carriage 17 will be provided with strengthening braces, or the like, for securely holding the plow 18. Said carriage will also be provided with means for anchoring the carriage securely at desired positions longitudinally of the trough 12. The details of construction of the carriage 17 need not be described in detail herein, inasmuch as construction suitable for the purpose will be apparent to those skilled in the art.

An important feature of the invention is that the mechanism (not illustrated) for pushing the coke from the ovens 10—10 into the trough 12 may be synchronized with the speed of the conveyor 19 and with the amount of water admitted through the quenching sprays 21—21 and through the water inlets 25a—25a, whereby the percentage of moisture in the coke may be definitely controlled.

The mode of operation of the above described embodiment of the present invention may be briefly summarized as follows: In the course of manufacture of coke in the ovens 10—10 the gates of said ovens will be opened successively and the coke will be pushed therefrom through mechanism not illustrated. Mechanism suitable for the purpose is well known to those skilled in the art, and such mechanism may be operated through motive means, the timing and speed of which may be controlled by the operator. The coke from each of the ovens will be discharged into the adjacent portion of the trough 12 and will be conveyed in a left-hand direction as the parts are viewed in Figures 1 and 2 by means of the conveyor 19. The water from the water inlets 25a—25a will discharge into the basin provided by the depressed portion of the bottom wall 13 of the trough 12, whereby to provide a pool of water of uniform level, excess water draining off through the screens or gratings 22—22. The water in the pool thus provided will have the dual function of cooling the conveyor 19 and of forming steam, which in rising will prevent access of air to the coke, thereby preventing the burning thereof. The coke as it proceeds along in a left-hand direction will pass over the screens or gratings 22—22. Water from the water sprays 21—21 will quench the coke, and the outgoing steam generated will escape through the vent 25. As in-

licated above, the screens or gratings 22—22 will have openings of definite size, whereby braise of a size up to certain predetermined dimensions will be carried off through said gratings or screens with the water to the receptacle 24, from which the braise may be recovered and from which the water may be delivered to any preferred point of disposal. At the left-hand end of the trough 12 the coke will be delivered to the chamber 26. If domestic coke is desired having a predetermined water content, the gate 27 will be moved to a position to deliver the coke to the portion 29 of the chamber 26, whence said coke will be delivered by means of the conveyor 32 to the conveyor 33. If anhydrous coke is desired, the gate 27 will be thrown to the opposite position, whereby said coke will be delivered through the portion 30 of the chamber 26 to the drying box 35. Said drying box 35 will be provided with hot inert gases which may be delivered from the ovens 10—10. The conveyor 38 will carry the coke along the false bottom 36 to the chute 41, which delivers the anhydrous coke to the conveyor 33. Pieces broken off from the coke in the drying box 35 will drop through the false bottom 36 to the real bottom 37 and will be scraped along in a right-hand direction as the parts are viewed in Figure 2, part A, toward the right-hand end of the drying box 35, where they will be discharged. The designs of conveyors 19 and 38 will be so chosen as to permit braise and broken coke to drop therethrough as they convey the coke along their supporting surfaces.

By reason of the fact that the discharge from the ovens 10—10 may be synchronized with the speed of the conveyor 19, and by reason of the further fact that the cross section of the moving stream of coke may be maintained substantially uniform by means of the plow 18, and by reason of the further fact that the amount of water supplied by the sprays 21—21 may be controlled, it is possible to deliver coke having a predetermined water content.

By reason of the fact that the screens or gratings 22—22 have openings of definite size, it is possible to remove with the quenching water braise up to predetermined dimensions.

Though a preferred embodiment of the present invention has been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is—

1. In combination, a coke oven, a horizontal trough extending in front of and past the discharge end of said coke oven, a conveyor in said trough adapted to convey a layer of hot coke along said trough, the bottom portion of said trough at the region adjacent to said oven being depressed slightly with respect to the remainder of said bottom portion, means for supplying water to said depressed portion, said remainder adjacent the depressed portion being provided with drain means on the surface positioned slightly above said depressed bottom portion whereby to limit the water in said depressed portion to a depth shallow with reference to the height of coke in said trough whereby hot coke traveling in said trough in said depressed portion will be enveloped

in steam to prevent combustion of said coke prior to quenching, means for delivering a measured amount of quenching water to coke carried by said conveyor, said means for supplying said quenching water being disposed adjacent to a region reached by said coke after it has passed said depressed portion, said drain means being located below said quenching water supplying means, and means for maintaining an approximately uniform cross-section in the coke moving along said trough in the region adjacent to said quenching water supplying means.

2. A device adapted to be placed in front of a battery of coke ovens for preventing discharged hot coke from burning and also for quenching said coke, comprising a horizontal trough, a conveyor located at the bottom of said trough adapted to convey a layer of hot coke along said trough, said trough being provided with a depressed bottom portion to form a basin for water and being also provided with a slightly higher bottom portion, said trough beyond said depressed portion being provided with water outlet means to limit the water in said trough to a depth substantially no greater than the depth of water in said basin, said water in said basin being adapted to form steam to envelope said hot coke to prevent combustion thereof before quenching, means for delivering a measured amount of quenching water to said moving layer of coke after it has passed said basin, and means for maintaining a uniform cross-section of the stream of coke moving along said trough in the region thereof under said quenching water delivering means, said outlet means being located at a height to limit the water in said basin to a depth decidedly less than the depth of said coke as it passes over said depressed portion.

3. In combination, a coke oven, a horizontal trough extending in front of and past the discharge end of said coke oven, a conveyor in said trough adapted to convey a layer of hot coke along said trough, the bottom portion of said trough at the region adjacent to said oven being depressed slightly with respect to the remainder of said bottom portion, means for supplying water to said depressed portion, said remainder adjacent the depressed portion being provided with drain means on the surface positioned slightly above said depressed bottom portion whereby to limit the water in said depressed portion to a depth shallow with reference to the height of coke in said trough whereby hot coke traveling in said trough in said depressed portion will be enveloped in steam to prevent combustion of said coke prior to quenching, means for delivering a measured amount of quenching water to coke carried by said conveyor, said means for supplying said quenching water being disposed adjacent to a region reached by said coke after it has passed said depressed portion, said drain means being located below said quenching water supplying means, said drains being provided with screens having openings of definite size to screen out braise up to predetermined dimensions washed out by said quenching water, and means for maintaining an approximately uniform cross-section in the coke moving along said trough in the region adjacent to said quenching water supplying means.

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