April 1, 1969 K. HORNUNG 3,435,596

GAS CLEANING APPARATUS FOR COKE OVEN BATTERIES

Filed June 29, 1967 Sheet 1 of 2

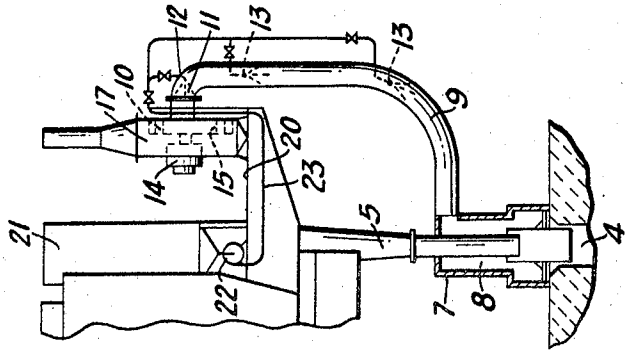


FIG. 2

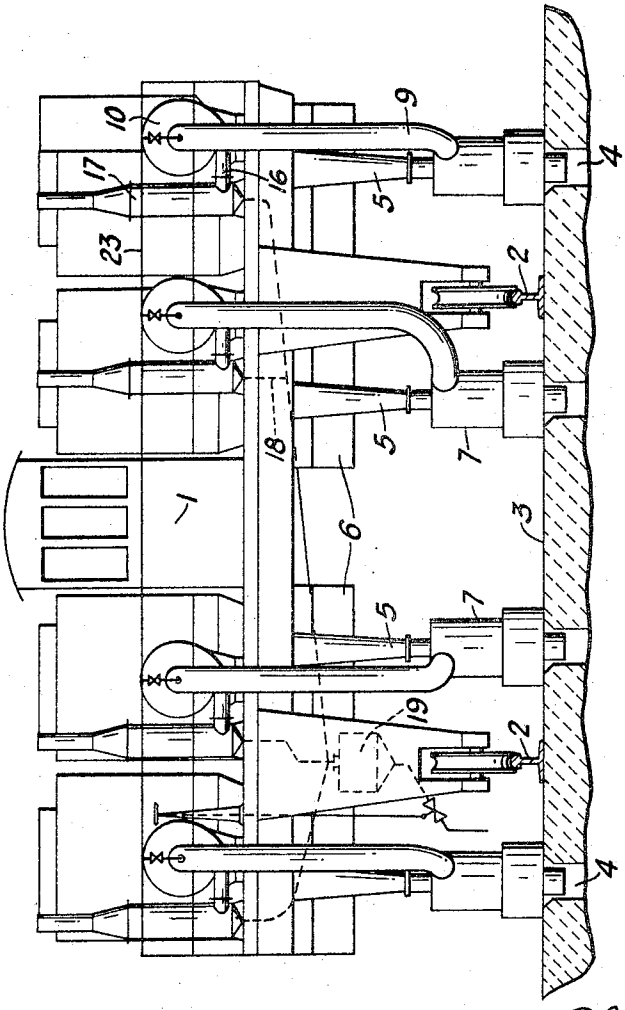


FIG. 1

INVENTOR.
KLAUS HORNUNG
BY Sherman H Barber
his Attorney

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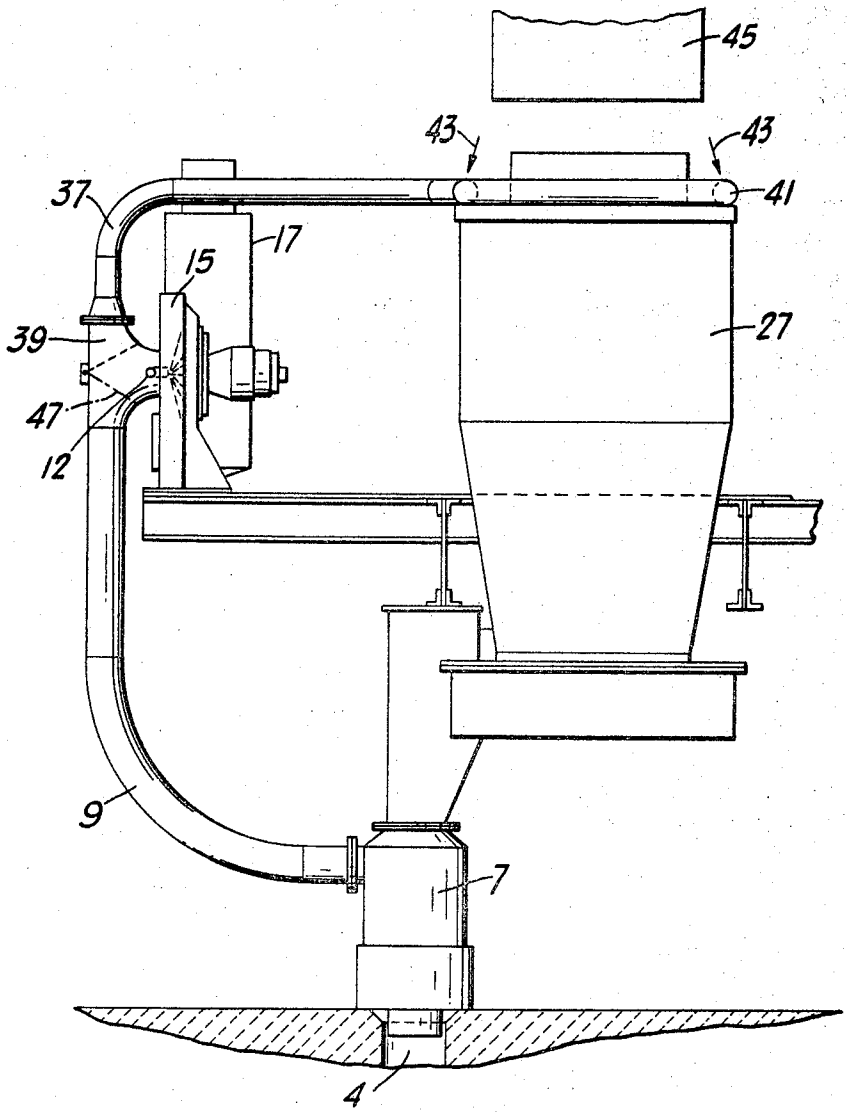


FIG. 3

INVENTOR.
KLAUS HORNUNG

BY Sherman H. Barber
his Attorney

United States Patent Office

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GAS CLEANING APPARATUS FOR COKE OVEN BATTERIES

Klaus Hornung, Essen-Kray, Germany, assignor, by mesne assignments, to Koppers Company, Inc., Pittsburgh, Pa., a corporation of Delaware

Continuation-in-part of application Ser. No. 554,438, June 1, 1966. This application June 29, 1967, Ser. No. 650,085

Int. Cl. B01d *47/06*

U.S. Cl. 55—223

5 Claims

ABSTRACT OF THE DISCLOSURE

A rotating impact wheel communicates through a conduit mounted tangentially to a gas-tight annular hood surrounding the coal discharge conduit on a larry car, and causes gases, emanating during charging coal into a coke chamber, to separate partially from solid matter in the gases. The gases pass through the rotating wheel into a static separator where further separation of solid particles occurs. The gases passing through the conduit are sprayed with washing fluid.

Another conduit surrounds the opening in the larry car hopper and this conduit, having slits in the top, communciates wtih the rotating impact wheel. When loading coal into the larry car suction in the other conduit removes coal dust from the vicinity of the larry car hopper.

Cross reference to related application

This application is a continuation-in-part of my copending application Ser. No. 554,438, filed June 1, 1966, now abandoned.

Background of the invention

This invention relates to gas cleaning and, more particularly, to gas cleaning apparatus for use with a coke oven battery.

The charging gases formed on charging the oven chambers of coke oven batteries consist of a mixture of tar-containing vapors, steam, air, and particles of coal and coke. The solid particles cause a considerable air pollution.

A number of apparatus for exhausting and cleaning the charging gases are known. These apparatus more or less incompletely fulfill the function of separating the solid particles and the small amount of tar contained in the charging gas.

For example, a known suction and cleaning apparatus for charging gases comprises a rotary, centrifugal, wet dust-removal device. In this case it is a question of a rotating dust-removal device, which is provided with a brush wheel sprayed with water. However, a brush wheel is not suitable for cleaning tar-containing gas, since the precipitated tar gums up the brushes after a short operating period and the suction and cleaning of the charging gas are doubtful.

