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AUTOMATIC ACTUATION OF THE UPTAKE VALVES IN A COKE OVEN BATTERY

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Fig. 1.

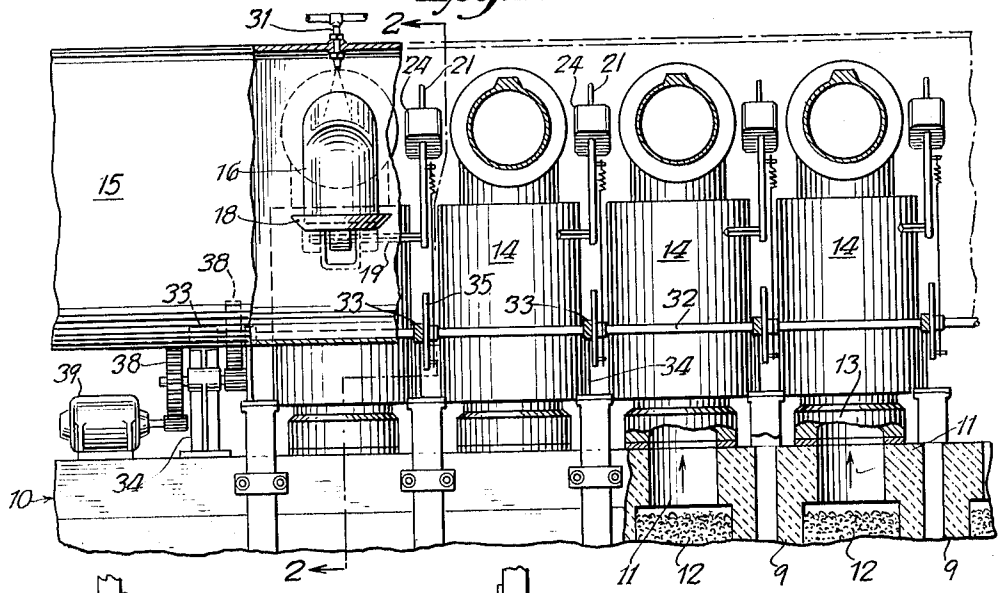
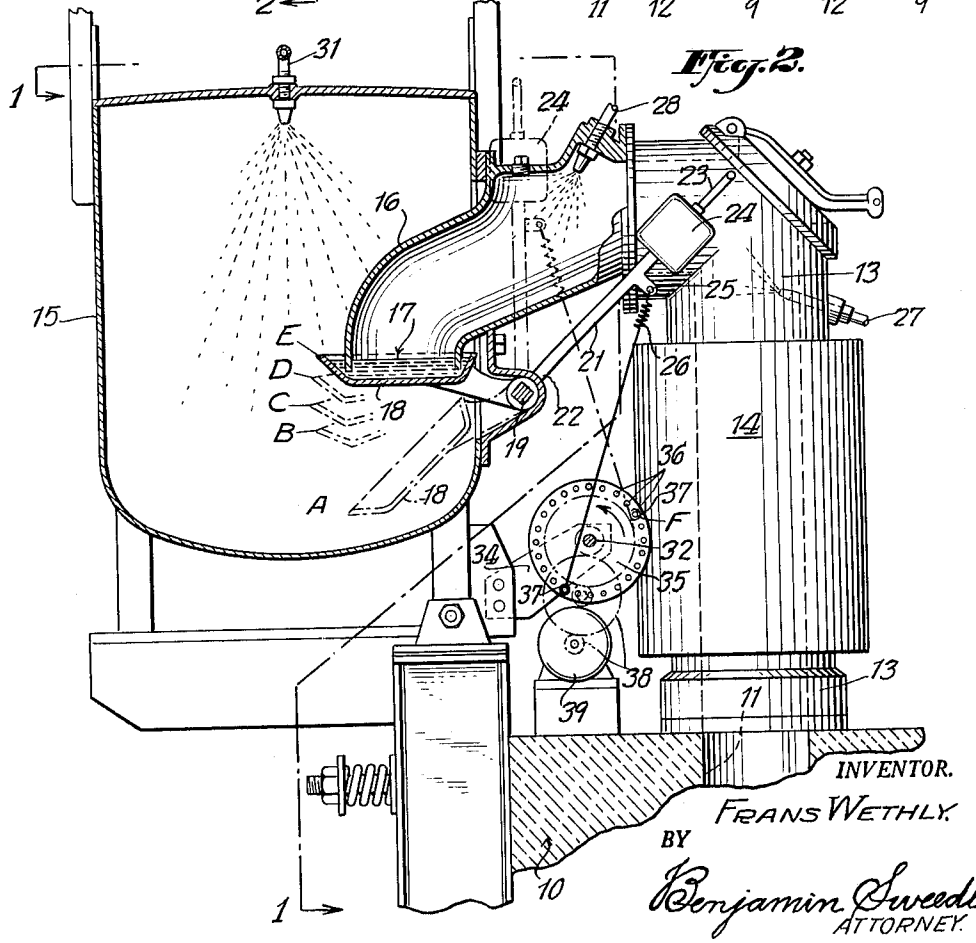


