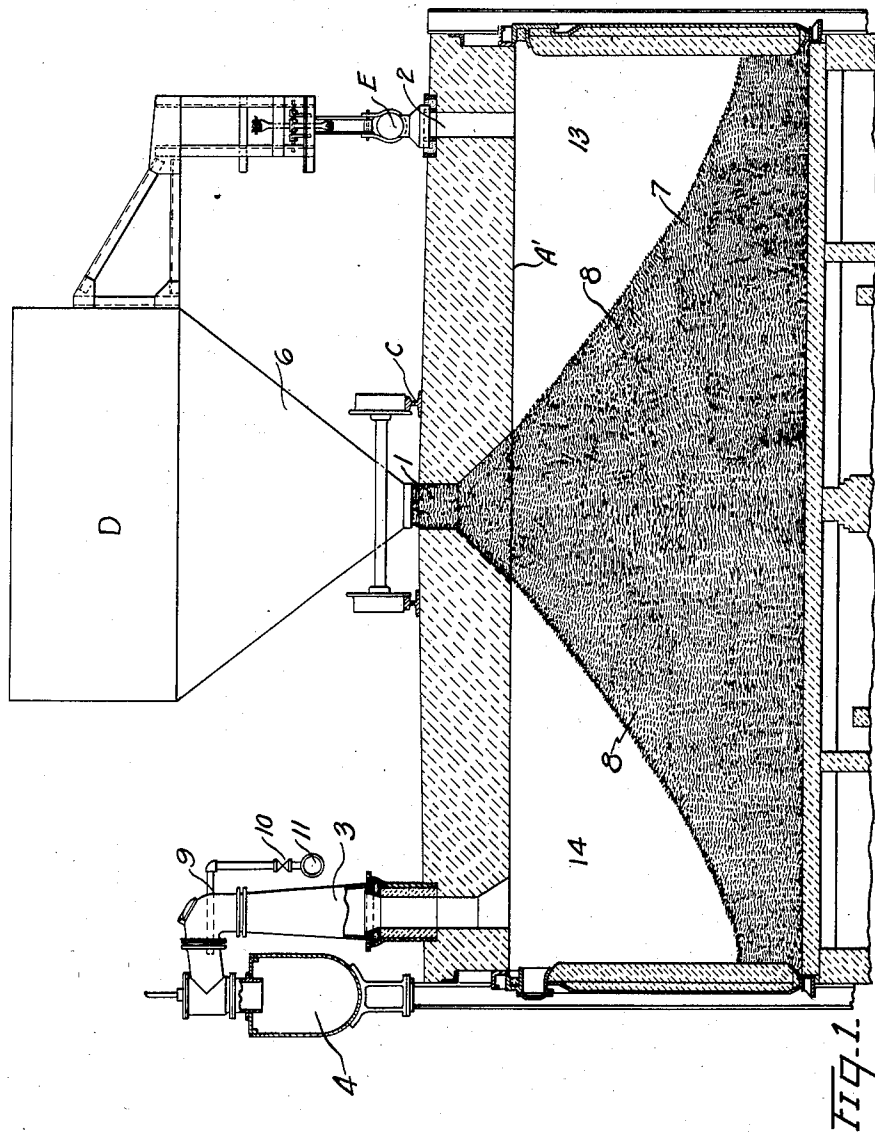


April 26, 1932.

