Nov. 25, 1969 R. C. KINZLER ET AL 3,480,514

ASCENSION PIPE CLEANING APPARATUS IN COMBINATION WITH A HORIZONTAL COKE OVEN BATTERY

Filed Sept. 30, 1966

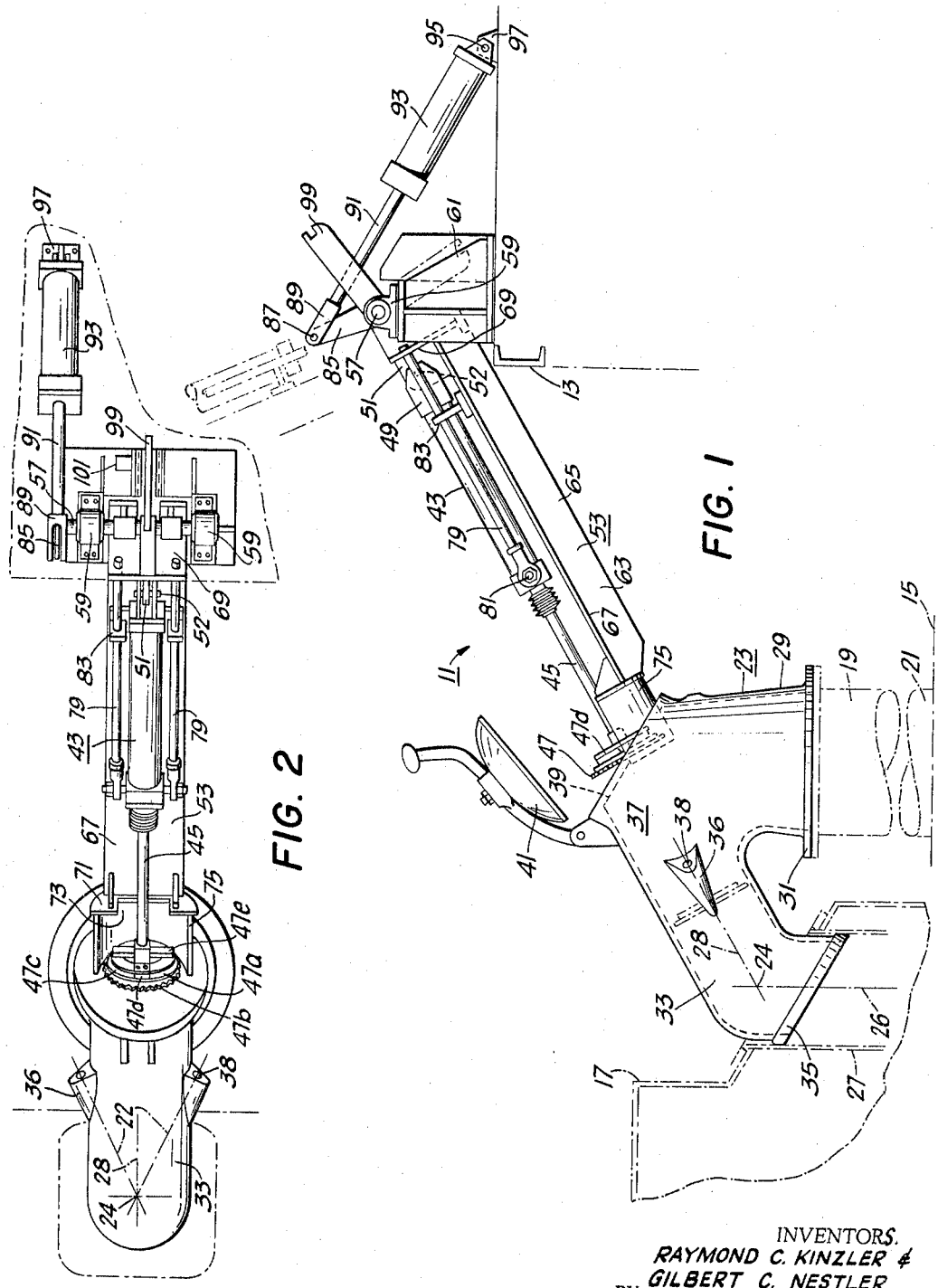


FIG. 1

FIG. 2

INVENTORS.
RAYMOND C. KINZLER &
GILBERT C. NESTLER
BY Sherman H. Barber
their Attorney

United States Patent Office 3,480,514
Patented Nov. 25, 1969

3,480,514

ASCENSION PIPE CLEANING APPARATUS IN COMBINATION WITH A HORIZONTAL COKE OVEN BATTERY

Raymond C. Kinzler, Carnegie, and Gilbert C. Nestler, Pittsburgh, Pa., assignors to Koppers Company Inc., a corporation of Delaware

Filed Sept. 30, 1966, Ser. No. 583,376
Int. Cl. C10b *43/06*
U.S. Cl. 202—241 7 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for cleaning depository material from within elbows of ascension pipes of a coke oven battery includes a ram, pivotally mounted to a frame that is pivotally mounted to a larry car, the ram carrying a cutter head or abrading tool which is inserted into the ascension pipe and reciprocated therein to remove depository material from the ascension pipe elbow. The outer end of the frame carries a guide that engages the opening in the ascension pipe to insure axial alignment for the abrading tool.