Fig. 2.



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AUTOMATIC ACTUATION OF THE UPTAKE VALVES IN A COKE OVEN BATTERY

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This invention relates to a coke oven battery having a collector main and valve controlled uptakes leading from each coking chamber into the collector main.

In such coke oven batteries, the valves throttling the flow of gas evolved in the coking chambers into the collector main, control the pressure within the coking chambers. These valves are adjusted during the coking cycle to maintain positive pressure conditions in the coking chambers at all times throughout the coking cycle, particularly near the sole of the coking chambers, where unless the flow of gas from the coking chambers is throttled towards the end of the coking cycle, the pressure tends to fall due primarily to the reduction in gas evolution towards the end of the coking cycle. Such operation of the valves controlling flow through the uptake pipes into the collector main to throttle the flow of gas and thus maintain positive pressure conditions therein in the coking chambers is important particularly in modern high coking chambers where the height of the coking chambers exerts a marked "stack effect" on the lower portions of the coking chambers. Unless the flow of gas from the chambers is throttled adequately towards the end of the coking cycle, negative pressures are created in the lower portions of the chambers with all of the objections incident thereto, such as leakage of fuel gas and air into the coking chambers. Adequate control of the pressure within the coking chambers is important not only from the standpoint of minimizing the adverse effect of gas leakage but also from the standpoint of objectionable carbon formation on the walls thereof, which takes place when gas or air leakage into the coking chambers occurs.

The mechanism heretofore proposed for operating the individual valves controlling the flow of the gas evolved in the coking chambers through the uptakes into the collector main or mains were either operated manually or by excessively complicated automatic mechanism. Such automatic mechanism heretofore suggested was relatively expensive both in first cost and to maintain in operating condition.

It is a particular object of the present invention to provide a coke oven battery with mechanism automatically actuable during the coking cycle to control the gas pressure in the coking chambers, which automatic mechanism is simple and rugged in design and efficient in operation. Hence as compared with the automatic mechanism heretofore suggested, the mechanism of the present invention effects a marked saving in initial cost as well as in maintenance expense.

In the accompanying drawing, forming a part of this specification and showing, for purposes of exemplification, a preferred form of this invention, without limiting the claimed invention to such illustrative instance.

FIGURE 1 is a fragmentary view, partly in vertical section, and partly in elevation, looking at one side of the battery toward the collector main positioned along the length of the battery and shows the upper end portion of the battery; and

FIGURE 2 is a view partly in vertical section and partly in elevation taken in a plane passing through line 2—2 on FIGURE 1.

The drawing shows the upper portion of one end of

a coke oven battery comprising the battery superstructure 10 having therein at one side of the battery the ports 11 leading from the top of each coking chamber 12 into the uptake pipe 13 individually to each coking chamber at one side of the battery. As conventional, the coking chambers 12 are arranged in side by side relation separated by the heating walls 9. Each uptake pipe 13 has a heat insulating jacket 14 thereon. It leads from the top of its coking chamber into a collector main 15 extending along the length of the battery, on one side thereof. It will be appreciated that the present invention is applicable to all known coke oven batteries having one or more collector mains including batteries having collector mains at the opposite sides thereof. In the latter type of batteries the structure hereindescribed for a battery having a collector main at one side thereof is duplicated on both sides of the battery.