E. W. KING
METHOD AND MEANS FOR DISTILLING COAL WITH
RECOVERY OF THE GASEOUS DISTILLATE
Filed April 23, 1927

1,855,191

3 Sheets-Sheet 1



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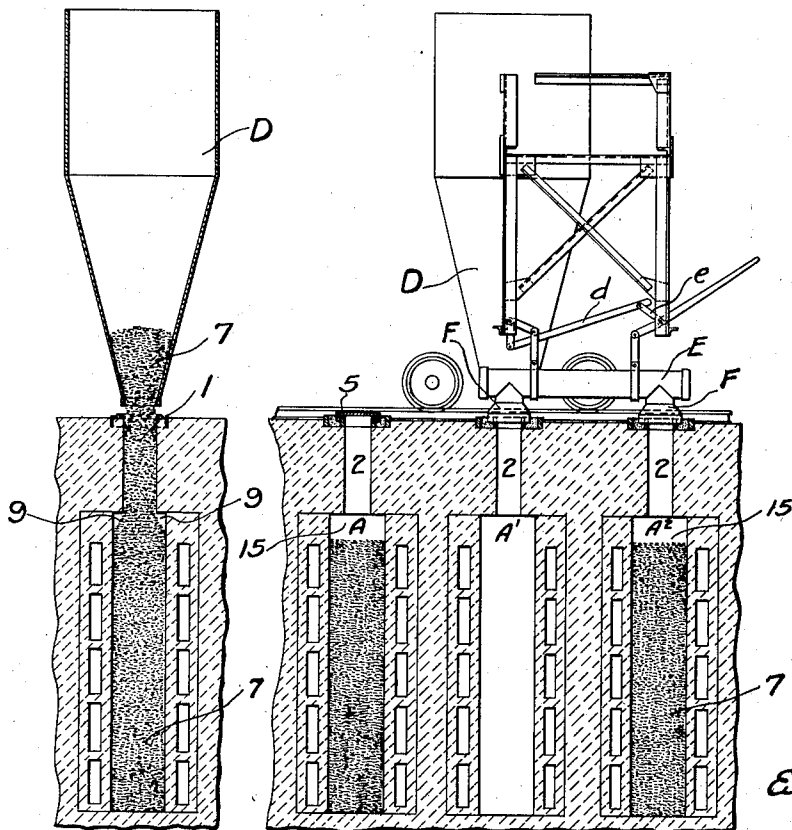
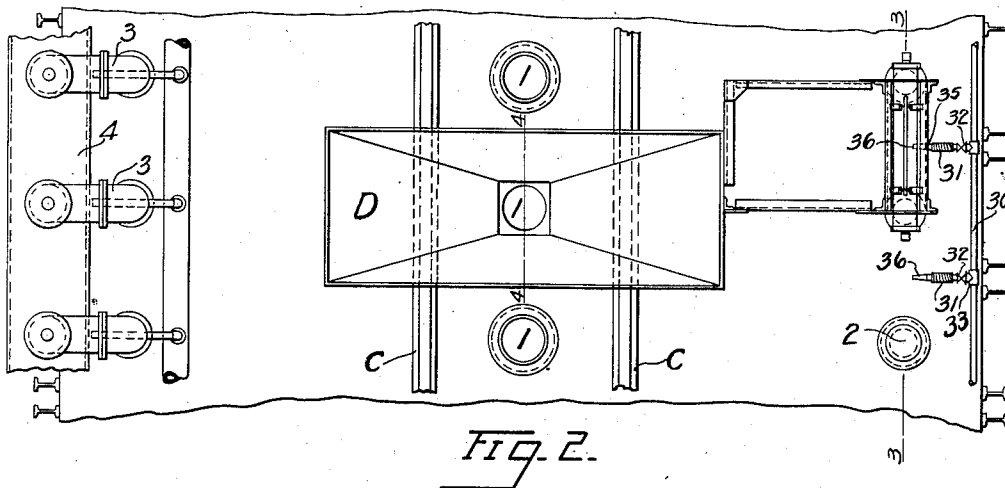
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3 Sheets-Sheet 3

