Jan. 9, 1973 R. C. KINZLER ET AL 3,709,794

COKE OVEN MACHINERY DOOR EXTRACTOR SHROUD

Filed June 24, 1971 5 Sheets-Sheet 1

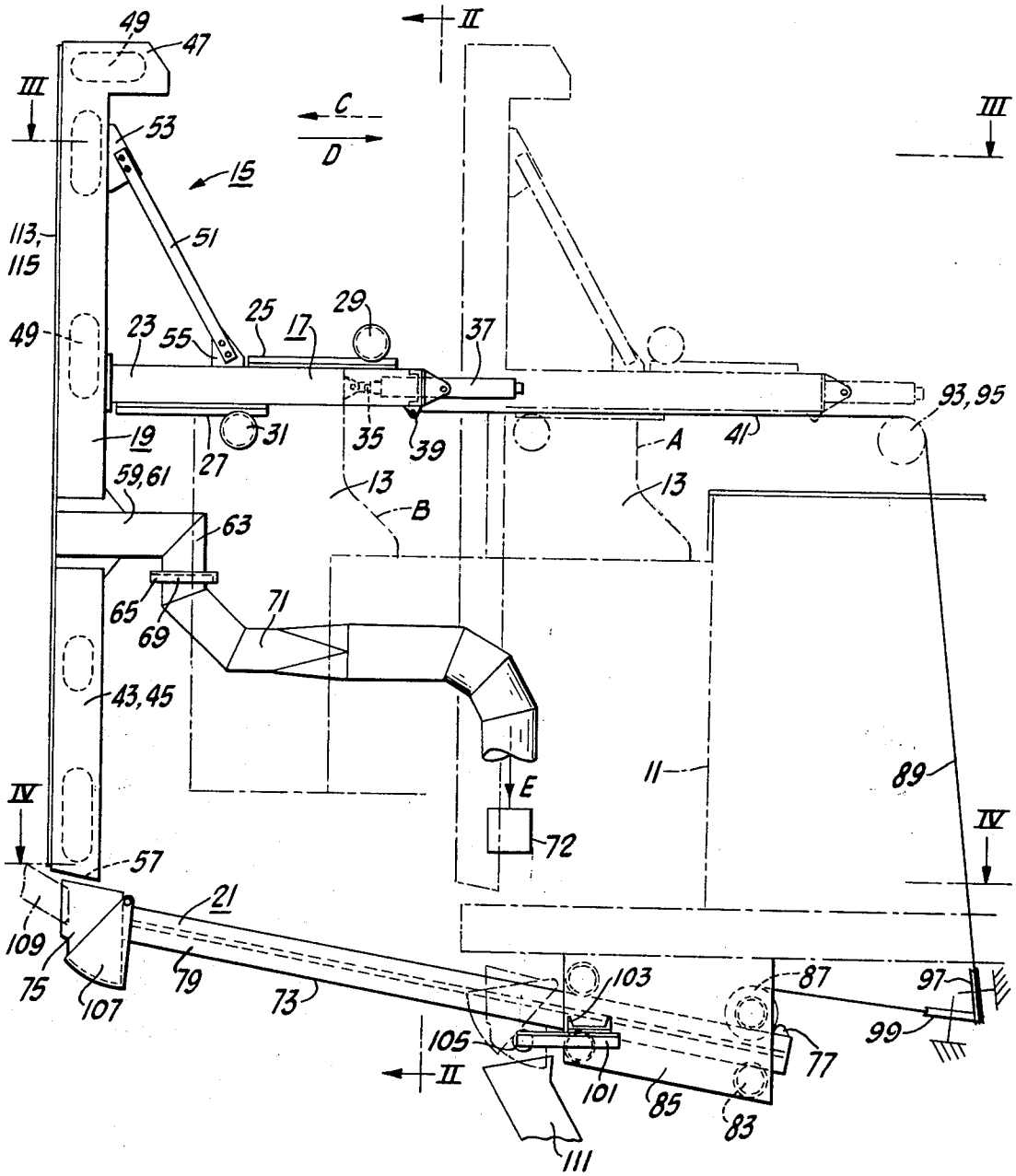


FIG. 1

INVENTORS
RAYMOND C. KINZLER,
WILLIAM D. EDGAR &
JOHN D. SUSTARSIC
Sherman H. Barber
Attorney