In the battery as shown on the drawing each uptake pipe 13 is provided with a gooseneck discharge end 16 disposed within the collector main 15 as clearly shown in FIGURE 2. A liquid-seal type valve 17 of a known type, such as those disclosed for example in United States Patents 2,424,865 of July 29, 1947 or 2,759,885 of August 21, 1956 is employed to control the flow of gas evolved in the coking chambers through each uptake pipe 13 into the collector main 15. One such valve 17 and its actuating lever arm 21, hereinafter described, is individual to each uptake 13 for controlling and throttling the flow of gas therethrough into the collector main 15. This liquid-seal type valve 17 comprises a valve pan 18 pivoted on shaft 19 for movement from the fully open position shown in dotted lines and indicated by A in FIGURE 2, through a series of throttling positions B, C and D, to the valve closed position E shown in the full lines, and back to position A. Such movement of the valve is effected by the mechanism hereinafter described actuating a lever arm 21 having end 22 fixed to the shaft 19 on which the valve pan 18 is mounted and having the opposite end 23 suitably counterweighted by a counterweight 24 which balances the weight of the valve pan 18 when empty. Lever arm 21 has a lug 25 for receiving one end of an actuating coil spring 26 hereinafter described in greater detail.

As conventional, each uptake 13 is provided with a spray 27 for spraying water or other liquid into the gas stream passing through the uptake. An additional spray 28 is disposed in the discharge gooseneck end 16 of the uptake for spraying water or other liquid thereinto. The collector main 15 is provided in its top with sprays 31 spaced along the length thereof; desirably one such spray is provided just above each gooseneck 16 of each uptake.

When the valve pan 18 is in the E or closed position, liquid from sprays 28 and 31 fills the pan to the overflow point providing a liquid seal which effectively seals the discharge gooseneck 16.

A shaft 32 constituted of one or more sections is disposed along the length of the battery at the side thereof adjacent the uptakes 13 journaled for rotation in suitable bearings 33 on supports 34 positioned at spaced points along the length of the battery. Keyed to this shaft at spaced points along the length thereof are a plurality of actuating discs 35, one for each coking chamber and individual thereto as clearly shown in FIGURE 1. Each disc 35 has near its periphery, a series of spaced openings 36. End 37 of each operating coil spring 26 is inserted in one of these openings, as will be described hereinafter. For this purpose end 37 is provided with a hook so that it can be readily slipped into and removed from an opening 36 in the disc 35.

Shaft 32 is driven through the reduction gearing 38 by an electric motor 39 suitably mounted at one end of

the battery. The reduction gearing **38** effects relatively slow rotation of shaft **32** so that this shaft makes one complete revolution during each coking cycle which may be approximately 18 hours more or less in duration, depending on the design of the coke oven battery. This shaft **32** (or in the case of a long battery two or more such shafts, one for each section of a battery) effects actuation of all the discs **35**, each of which is individual to one and only one coking chamber **12** and its uptake **13** and has individual thereto a separate coil spring **26** for actuating the valve pan **18** controlling the flow of gas through the said uptake into the collector main **15**.

The description of the operation which follows will refer throughout to one and the same coking chamber during one coking cycle. When the charging of that chamber is commenced, its valve pan **18** is in the full open A position. Before commencing charging, the operator attaches end **37** of the coil spring **26** to an opening **36** in the disc **35** individual to the coking chamber being charged, which opening is in the position indicated by F in FIGURE 2. Since each control disc **35** has the openings **36** therein in side by side relation extending completely about its periphery, at least one opening is always in proper position to receive end **37** of coil spring **26**.

Shaft **32** is shown rotating in a counterclockwise direction. As the shaft **32** rotates, during the initial period of the coking cycle, the disc **35** is slowly rotated in a counterclockwise direction. Hence during the first approximate 60% of the coking cycle while the disc **35** moves through an arc of about 200°, the actuating spring **26** does not move the lever arm **21**. The coil spring **26** when thus attached at its opposite ends to an opening **36** in the F position and the lug **25** on the pivoted lever **21** respectively, is under tension, which as the disc **35** rotates is first reduced or lessened during rotation through about a 90° arc. Thereafter the tension is restored to it original condition through the next 90° arc. A downward force is not exerted on the lever arm **21** until the disc has rotated about 200°. This for an 18 hour coking cycle represents about 13 hours of the coking cycle.

During the next 70° of rotation, a downward force is exerted which progressively increases slowly moving the valve pan upwardly through the B, C and D throttling positions.

Since the counterweight **24** balances the pan **18** when empty, little force is required to initiate the closing movement of the valve **17**. As the arm **21** moves in a direction to effect closing of valve **17**, the counterweight **24** moves with it to increase the leverage exerted by arm **21** and thus aid in effecting the closing movement of valve **17** under the influence of coil spring **26**.