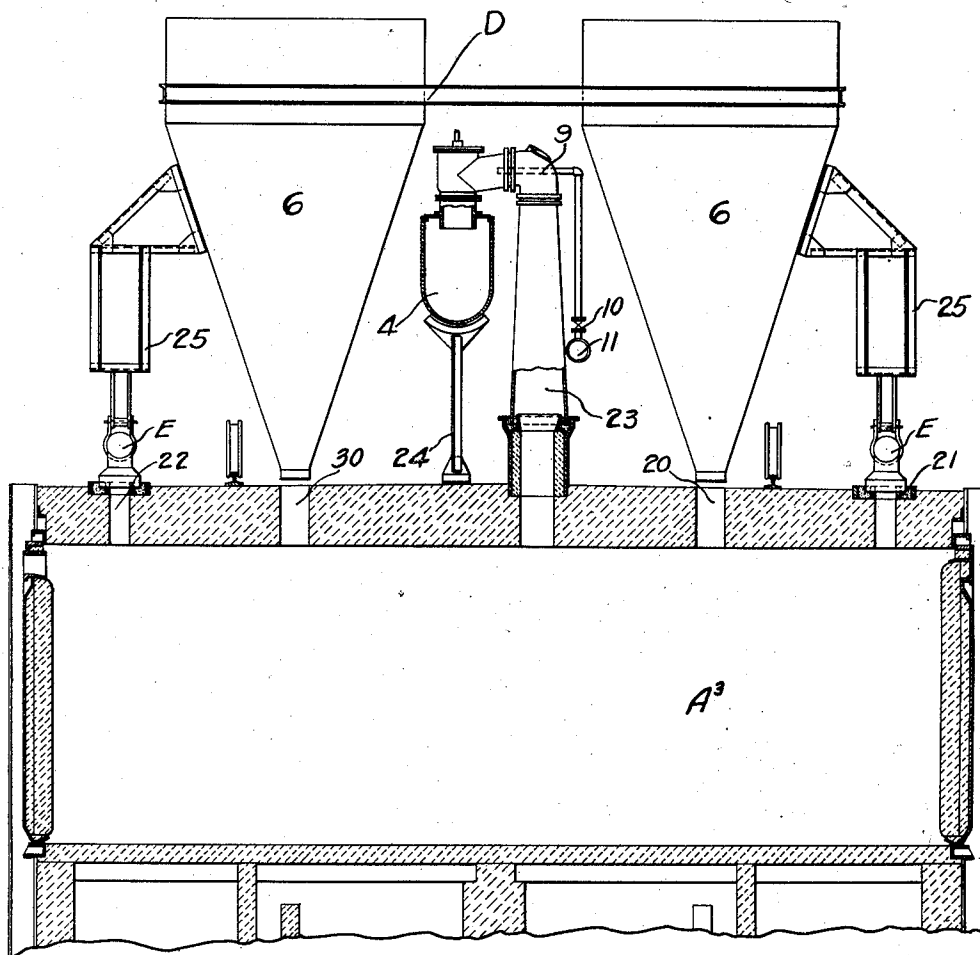


Fig. 5.

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METHOD AND MEANS FOR DISTILLING COAL WITH RECOVERY OF THE GASEOUS DISTILLATE

Application filed April 23, 1927. Serial No. 186,078.

This invention relates to a process and apparatus for recovering certain of the gases initially liberated in charging the hot ovens of a by-product coke oven battery. These gases are usually allowed to burst into flame during the charging operation with, at times, considerable danger to the operatives and with the production of smoke and soot, which may be highly objectionable, particularly if the battery is located, for example, within the limits of a city.

The principal objects of the invention are to provide a simple and efficient process and apparatus for the recovery of such initial gases evolved by the various ovens of the battery.

The invention accordingly comprises a process and apparatus for recovering the gaseous products evolved during the charging of an oven chamber, which includes discharging a part of such products into an adjoining oven and simultaneously discharging substantially the remainder of such products by suction into the collector main under pressure.