Summary of the invention

Apparatus for cleaning gases formed when coal is charged into a coking chamber comprises a gas tight hood annularly surrounding the coal charging chute and a conduit tangentially mounted to the hood that communicates with a rotary impact wheel. The rotary impact wheel communicates with a static separator. The rotating impact wheel causes whirling of the gases in the

hood whereby some particle separation takes place there before the gases pass through the impact wheel and into the static separator. Spray nozzles are used to inject washing water into the tangentially arranged conduit.

Brief description of the drawings

The invention is illustrated by way of example in the drawing; wherein:

FIG. 1 is a front view of a larry car provided with the charging-gas cleaning device conforming to the invention;

FIG. 2 is a partial side view of the embodiment of FIG. 1; and

FIG. 3 is a view along line III—III of FIG. 1.

Detailed description

According to the invention, each suction line for the charging gas is tangentially connected at the upper part of the high annular space of the mouth of the larry car and the suction line leading to a disintegrating washer is provided with spray nozzles.

The high annular space of the mouth of the larry car forms a centrifugal dust separator, in which the coarse particles of dust are separated in the dry state, so that the load of the rotating washer is relieved and the function of a practically complete separation of the residual fine components can be carried out more effectively. The suction line acts as a spray cooler. The amount of sprayed water and the cross section of the suction lines are adjusted so that the steam mist condenses the tar. The fine dust as well as the droplets of tar and water are exhausted with the charging gas into the disintegrating washer.

No more water has to be injected into the disintegrating washer. The fine dust and the droplets of tar and water carried by the charging gas are intimately mixed and combined by alternately arranged stationary and rotating cages of disintegrating bars. The disintegrating bars are constructed in such a way that they exert a suction effect and a pressure effect.

According to another characteristic of the invention, the disintegrating washer is connected to a separator, preferably a static separator, in which the droplets of water and tar combined with the dust are separated. The droplets are withdrawn at the bottom as slurry, while the clean charging gas mixed practically only with steam leaves through a nozzle-shaped connecting pipe in the cover of the separator.

The arrangement of the suction and cleaning devices, which are coordinated with each charging-hopper mouth and require little space, makes possible an uninterrupted operation during each charging procedure, since the total amount of charging gas can be exhausted through the remaining cleaning apparatus in the case of failure of individual suction and cleaning apparatus.

Referring to FIG. 1, the larry car **1** is movably arranged on tracks **2** on the top of a coke oven battery, not illustrated in detail.

A charging-hopper discharge conduit **5** is joined with each charging hole **4** in the top of the oven. In the illustrated example the larry car **1** is provided with revolving tables **6** (not illustrated in detail) by which the coal is conveyed into the discharge conduit **5** of the charging-hopper.

Around the lower part of each discharge conduit **5** is arranged an annular hood **7**, which telescopically surrounds the lower part of the discharge conduit **5**, and is

connected therewith. After the annular sheath **7** is lowered over the charging hole **4**, there is formed a closed annular space **8**, open only at the bottom. The charging gases are withdrawn from the annular space **8** through a suction line **9** tangentially connected at the top, and the gases discharge concentrically into a rotating impact washer **10**.

Spray nozzles **13** are connected in the suction line **9**. An impact wheel **15** is arranged in the washer **10** and is rotated at a high speed by a motor **14**. The impact wheel causes an agglomeration of the dust in the droplets of liquid and tar by the intimate mixing. If desired, a liquid spray nozzle **12** also can discharge into the pipe section **11** of the suction line **9**, connected to the washer **10**.

As a result of the tangential connection of the suction line **9**, centrifugal motion of the charging gas is produced in the annular space **8** of the conduit **5**, so that a preliminary separation takes place, particularly of the coarser solid particles. The solids deposited on the bottom are swept into the charging hole after raising the conduit **5**, upon completion of the charging procedure.

The droplets of water, tar and the solid particles are hurled outwardly by the impact wheel **15** and pass through a tangentially connected pipe **16** into a static separator vessel **17**, in which the droplets laden with dust and tar are separated. The formed slurry is withdrawn at the bottom of the separator vessel **17** through lines **18**, into a collecting tank **19**. A mixture of gas, air, and steam, free from solids, goes into the atmosphere from the individual separators **17** and this mixture causes practically no air pollution.

The rotating washers **10**, associated with each charging hole **4** are arranged on an accessible platform **20** and require little space because of their high efficiency.

The washing liquid is supplied to the spray nozzles **12**, **13** from a tank **21** by means of a pump **22** and a common line **23**.