This invention relates to apparatus for cleaning and decarbonizing and, more particularly, to improved apparatus for removing depository material within the gooseneck elbow of a coke oven battery ascension pipe.

The usual coke oven is equipped with one or more ascension pipes for each coking chamber, to carry the volatile products of combustion that are liberated during the coking process into the collecting mains that run along the sides of the coke battery. In passing from an ascension pipe into the collecting main, the gases traverse a gooseneck type elbow and change direction. The gases are generally cooled by spraying flushing liquor in the ascension pipe elbow, and carbon substances deposit on the internal surfaces of the gooseneck elbow, that tend to accumulate and restrict the flow of volatile products of combustion through the elbow.

Heretofore, the removal of such carbon deposits from within the gooseneck ascension pipe elbow was accomplished manually by inserting a chisel-like rod or tool through an ascension pipe lid opening, and chipping the carbon deposits from the interior wall of the elbow casting. Such cleaning is, of course, arduous and hazardous to operating personnel performing this task.

The present invention includes apparatus for cleaning depository material from an ascension pipe elbow, such apparatus including a ram, pivotally mounted to the larry car, that carries a cutter head or abrading means for removing the carbon depository material from the elbow structure when the cutter head is reciprocated in the elbow by the ram.

For a further understanding of the present invention and for advantages and features thereof, reference may be made to the following description in conjunction with the accompanying drawing which shows, for the purpose of exemplification, a preferred embodiment of the invention.

In the drawing:

FIG. 1 is a schematic elevational view of apparatus constructed in accordance with a preferred embodiment of the invention; and

FIG. 2 is a plan view of the apparatus of FIG. 1.

Referring to FIG. 1, the apparatus **11** is mounted to the frame portion **13** of a conventional larry car that travels along the top of a coke oven battery **15**. A typical transverse section at an upper corner of a coke oven battery (FIG. 1) includes a collecting main (conduit) **17**, a vertical ascension pipe or stand pipe **19** that communicates with an off-take duct **21** in the top **15** of the coke battery, and an elbow structure **23** that is connected to both the ascension pipe **19** and the collecting main **17**. The collecting main **17** also includes the usual liquor seal valve (not shown) that cooperates with a downwardly extending riser pipe **27** within the collecting main, that cooperates with the elbow structure **23** in the usual manner.

The frame portion **13** of the larry car supports the apparatus **11** adjacent one side of the larry car in the case of a single collecting main, or when two gas collecting mains are used, the larry car frame **13** supports two apparatus **11** on each side of the car. The apparatus **11** is adapted to cooperate most readily with the type of elbow **23** illustrated in FIG. 1, but, however, such apparatus may be readily used with other conventional gooseneck ascension pipe elbows.

The elbow structure **23** has a first vertical downwardly extending leg portion **29** having a flange **31** that connects to the upper flanged end of the ascension pipe **19**. The elbow **23** has, also, a second integrally formed angularly extending leg portion **33** having a downwardly curving end that is enlarged, as at **35**, to slidingly fit within the inner surface of the vertical duct **27**. In the central portion **37** of the elbow **23**, where the first **29** and second **33** leg portion join, there is provided the usual access openings **39** that vents the oven **15** to atmosphere when the usual elbow cover or cap valve **41** is opened. The opening **39** also affords access to the elbow **23** for the cleaning tool of the invention.

Associated with the second leg portion **33** are diametrically opposed bosses **36** in each of which there is a hole **38** to receive a conventional flushing spray nozzle (not shown). The axes **22** (FIG. 2) of the holes **38** are directed angularly toward the central vertical plane of the elbow **23**, and the flushing liquor sprays converge in the vicinity of a point **24** where the vertical axis **26** of the riser pipe **21** intersects the axis **28** of the second leg portion **33**.