Other advantages will appear from the following detailed description taken in connection with the accompanying drawings in which Fig. 1 is a vertical elevation, partly in section, of part of an oven battery and charging device, showing an embodiment of the invention associated therewith; Fig. 2 is a fragmentary top plan view corresponding to Fig. 1; Fig. 3 is a vertical elevation partly in section along the line 3—3 of Fig. 2, showing an empty oven connected by the cross over pipe to a partly coked charge which is at approximately the height of the coal after leveling; Fig. 4 is a vertical section along the line 4—4 of Fig. 2 of the oven during charging, showing the position of the coal after a portion of the charge has gravitated into the oven chamber; Fig. 5 is a vertical section through the upper part of an oven battery showing a different charging device in elevation and embodying a modified form of the invention.

In the preferred embodiment of the invention illustrated in Figs. 1 to 4 inclusive, A, A¹, A² indicate three contiguously located

coke oven chambers forming part of a battery, each of which chambers is provided with a single charging opening 1, smoke off-take or gas outlet 2 and an offtake or ascension pipe 3 leading from the offtake in the top of the coking chamber into the collector main 4. Covers 5 normally close the charging openings and gas outlets when the ovens are in operation.

Disposed longitudinally of the battery is a track C, upon which is mounted a wheeled charging device D, adapted to travel the length of the battery of ovens. Upon the carriage D is mounted a cross-over, purge or vent pipe E, arranged to be raised and lowered by means of pivoted levers d, e. The vent pipe E is provided with depending branches F, F so spaced as to register at the same time with the gas outlets 2 of any two adjacent chambers, as A¹ A². If desired the vent pipe E may be so extended as to have more than two depending branches, and thus be used to connect more than one adjacent oven with that being charged.

The offtake pipe 3 is provided with a steam jet or ejector 9 controlled by a valve 10 connected to a steam pipe 11. When the steam ejector is turned on by means of valve 10, a suction is created in the offtake pipe and also in the oven chamber, causing a flow of the gaseous products, evolved during the charging operation, into the collector main 4. The collector main preferably is under pressure throughout the entire operation of the oven. It will be noted that operation of the steam jets during charging increases the pressure in the collector main 4, and also causes a suction to be maintained in the offtake pipe and chamber communicating therewith, thus facilitating the removal of the gaseous products throughout the charging operation.

Prior to the commencement of the charging operation the purge or vent pipe E is placed over the gas outlets 2 of adjacent ovens. The cover of the charging opening is removed and then the coal 7 is permitted to gravitate through the charging opening 1 from the hopper 6 of the larry or charging device D. The coal thus accumulates in a pile or stack completely covering the lower sur-

face of the chamber and inclining upwardly as indicated at 8—8 through the charging opening which is completely filled by the down-coming coal. The coal in gravitating into the chamber does not completely fill the transverse cross section of the chamber, i. e., the width of the chamber being such that conduits or paths 9'—9' are formed as the coal falls through the opening 1 on the pile accumulated therein. For removing the coal in the oven from beneath the charging opening, thus causing more coal to be drawn from the charging device, for uniformly leveling and distributing it in the oven, and for pushing it from the oven after the completion of the coking operation, a conventional type of leveler and pusher (not shown on the drawings) is provided.

Referring to Fig. 1, it will be noted that as the first portion of the charge is fed into the oven, pockets or gas spaces 13, 14 are formed. The volatile matter evolved and collected at 13 is provided a path through the cross-over or purge pipe E and is thus removed as soon as formed. Also the volatile matter collected at 14 is removed as formed through the smoke offtake in the top of the coking chamber communicating with the offtake pipe 3, by the action of the steam jet or aspirator. The conduits or passageways 9'—9' provide a connecting means across the oven thus maintaining an even pressure so that if more gas is given off and accumulated at one end than can be disposed of by the outlet at that end, the excess is automatically conducted into the adjoining pocket, thence through the outlet and removed from the chamber.