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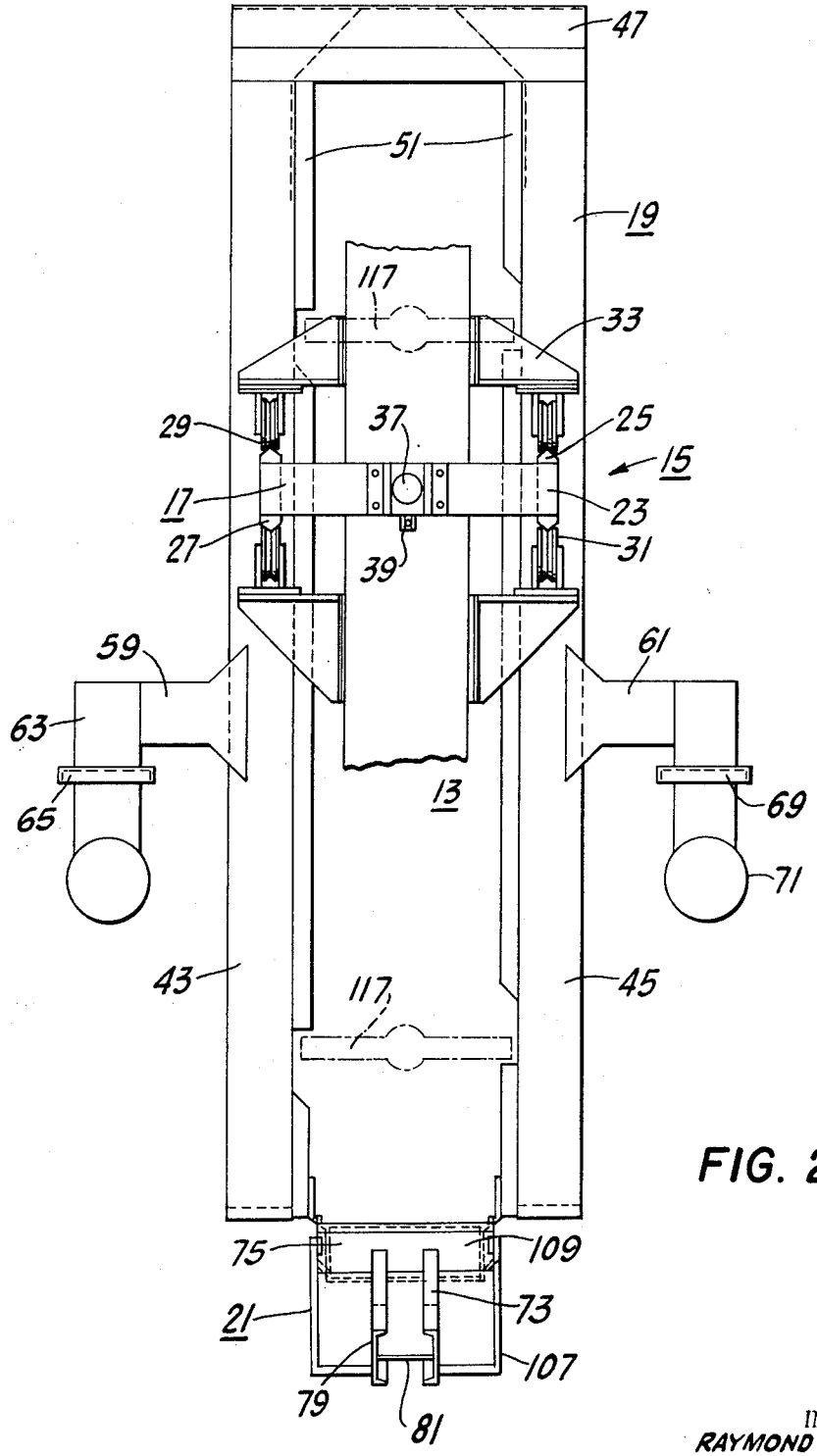


FIG. 2

INVENTORS
RAYMOND C. KINZLER,
WILLIAM D. EDGAR &
JOHN D. SUSTARSIC
Sherman H Barber
Attorney