As may be noticed from FIGS. 1 and 2, the cleaning apparatus **11** includes a first ram **43**, extending from one end of which is a rod **45** that carries a cleaning head **47**. The first ram **43** has, at the other end, a clevis **49** that mates with a tongue **51** carried by a cradle **53**. The tongue **51** cooperates with the clevis **49** in a swivel type bearing **55** and the cradle **53** is pivotally mounted to a horizontal shaft **57** journalled in bearings **59** that are fixed to a support structure **61**. The support structure **61**, preferably, is mounted at the edge of the larry car frame **13**, and the cleaning apparatus **11**, extending outwardly from the larry car frame **13**, is pivotally actuatable in a vertical plane that is generally perpendicular to the longitudinal axis of the larry car.

In a preferred embodiment of the invention, the cleaning or abrading head **47** is comprised of an outer first circular disc **47***a* that has on the peripheral edge a plurality of teeth **47***b* that are similar to the teeth on a conventional circular saw blade. The cleaning head **47** also carries a concentric slightly smaller inner second circular disc **47***c* that serves as a support for the thin flat first circular disc **47***a*. Four mounting lugs **47***d* are provided on the second circular disc **47***c* for the purpose of mounting a cruciform arrangement of bars **47***e* that are mounted to the end of the rod **45**.

While in a preferred embodiment of the invention, the cleaning or abrading head **47** carries a circular disc **47***a* having a plurality of teeth **47***b*, in some applications, other forms of cleaning heads may be employed if they are preferred, such as flat individual scraper blades or knives, wire rods, wire brushes, and the like.

The cradle **53** is comprised of a T-shaped main body portion **63**, the stem portion **65** of the T-shaped main

body extending below the flat T-head portion **67**. The end of the T-shaped main body portion **63** nearest the support **61** abuts a rectangular end plate **69** to which is fixed the tongue **51** that is also mounted to the T-head portion **67**.

The clevis **49**, referred to hereinbefore, mates with the tongue **51**, and they are pivotally connected, as by a pin **52**, so that the cylinder assembly **43** may be easily disconnected from the cradle **53** whenever repairs or replacement of it is desired. The other end of the main body portion **63** abuts a semi-circular end plate **71** that has, in a flat edge thereof, a rectangular notch **73** (FIG. 2).

Extending lengthwise of the apparatus **11**, from the semi-circular notched end **71**, is a hemicylindrical shell **75** that serves as a guide and support for the cutter head **47** of the apparatus when the shell **75** rests on the lower edge portion of the opening **39**. A pair of brackets **77** are fixed to the notched-end plate **71** and the flat T-head portion **67** to support the shell **75** and the end plate **71** when the apparatus is placed in service.

The ram **43** is also provided with a pair of diametrically opposed guide rods **79** that are mounted to the ram in swivel-type bearings **81**, and that are supported along the length thereof in guide blocks **83**. The guide blocks **83** are fixed to the flat T-head portion **67**, as by welding or in any other suitable manner. The free ends of the guide rods **79** extend through slightly larger sized openings in the rectangular end plate **69**.

One end of the horizontal shaft **57** projects beyond one of the bearings **59** and, to the shaft extension, there is fixed a crank arm **85** which is pin connected as at **87** to a clevis portion **89** of rod **91** extending from a second ram **93**. The ram **93** is pivotally connected, as at **95**, to a fixed abutment **97** that may be bolted or otherwise suitably fastened to the larry car frame **13**.

On the shaft **57**, adjacent to the midlength portion thereof, there is fixedly mounted a locking arm **99** that is generally rectangular in shape. The locking arm **99** pivots in a clockwise direction from the operative position of the apparatus shown in FIG. 1, to the stowed position, or inoperative position, indicated by the dotted lines in FIG. 1. As the locking bar **99** approaches the bottom or stowed position, it may engage a suitable latching mechanism such as a solenoid operated latching device **101** that engages the locking bar **99** and maintains it and the other pivotable portion of the apparatus in the stowed position. When the latch is released, the cleaning apparatus **11** is ready for use and may be pivoted downwardly to the operating position shown in FIGS. 1 and 2.

In operation, the larry car moves along the top **15** of the coke oven battery over the coking chambers to refill the empty coke chambers with a fresh supply of coal. As often as the larry car stops to refill a coking chamber, the apparatus **11**, being in a position opposite the ascension pipe leading from the coking chambers, may be used at the same time to clean the ascension pipe elbow or elbows if two are provided for each coking chamber. Operating personnel at first pivot upwardly the hinged elbow cover **41** and the operator of the larry car then releases the latched device that holds the cleaning apparatus **11** in the stowed upward position.

The cleaning apparatus **11**, under the influence of the second ram **93**, pivots downwardly until the guide shell **75** engages the lower arcuate portion of the opening **39** and the end of the shell **75** projects into the elbow.