The apparatus herein described is designed to operate with only the steam jet in the offtake pipe of the oven being charged turned on during the charging operation. If desired, however, the steam jet in the adjacent oven can also be turned on to provide a suction in the corresponding offtake pipe which would cause a similar suction in the oven chamber and consequently in the vent pipe E. It is understood that after the oven has been completely charged and leveled a space 15 remains between the upper surface of the charge and the ceiling or top of the oven chamber, which provides a continuous passageway from the offtake pipe of the adjacent oven through that oven into and through the vent pipe to the pocket or gas space 13. After the charging and leveling operations are completed, the covers are replaced, the steam jets are turned off, the charging device is moved into its next charging position and the coking operation of the oven that has been completely charged commences under the pressure of the collector main.

If desired the purge or vent pipe E may be provided with an opening 35 through which a steam jet 36 may be inserted. This

jet when in operation creates a suction in the vent pipe and oven connected thereto, thus facilitating the removal of the gaseous products evolved during the charging operation. In Fig. 2, 30 indicates a steam pipe disposed the length of the battery and connected by pipe 33 and valve 32 to a flexible pipe 31 which in turn is connected to a steam jet 36. This flexible pipe permits the ready insertion or removal of the jet. There is, of course, a similar arrangement of jet, flexible pipe, valve and pipe connection to the steam pipe 30 for each oven. A plug or other suitable closure is preferably provided for the opening 35 in the purge pipe.

It will be noted that the mechanism described herein is simple in construction, efficient in operation and arranged to provide a safe, convenient, cool and well ventilated surface to the operators. In operation the cross-over or vent pipe and offtake pipe having the steam ejectors therein, conduct the gaseous material as soon as it is evolved, into the collector main, thus preventing its discharge into the atmosphere where it would form dense clouds of smoke and tend to ignite, constituting a continuous menace to the safety of the operators. The provision of a single conductor main provides the maximum free working space and only one hot and obstructed end which permits a free flow of air across the open end of the oven. This construction also enables an operator to observe and direct the charging, leveling and pushing operations while standing on the oven or while observing the pushing operation at the other end of the oven.

In the modified construction of Fig. 5 the coke oven chamber A² forms one of a battery of similar chambers, each of which is provided with two charging openings 20—30 located intermediate the ends of the oven, two gas outlets 21, 22 located near the ends of the oven and an offtake pipe 23 preferably positioned at a point half way between the ends of the oven. This offtake pipe is provided with a steam jet 9, having a valve 10 connected to a steam pipe 11 and leads into a collector main 4 under pressure. The collector main is supported by standards 24 at a point intermediate the ends of the oven, preferably at approximately the mid point. Charging device D, provided with two hoppers 6, is adapted to register with the charging openings 20, 30. Brackets 25 fasten a purge or vent pipe E to each hopper 6, the vent pipes being arranged to connect two or more ovens as explained in connection with the description of Figs. 1 to 4.

There is thus provided a pair of outlets for the disposal of the gaseous matter evolved during the charging operation at each side of a charging opening. It will be noted that each pocket or space formed when the coal is charged into the oven is in communication

with an outlet. Outlet 22 connects with vent pipe E and the adjacent oven, communicates with the pocket formed to the left (viewing Fig. 5) of the charging opening 30. Off-take pipe 23 communicates with the pocket formed to the right of charging opening 30 and left of 20, and gas outlet 21 communicates with the pocket formed to the right of charging opening 20. Side channels or passageways similar to 9'—9', Fig. 4, insure a uniform pressure throughout the chamber.

This construction retains all the advantages enumerated above and permits in addition a more rapid charging of the ovens. By elevating the collector main 4 above the surface of the oven, the operator can cross from one end to the other end also can view and direct the charging, leveling and pushing operations.

It will, of course, be understood that while a specific embodiment of the invention has been shown and described, various changes in the details thereof may be made by those skilled in the art, and this invention is not to be limited to the structure disclosed, but only by the scope of the appended claims.