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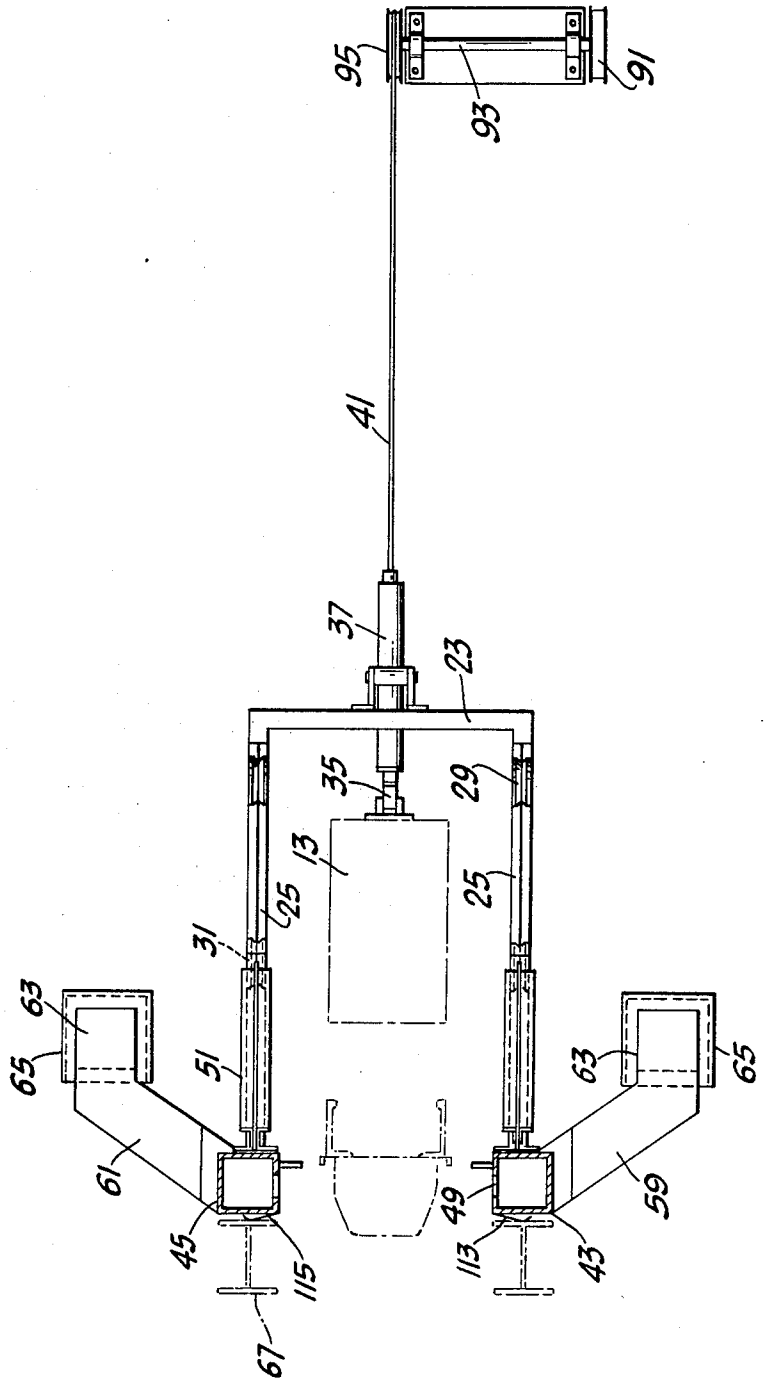


FIG. 3

INVENTORS
RAYMOND C. KINZLER,
WILLIAM D. EDGAR &
JOHN D. SUSTARSIC
Sherman H. Barber
Attorney