In another aspect of the invention, illustrated in FIGURE 3, the outlet **7** is coordinated with a feed hopper **27** of the larry car **1**. The gases formed during the charging of the oven chamber pass through the suction line **9** into the disintegrator or washer **15**, and from here through a static separator **17** into the atmosphere. A spray nozzle **12** is arranged on the inlet of the washer; additional nozzles **13**, illustrated in FIG. 2, are provided in the suction line **9**. In addition to suction line **9**, an additional suction line **37** is connected to a connecting piece **39** of the disintegrator **15**. Suction line **37** leads to the upper edge of the feed hopper **27** and there it is transformed into an annular pipe **41**. The top of the annular pipe has holes or slits (not illustrated), which are preferably arranged at an angle to the axis of the feed hopper so that the suction takes place approximately in the direction of the arrows **43**. This produces a current, which surrounds the free space between the outlet **45** of the bin and the feed hopper **27** in the form of a conical sheath.

A reversing valve **47** is installed in the connecting piece **39** of the disintegrator **15**, and, in the position indicated by the broken line, the suction line **37** is closed and the passage for the charging gases to the washer **15** is free. After completion of the charging of the oven chamber, the reversing valve **47** is placed in the position indicated in the dash-and-dot line so that the dusty air at the outlet **45** of the bin is removed by suction during the emptying of the coal bin, and it is cleaned by the disintegrator **15**, which also operates during this operation. The dirty water can be discharged and fresh water loaded simultaneously so that the larry car **1** is ready to charge the next oven after leaving the bin and reversing the valve **47** to the position illustrated by the broken line.

What is claimed is:

1. Apparatus for cleaning gases formed when coal discharges from a larry car through a conduit into an opening in a chamber of a coke oven, comprising:

(a) a hood surrounding the lower portion of said conduit and annularly spaced apart therefrom;

(b) means for bringing said conduit into operative association with said opening whereby said hood provides a closed annular space above said opening;

(c) a rotatable gas washer mounted to said larry car;

(d) a static separator mounted to said larry car wherein solid particles are removed from said gas;

(e) first conduit means communicating said rotatable gas washer with said static separator;

(f) second conduit means tangentially mounted to said hood and communicating with said rotatable gas washer; and

(g) means to rotate said gas washer and create centrifugal motion of the gases in said hood whereby first separation of some solid particles from said gas is accomplished in said hood before said gas is passed into said second conduit.

2. The invention of claim **1** including:

(a) a plurality of spray devices for injecting washing liquid into the gas in said second conduit.

3. The invention of claim **2** including:

(a) a source of washing liquid; and

(b) pump means and conduit means for delivering said washing liquid to said spray devices under pressure.

4. Apparatus for cleaning gases formed when coal is charged into a larry car hopper and when said coal is charged into coking chambers through a discharge conduit, comprising:

(a) a hood surounding the lower portion of said conduit and annularly spaced apart therefrom;

(b) means for bringing said conduit into operative association with said opening whereby said hood provides a closed annular space above said opening;

(c) a rotatable gas washer mounted to said larry car;

(d) a static separator mounted to said larry car wherein solid particles are removed from said gas;

(e) first conduit means communicating said rotatable gas washer with said static separator;

(f) second conduit means tangentially mounted to said hood and communicating with said rotatable gas washer;

(g) means to rotate said gas washer and create centrifugal motion of the gases in said hood whereby first separation of some solid particles from said gas is accomplished in said hood before said gas is passed into said second conduit;

(h) a third conduit surrounding the larry car hopper and having a plurality of perforations in the upper surface;

(i) means connecting said third conduit to said rotatable impact gas washer; and

(j) valve means in said third conduit to regulate the flow of air into said gas washer when coal is being loaded into said larry car hopper whereby the ambient air, carrying solid particulate coal, around the entrance to said hopper is drawn into said conduit through said openings and into said gas washer.

5. The structure of claim **4** wherein:

(a) said valve means is reversible to regulate the flow of gases into said rotatable impact washer from said hopper when coal is being loaded and from said hood when coal is being discharged from said larry car.

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HARRY B. THORNTON, *Primary Examiner.*

D. E. TALBERT, JR., *Assistant Examiner.*

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55—230, 238, 258, 260, 329, 356, 385, 459; 202—263; 214—18; 302—59