1. The method of charging and operating hot coking chambers having a collector main connected to each coking chamber top by an ascension pipe, a charging hole and smoke offtake in the top of each coking chamber, the charging hole being located intermediate the smoke offtake and the ascension pipe, and the smoke offtake of the individual coking chambers while respectively being charged being communicably connected with the smoke offtake of an adjacent coking chamber, which comprises charging a coking chamber while hot with coal through said charging hole, conducting products evolved upon charging into an adjacent coking chamber while accelerating the flow thereof by inducing forced draught in the connection between the coking chambers and increasing the pressure differential in said ascension pipe while maintaining the pressure in said collector main substantially constant above atmospheric.

2. The method of charging and operating horizontally elongated hot coking chambers having a collector main connected to each coking chamber top by an ascension pipe, a smoke offtake in the top of each coking chamber at one end thereof, a charging hole in the top of each coking chamber intermediate the smoke offtake and the ascension pipe, the smoke offtake of the individual coking chambers while, respectively being charged being communicably connected with the smoke offtake of one of the adjacent coking chambers, which comprises charging a coking chamber while hot with coal through said charging hole thus forming a pile of coal in said coking chambers extending from the base of said chambers to the charging hole, conducting

products evolved upon charging and tending to collect in the end of the coking chamber near the smoke offtake through the smoke offtake and communicating connection into an adjacent coking chamber while accelerating the flow of said products by inducing forced draught in said connection, conducting products evolved upon charging and tending to collect in that portion of the coking chamber in the neighborhood of the ascension pipe through said ascension pipe into the collector main while maintaining in said collector main substantially constant pressure above atmospheric.

3. The method of charging and operating horizontally elongated hot coking chambers having a collector main connected to each coking chamber top by an ascension pipe, a smoke offtake in the top of each coking chamber at one end thereof, a charging hole in the top of each coking chamber intermediate the smoke offtake and the ascension pipe, the smoke offtake of the individual coking chambers while respectively being charged being communicably connected with the smoke offtake of an adjacent coking chamber, which comprises charging a coking chamber while hot with coal through said charging hole thus forming a pile of coal in said coking chambers extending from the base of said chambers to the charging hole, conducting products evolved upon charging and tending to collect in the end of the coking chamber near the smoke offtake through the smoke offtake and communicating connection into an adjacent coking chamber while accelerating the flow of said products by inducing forced draught in said connection, conducting products evolved upon charging and tending to collect in that portion of the coking chamber in the neighborhood of the ascension pipe through said ascension pipe into the collector main and accelerating the flow of said products through said ascension pipe by increasing the pressure differential in said pipe while maintaining in said collector main substantially constant pressure above atmospheric.

4. The method of charging and operating horizontally elongated hot coking chambers having a collector main connected to the coking chamber tops by an ascension pipe individual to each coking chamber, a plurality of smoke offtakes in the tops of each coking chamber and a plurality of charging holes in the top of each coking chamber, each charging hole being located intermediate a smoke offtake and the ascension pipe, the smoke offtakes of the individual ovens while respectively being charged being communicably connected with the offtakes of an adjacent coking chamber, which comprises charging a coking chamber while hot with coal through said charging holes thus forming piles of coal in said coking chamber ex-

tending from the base of said chamber to the charging holes and gas pockets in the coking chamber between the tops of the piles of coal and the tops of the coking chamber, each of said pockets communicating with either a smoke offtake or the ascension pipe in the top of each coking chamber, conducting products evolved upon charging and collecting in the pockets communicating with the smoke offtakes through said offtakes into the adjacent communicating coking chamber and conducting products evolved upon charging in the pocket communicating with the ascension pipe through said ascension pipe into the collector main.