COKE OVEN MACHINERY DOOR EXTRACTOR SHROUD

Filed June 24, 1971 5 Sheets-Sheet 4

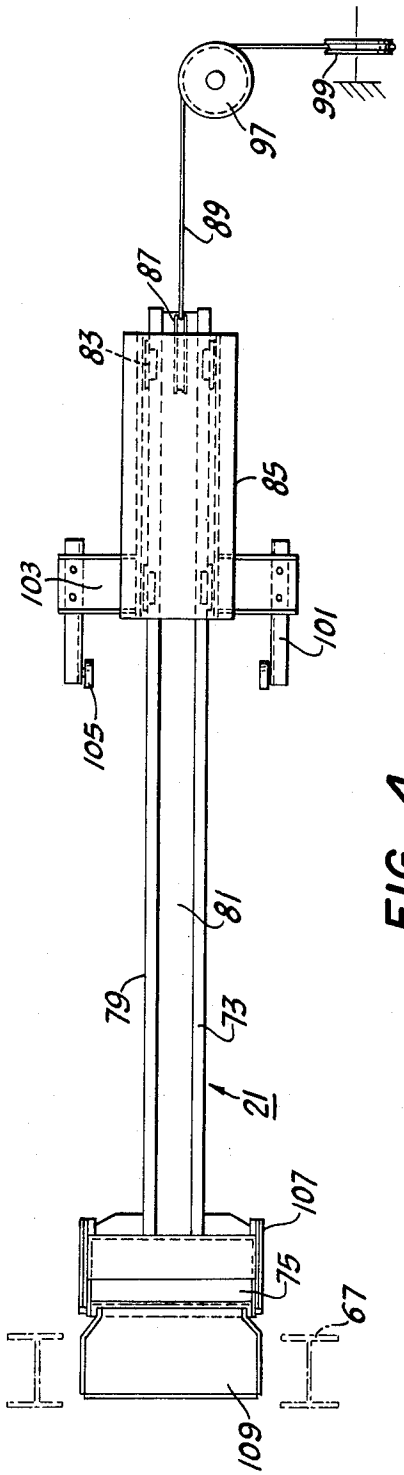


FIG. 4

INVENTORS
RAYMOND C. KINZLER,
WILLIAM D. EDGAR &
JOHN D. SUSTARSIC
Sherman H. Barber
Attorney