The cleaning apparatus **11** is then in substantial alignment with the axis **28** of the second leg portion **33** of the elbow. The operator then actuates the ram **43** and moves the cleaning head **47** through the opening **39** and into the elbow **23**. The cleaning head **47** may thereafter be reciprocated within the elbow, forward and backward, along the axis **28**, and the teeth **47*b*** on the circular disc **47*a*** contact and effectively remove any carbon depository matter from the inner walls of the elbow. During the reciprocation of the cleaning head **47**, it may be pivoted vertically, as necessary, by actuating the second ram **93** so that the teeth **47*b*** of the cleaning head **47** may contact the entire inner surface of the elbow **23**.

After the cleaning head **47** has performed its task at any one elbow, it may be withdrawn by actuating the ram **43** in the reverse direction to withdraw the cleaning head from the elbow and pivot the apparatus **11** upwardly by actuating the ram **93** in the reverse direction. Then the larry car may be moved along the top of the coke oven battery to the next coking chamber that needs to be refilled and the ascension pipe elbows at this chamber may be cleaned at the same time in the manner described herein.

A feature of the present invention is that the cleaning apparatus is pivotally mounted to the larry car frame and is ready for use by merely pivoting it from a stowed inoperative position to an operative position.

A feature of the present invention is that the cleaning apparatus may be operated remotely by the larry car operation; manual operation of the cleaning apparatus is eliminated.

A feature of the present invention is that the cutter head or abrading head is not power-rotated. Thus, an electric motor, and gear reducer if used, are eliminated from the cleaning apparatus.

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 various modifications and changes may be made within the scope of the invention as defined by the appended claims.

What is claimed is:

1. In a horizontal coke oven battery having a larry car that is movable along the top of said battery for charging coal into respective coking chamber, apparatus for cleaning an ascension pipe elbow connected to one of said coke oven chambers, comprising:

(a) a support mounted to said larry car;

(b) a cradle having a guide at one end mounted to a shaft on said support for movement in the vertical plane of said elbow;

(c) first ram means mounted to said cradle and having a piston rod extending therefrom;

(d) abrading means mounted directly on the free end of said piston rod and reciprocable with said piston rod;

(e) a locking arm mounted to and rotatable with said shaft;

(f) latching mechanism mounted to said support that is engageable with said locking arm to maintain said cradle in an inoperative position;

(g) means to release said latching mechanism;

(h) guide rods connected to said ram and to said frame for guiding said ram as said abrading head is reciprocated; and

(i) means for pivoting said frame so that said abrading head is extendable into said elbow whereby as said abrading head is reciprocated within said elbow and as said frame is pivoted, said abrading head contacts depository material on the inner wall of said elbow and removes the same.

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

(a) the means for pivoting said frame includes a second ram that is pivotally connected to said larry car.

3. In a horizontal coke oven battery having a larry car that is movable along the top of the battery for charging coal into respective coking chambers, apparatus for cleaning an ascension pipe elbow having an opening therein connected to one of said coke oven chambers comprising:

(a) a support mounted to said larry car;

(b) a frame pivotally mounted to said support and having a guide at its outer end;

(c) means to pivot said frame from a first inoperative position to a second operative position so that its outer guide end is engageable with the opening in said ascension pipe;

(d) an abrading tool mounted to the rod of a cylinder-piston assembly secured to said frame in such a way that said tool is reciprocable into and out of said ascension pipe; and,

(e) means to reciprocate said piston rod so that said abrading tool reciprocates and contacts the inner surface of said ascension pipe to remove deposited material therefrom.

4. The structure of claim **3** including:

(a) a locking bar secured to said frame and pivotal therewith; and

(b) releasable means on said support that is engageable with said locking bar to secure and hold said frame in the first inoperative position.

5. The structure of claim **3** including:

(a) crossed bars secured to said rod, with said abrading tool being mounted to said bars.

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

(a) a pair of rods mounted to said frame and to said cylinder-piston assembly for supporting said cylinder-piston assembly.

7. The invention of claim **3** wherein:

(a) said means to pivot the frame include a cylinder-piston secured to the frame and to the larry car.

References Cited

UNITED STATES PATENTS

2,931,060	4/1960	Kelly	15—104.1
3,049,738	8/1962	Randell et al.	15—5
3,196,088	7/1965	Coleman et al.	202—241

FOREIGN PATENTS

147,282	10/1962	U.S.S.R.

WILBUR L. BASCOMB, JR., Primary Examiner

U.S. Cl. X.R.

15—104.1; 196—122; 201—2; 202—270, 256