5. The method of charging and operating horizontally elongated hot coking chambers having a collector main connected to the coking chamber tops by an ascension pipe individual to each coking chamber, a plurality of smoke offtakes in the tops of each coking chamber and a plurality of charging holes in the top of each coking chamber, each charging hole being located intermediate a smoke offtake and the ascension pipe, the smoke offtakes of the individual ovens while respectively being charged being communicably connected with the offtakes of an adjacent coking chamber, which comprises charging a coking chamber while hot with coal through said charging holes thus forming piles of coal in said coking chamber extending from the base of said chamber to the charging holes and gas pockets in the coking chamber between the tops of the piles of coal and the tops of the coking chamber, each of said pockets communicating with either a smoke offtake or the ascension pipe in the top of each coking chamber, conducting products evolved upon charging and collecting in the pockets communicating with the smoke offtakes through said offtakes into the adjacent communicating coking chamber while accelerating the flow of said products by inducing forced draught in said connection between said coking chambers, conducting the products evolved upon charging in the pocket communicating with the ascension pipe through said ascension pipe into the collector main and accelerating the flow of products through said ascension pipe by increasing the pressure differential therein while maintaining the pressure in said collector main substantially constant above atmospheric.

6. In a coke oven battery, in combination, horizontal coking chambers having in their tops charging openings and gas offtakes, said offtakes in each of the chambers being disposed on opposite sides of each of the charging openings in the chamber relative to the opposite ends of the coking chambers, collecting main means for collecting the distillate gases from the coking chambers of the battery, means for maintaining substantial-

ly constant pressure above atmospheric in said collecting main means, means for connecting the gas offtakes of the individual coking chambers while respectively being charged with gas offtakes of adjacent coking chambers and means for inducing forced draught in the connecting means to withdraw the products evolved upon charging from the individual coking chambers while respectively being charged and to cause said products to pass into adjacent coking chambers.

7. In a coke oven battery, in combination, horizontally elongated coking chambers each provided in its top adjacent one end thereof with a smoke offtake, a collector main, an ascension pipe leading from the top of each coking chamber adjacent the other end thereof into the collector main, a charging opening disposed in the top of each coking chamber substantially midway between the ends thereof, a charging device movable over the top of said battery into charging position over said oven chamber and a vertically adjustable pipe carried by said charging device and arranged to connect the smoke offtakes of adjacent coking chambers.

8. In a coke oven battery, horizontally elongated coking chambers each provided in its top with a single charging opening, a smoke offtake and an ascension pipe, the charging opening being positioned substantially midway between the smoke offtake and the ascension pipe, a collector main, the ascension pipe of each coking chamber leading into said collector main, a vent pipe adapted to connect the smoke offtakes of a plurality of coking chambers, means for inducing forced draught within said vent pipes and means for creating a pressure differential in said ascension pipe.

9. In a coke oven battery comprising horizontally elongated coking chambers and alternating heating walls, arranged side by side in a row, a collector main elevated above the surface of said battery and located at a point intermediate the sides of said battery, each of said coking chambers being provided in their tops with a plurality of charging holes and independent gas outlets located at the ends of each of said coking chambers in the top thereof, an offtake pipe leading from substantially the mid point of the top of each of said coking chambers into the collector main, a charging device movable into charging position and carrying a plurality of pipes arranged to connect gas outlets of adjacent coking chambers, and an aspirator in the offtake pipe of each coking chamber to cause the passage of part of the gaseous products evolved during the charging operation through the offtake pipe of the coking chamber being charged, and thence into said collector main.

10. In a coke oven battery comprising hor-

izontally elongated coking chambers and alternating heating walls, arranged side by side in a row, each of said coking chambers being provided in its top with a plurality of charging holes and independent gas outlets located at the ends of said chambers, a collector main elevated above the top of said battery and located at a point intermediate the ends of the coking chambers, an offtake pipe leading from substantially the mid point of each of said coking chambers into the collector main, each of said charging holes being located intermediate one of said gas outlets and said offtake pipe, a charging device movable into charging position and carrying a plurality of vertically adjustable pipes arranged to connect gas outlets of adjacent coking chambers, and an aspirator in the offtake pipe of each coking chamber to cause the passage of part of the gaseous products evolved during the charging operation through the offtake pipe and thence into the collector main.

In witness whereof I have hereunto set my hand.

EUGENE W. KING.