Jan. 9, 1973 R. C. KINZLER ET AL 3,709,794

COKE OVEN MACHINERY DOOR EXTRACTOR SHROUD

Filed June 24, 1971 5 Sheets-Sheet 5

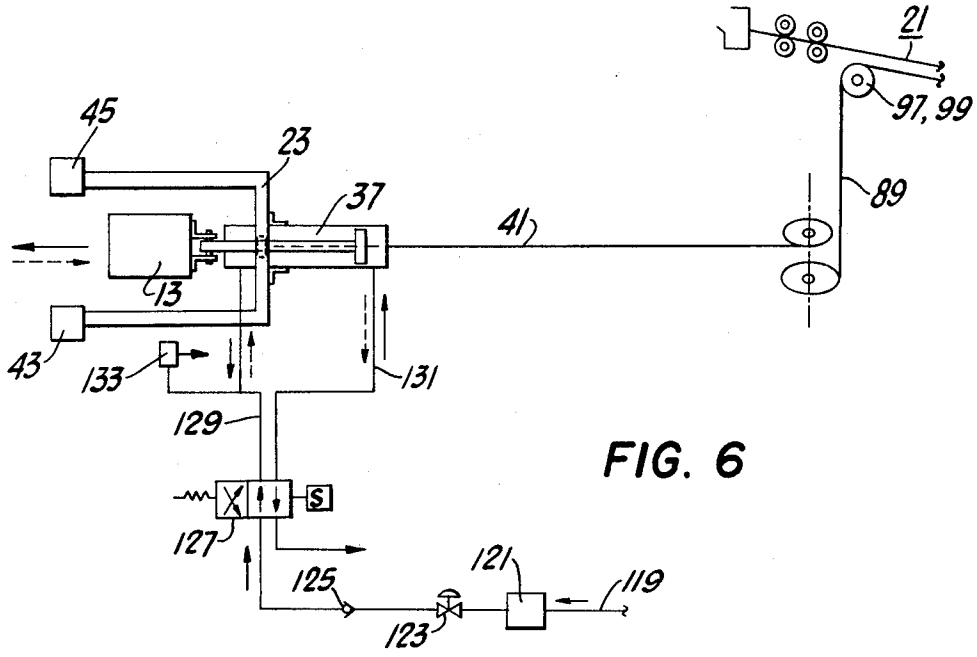


FIG. 6

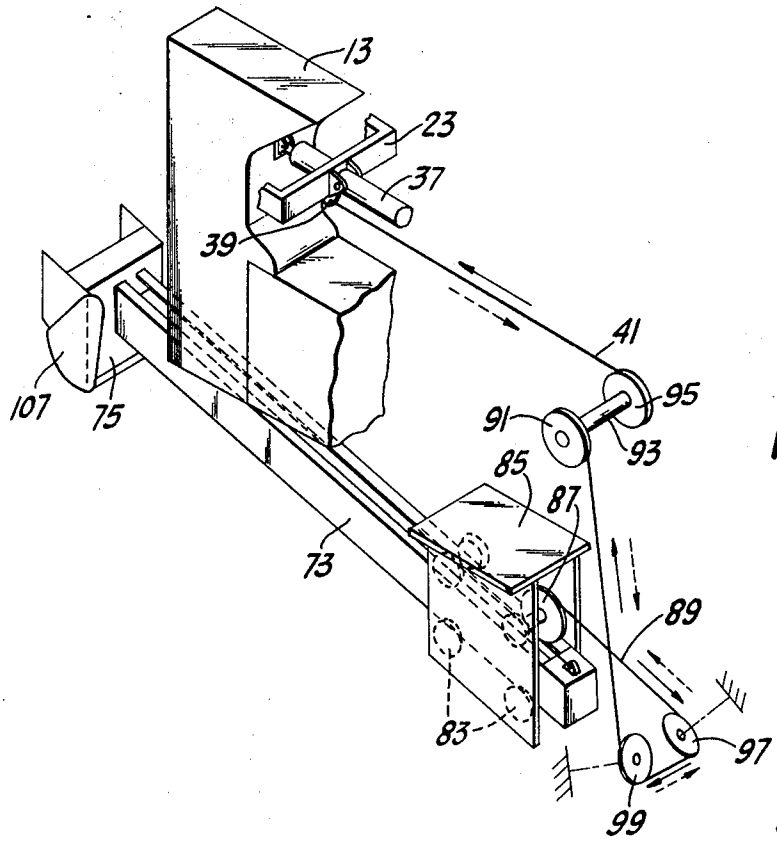


FIG. 5

INVENTORS
RAYMOND C. KINZLER,
WILLIAM D. EDGAR &
JOHN D. SUSTARSIC
Sherman H. Barber
Attorney

United States Patent Office 3,709,794
Patented Jan. 9, 1973

3,709,794

COKE OVEN MACHINERY DOOR EXTRACTOR SHROUD

Raymond C. Kinzler, Carnegie, William D. Edgar, Allison Park, and John D. Sustarsic, McKees Rocks, Pa., assignors to Koppers Company, Inc., Pittsburgh, Pa.

Filed June 24, 1971, Ser. No. 156,412
Int. Cl. C10b 25/14
U.S. Cl. 202—248 10 Claims

ABSTRACT OF THE DISCLOSURE

A shroud that is movable into position with a door extractor forms a seal with the buckstays of a coke oven and provides a curtain of negative pressure around the perimeter of the door. A spillage box is extended to a position beneath the doorsill to catch the fallout of coke when the door is retracted.

BRIEF SUMMARY OF THE INVENTION

To a door extractor machine, which is usually carried by a pusher machine, there is attached a door extractor shroud including two interconnected upright tubular conduits having smoke and fume entry holes in opposite facing sides. The conduits are provided with ducts that are adaptable to cooperate with other fixed ducts on the pusher machine; these other ducts leading to a gas scrubber of conventional design.

The two upright tubular conduits move in coordination with the door extractor machine whereby, when the door extractor machine moves toward a door to be removed, the upright tubular conduits move into engagement with the buckstays on either side of the door. When the door is removed, the gas scrubber is actuated and smoke and fumes evolving from the coking chamber are collected in the upright conduits and carried through the ducts to the gas scrubber.

After pushing is completed, the door is replaced and the cycle repeated at another chamber.

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 which is suitable for practicing the method of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 illustrates schematically a side elevational view of an embodiment of the invention;

FIG. 2 is a view along line II—II of FIG. 1;

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

FG. 4 is a view along line IV—IV of FIG. 1;

FIG. 5 is a schematic perspective view, simplified in scope, that illustrates the operation of one feature of the invention; and

FIG. 6 is a schematic diagram of the fluid actuating mechanism of the apparatus of FIG. 5.

DETAIL DESCRIPTION

In FIG. 1, a coke oven door extractor machine **11** carries, in addition to a conventional door extractor head **13** (FIG. 5), a door extractor shroud **15**.

The door extractor shroud **15** includes a main support frame **17**; a smoke suction shroud portion **19**; and a spillage box assembly **21**.

The main supports frame **17** includes a transversely extending carriage **23** which is fitted with upper **25** and lower **27** knife edge rails as shown in FIGS. 1 and 2. The upper

knife edge rail **25** coacts with a pair of suitably grooved wheels **29** and in like manner the lower knife edge rail **27** coacts with a pair of suitably grooved wheels **31**.

The upper **25** and lower **27** grooved wheels are mounted onto the conventional door extractor head **13**, shown only schematically in phantom outline in FIG. 1 in two positions A and B. In position A, the door extractor head **13** is retracted, and in position B, the door extractor head **33** is extended to its operative position.

The door extractor head **13** is secured to a piston rod **35** portion of a cylinder-piston assembly **37** which is movable in the direction of the arrows C, D for the purpose of engaging, unlatching, removing, and thereafter replacing a coke oven door.

The carriage **23** is provided with a downwardly extending clevis **39** to which is connected one end of a wire rope cable **41**, the purpose of which will be described more fully hereinafter.

The smoke suction shroud portion **19** includes a pair of vertical elongate parallel rectangular conduits **43, 45** which are connected at their respective upper ends by a transversely extending rectangular conduit **47**, arranged about as shown in FIG. 2. Each vertical conduit **43, 45** is provided with a plurality of long oval holes **49** in opposed sides; five such long oval holes being suggested (FIG. 1) in each vertical conduit. But, more or less holes **49** may be provided as desired.

Each vertical conduit **43, 45** is supported by the carriage **23** and is provided with an angle brace **51** secured to brackets **53, 55** on the conduits **43, 45** and on the carriage **23** respectively.

Each vertical conduit **43, 45** is closed at its bottom in a suitable manner, as by a plate **57**, and at approximately the mid-height location on each vertical conduit **43, 45**, there is a branch conduit **59, 61** that angles off about as shown in FIG. 3 and terminates in a downwardly extending duct **63** having a rectangularly shaped enlarged cap **65**. The downward side of the cap **65** on the side nearest the coke oven, represented in the drawings by a pair of buckstays **67**, is not provided; there being downward sides **69** only on three edges of the cap **65** for a purpose that will be explained hereinafter.

Each cap **65** coacts with the upper end of a fixed conduit **71** which is located, in relation to the movable door extractor shroud **15**, about where shown in FIG. 2; the fixed conduits **71** being mounted suitable to a conventional pusher machine. The free end of the conduit **71** is connected to a conventional gas scrubber **72** mounted at a convenient location on the pusher machine.

The spillage box **21** includes an elongate fabricated weldment type beam **73** which is connected at one end to a receptacle **75** while the other end of the elongate beam **73** carries a cable dead-end lug **77**. The fabricated weldment type beam **73** includes two facing channels **79** and a flat plate **81** welded to the webs of the channels about where shown in FIG. 2. Of course, any other type of beam may be used if preferred.

The elongate beam **73** engages a plurality of rollers **83** journaled in a support structure **85** that is secured to the pusher machine, and the support structure **85** also carries a sheave **87** over which a wire rope **89** is looped.

The wire rope **89** is connected at one end to the cable dead-end lug **77** and the other end is looped around and is fastened to a drum **91** that is journaled on a shaft **93**. As may be noted by reference to FIG. 5, the shaft **93** also carries another drum **95** onto which the wire rope cable **41** is wound and to which it is fastened. The shaft **93** is journaled in a conventional manner to the pusher machine. The wire rope cable **89** passes around a pair of idler sheaves **97, 99** that are suitably journaled to the pusher machine also.

The support structure **85** also carries a pair of outstanding arms **101** that are mounted to channels **103** on the structure **85**, and each arm **101** carries a roller **105** at its free end.

The receptacle **75** is adapted to receive hot coke and has a pivotally mounted gate **107** that closes the bottom of the receptacle. Pieces of hot coke that fall out of the oven when the door is removed, collect on and gravitate down an inclined chute **109** into the spillage box receptacle **75**. The chute **109** is disposed at a level below the bottom of the doorsill and is connected suitably to the doorjambs.

A hopper **111** is mounted to the pusher machine, about where shown in FIG. 1, and this hopper **111** receives coke from the spillage box **75** when it is retracted to the phantom outline position shown in FIG. 1 in the manner described hereinafter.

In operation, the coke oven machinery door extractor shroud **15** is initially in the retracted position shown by the dotted phantom outline of FIG. 1. The door extractor head **13** is also in the retracted position, A, shown in FIG. 1, and the spillage box **21** is also retracted.

Now, then, when it is desired to push coke from a coke oven chamber, the pusher machine and coke guide are brought into alignment in a conventional manner and the door extractor on the pusher machine side, as well as the door extractor on the coke side, are moved from the retracted position, A, toward the coke oven.

The door extractor shroud **15** also moves from right to left, as viewed in FIG. 1, and the vertical conduits **43, 45** are brought into contact with the buckstays on both sides of the coke oven chamber, or close enough to the buckstays so that flexible sealing strips **113, 115** on the vertical conduits engage the buckstays.

As the door extractor shroud moves into contact with the buckstays, the spillage box moves from its retracted position to its extended position.

After the door extractor shroud contacts the buckstays, the door extractor head continues to move toward and into contact with the door, which is unlatched. The door latches **117** are shown schematically in FIG. 2.

FIG. 6 illustrates schematically a fluid (air) flow and electrical diagram for the operation of the door extraction hood **15**. Fluid is conveyed in a conduit **119** from a convenient source of supply to a filter lubricator **121** and then through a pressure regulator **123** and check valve **125** to a four-way solenoid valve **127**.

From the solenoid-operated, four-way valve **127**, the fluid (air) flows either in conduit **129** or **131** into the cylinder portion of the cylinder-piston assembly **37**. As shown in FIG. 6, the door extractor head **13** is retracted. So, in order to advance the door extractor toward the door, fluid would flow from the cylinder in conduit **129** and be discharged to atmosphere, if air is the fluid, or to a reservoir, if hydraulic fluid is used, after passing through a pressure relief valve **133**. Fluid, of course, will flow in conduit **131** into cylinder **37**.

After the door is unlatched, the gas scrubber system is activated and smoke and fumes are drawn into the vertical conduit **43, 45** through the openings **49**, and the smoke and fumes flow in the fixed exhaust conduit **71** in the direction of the arrow E.

The door extractor, carrying the door, retracts about two feet and stops under the influence of a limit stitch. Simultaneously, the door extractor activates a timer.

As the door is retracted, it usually happens that a small quantity of hot coke falls from the coke in the chamber. Tihs coke falls into the receptacle **75** which is in position below the chute **109**.

When the timer times out, it initiates the following sequence: the door extractor retracts; the solenoid valve is deenergized, whereby the door extractor shroud retracts; and the gas scrubber system stops.

When the door extractor retracts, it will be observed from FIG. 5, the spillage box retracts under the influence of the force of gravity to the retracted position.

As the spillage box receptacle approaches the retracted position, the rollers **105** engage the gate **107** and pivot it to the open position; the hot coke in the receptacle gravitating into the coke hopper. The hopper, thereatfer, is emptied at one end of the coke battery and the water used for scrubbing the fumes and smoke and collected by the apparatus is used again to quench the hot coke in the hopper .

After the initial outpouring of smoke and fumes have subsided, the door extractor head is further retracted and the shroud is also retracted. Then, the pusher machine is moved along its track to align the pusher ram with the coke oven chamber for pushing coke.

When pushing is completed, the pusher machine is again moved to align the door extractor with the chamber, and the shroud and door are moved toward the battery. The door is replaced and the shroud and door extractor head are retracted.

A cycle is now completed and the pusher machine is ready to be moved to the next oven to be pushed.

Those skilled in the art will recognize, from the foregoing description of one embodiment of the invention, many features and advantages, among which these are most significant.

The apparatus is readily adaptable for installation on existing as well as on new pusher machines;

The apparatus operates automatically once the door extractor is aligned with an oven to be pushed; and

The apparatus is particularly effective and efficient in removing smoke and fumes from the environment of the open ends of a coke oven chamber when the doors are being removed. Heretofore, there has been no effective apparatus for collecting and removing smoke and fumes from this environment.

Visual monitoring of the door extractor operation is not hampered in any way and the machine operator can see at all times what is happening.

Although the invention has been described herein with a certain degree of particularly 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 coke oven battery having doors at the ends of a coking chamber from which coke is to be pushed by means of a pusher machine carrying a door extractor, the improvement comprising:

(a) first and second spaced apart vertical tubular conduits having perforations therein;

(b) means maintaining said tubular conduits a fixed distance apart which is substantially the distance between adjacent buckstays of said coke oven battery;

(c) means mounting said vertical conduits to said door extractor for movement along with said extractor toward and away from said coking chamber;

(d) a duct connected to each vertical conduit and having means for communicating with means for pulling smoke and fumes through said perforations into said conduits;

(e) a pair of ducts fixed to said pusher machine and communicating with said conduits for carrying smoke and fumes collected in said vertical conduits away from the environment of said chamber to be pushed when a door is removed; and

(f) means coordinating the movements of said door extractor and said vertical conduits whereby, when said door extractor moves toward a door, said vertical conduits move into engagement with said buckstays and when said door extractor removes said door said smoke and fumes are collected in said vertical tubular conduits.

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

(a) said means maintainin said conduits in spaced apart relation includes a transversely extending other conduit.

3. The structure of claim 1 wherein:
(a) said means mounting said conduits to said door extractor includes a carriage having rails that coact with rollers journaled to said extractor.
4. The structure of claim 1 including:
(a) sealing means disposed between said vertical conduits and said buckstays.
5. The structure of claim 4 including:
(a) a receptacle that is movable in coordination with said vertical conduits and said door extractor into position beneath said door whereby when said door is removed spillage coke gravitates into said receptacle; and
(b) means for advancing and retracting said receptacle toward and from beneath said door when said door is extracted.
6. The structure of claim 4 including:
(a) fluid actuated cylinder-piston assembly that is connected to said door extractor into engagement with said buckstays; and
(b) sealing means on said vertical tubular conduits disposed between said conduits and said buckstays.
7. In a coke oven battery having doors at the ends of a coking chamber from which coke is to be pushed by means of a pusher machine carrying a door extractor, the improvement comprising:
(a) first and second spaced apart vertical tubular conduits having perforations therein;
(b) a transverse conduit connecting said vertical conduits and maintaining them a distance apart that is substantially equal to the distance between adjacent buckstays of said coke oven battery;
(c) a frame connected to said vertical conduits that is cooperative with means on said door extractor whereby said frame is movable relative to said extractor;
(d) a cylinder-piston assembly mounted to both said door extractor and to said frame for moving said frame relative to said extractor and into engagement with the buckstays on opposite sides of a chamber to be pushed;
(e) a duct connected to each vertical conduit having means adapted to coact with conduit means supported by said pusher machine; and
(f) a gas scrubber mounted to said pusher machine that is connected to each said conduit means on said pusher machine, which, when actuated, withdraws smoke and fumes from the environment around a door when it is removed from said chamber to be pushed.

8. The structure of claim 7 including:
(a) a receptacle that is movable in coordination with said vertical conduits and said door extractor into position beneath said door whereby when said door is removed spillage coke gravitates into said receptacle; and
(b) means for advancing and retracting said receptacle toward and from beneath said door when said door is extracted.
9. The structure of claim 7 including:
(a) fluid actuated cylinder piston assembly that is connected to said door extractor into engagement with said buckstays; and
(b) sealing means on said vertical tubular conduits disposed between said conduits and said buckstays.
10. The structure of claim 8 wherein:
(a) said means for advancing and retracting said receptacle includes:
(i) an elongate beam secured to said receptacle,
(ii) rollers coating with said elongate beam and journaled to said pusher machine in such an arrangement that said receptacle is retractable under the force of gravity,
(iii) wire rope means secured to said elongate beam and to a first rotatable drum that is fixed to a shaft to which a second drum is secured, and
(iv) wire rope means secured to said frame and to said second drum, whereby when said frame advances toward said chamber to be pushed, said elongate beam and the receptacle also advance toward said chamber, and whereby when said frame is retracted said elongate beam and receptacle gravitate away from said chamber.

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NORMAN YUDKOFF, Primary Examiner
D. EDWARDS, Assistant Examiner

U.S. Cl. X.R.
202—263; 212—4