At or near the end of 270° of rotation of disc **35** when the spring exercises its maximum downward pull, the valve **17** is in the fully closed or E position. This corresponds to the end of the coking cycle when the coking chamber is ready for pushing. The counterweight **24** is then in the full line position shown in FIGURE 2 where it exercises through arm **21** adequate force on valve **17** to maintain it closed during the pushing of the coking chamber.

The operator disconnects the end **37** of the spring **26** from disc **35** after the valve **17** has been moved to the fully closed position; this permits the disc to complete its rotation without interference between the spring **26** and the shaft **32**.

When the operator is ready to effect recharging of the coking chamber the end **37** of the spring **26** is again attached to its control disc **35** as hereinabove described, after the valve **17** has been moved to its fully open position A; this, as described above, is done before the charging is commenced.

It will be appreciated that by proper spacing of the openings **36** in the control discs any desired rate of throttling during the latter portion of the coking cycle can be obtained.

It will be noted that the present invention provides a coke oven battery with mechanism automatically actuable during the coking cycle to control the gas pressure in each coking chamber, which mechanism is simple and rugged in design, involving as it does a control disc, individual to each coking chamber, rotatable to make one revolution per coking cycle and connected with the operating lever for the valve controlling flow through the uptake by a simple detachable flexible connection which is readily attachable to the control disc to effect actuation of this valve.

Since different embodiments of the automatically actuated uptake valves could be made without departing from the scope of this invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A coke oven battery comprising, in combination, side by side coking chambers; a collector main disposed along the length of the battery; an uptake pipe leading from the top of each coking chamber into said collector main, a pivoted valve individual to each uptake pipe for controlling the flow of gas therethrough into the collector main; and means for automatically actuating said valve, said means comprising an actuating arm for effecting pivotal movement of said valve to open and close said valve, a rotating shaft extending longitudinally of the battery, a control disc on said shaft individual to said valve and rotatable with said shaft, said disc having at least one opening near its periphery, and a readily attachable and detachable flexible connection individual to, extending between and joined to said actuating arm and to said disc to actuate said arm to effect gradual closing of said valve upon rotation of the portion of said disc to which said flexible connection is joined through a predetermined portion of the path of rotation of said disc.

2. A coke oven battery comprising, in combination, side by side coking chambers; a collector main disposed along the length of the battery; and uptake pipe leading from the top of each coking chamber into said collector main; a pivoted valve individual to each uptake pipe for controlling the flow of gas therethrough into the collector main, said valve being movable from one pivoted position where the discharge end of said uptake pipe is unobstructed through throttling positions throttling the flow of gas through said uptake pipe into said collector main, to a valve closed position and back to said initial position where the discharge end of said uptake pipe is unobstructed; and means for automatically actuating each of said valves during the coking cycle, said means comprising a shaft extending along the length of the battery, control discs on said shaft, one for each coking chamber and individual thereto, each of said discs having a series of spaced openings near its periphery, a pivoted arm for moving said valve from said valve open position, through said throttled positions to the valve closed position, and a readily attachable and detachable flexible connection between said disc and said pivoted arm.

3. A coke oven battery comprising, in combination, side by side coking chambers separated by intervening heating walls; a collector main disposed along the length of the battery at one side thereof; an uptake pipe leading from the top of each coking chamber at the collector main side thereof into collector main; a liquid seal valve having a pivoted valve pan individual to each coking chamber, disposed in the collector main and arranged to be moved from a position where said pivoted pan is spaced from the discharge end of such uptake pipe, through a series of throttling positions throttling the flow of gas through the discharge end of said uptake pipe, to a position where said pivoted pan containing liquid seals the discharge end of said uptake pipe and back to said first mentioned position; and means for automatically actuating each of said valves during the coking cycle, said means comprising (1) an actuating arm for moving said

pivoted pan having a portion thereof extending externally of said collector main; (2) a shaft extending along the length of the battery; (3) control discs on said shaft, one for each coking chamber and individual thereto, each of said discs having a series of spaced openings near the periphery thereof; (4) a coil spring having one end readily attachable to and detachable from one of said openings in said disc and the other end secured to the end of said arm disposed exteriorly of said collector main; and (5) means for rotating said shaft to make one complete revolution during the coking cycle.

References Cited by the Examiner

UNITED STATES PATENTS

1,544,945	7/1925	Seixas	251—294
1,545,058	7/1925	Merritt	202—256
1,547,196	7/1925	Arbon	251—294
2,211,156	8/1940	Otto	202—255
2,266,949	12/1941	Becker	202—256
2,620,673	12/1952	Whitcomb	251—299
2,727,933	12/1955	Evans et al.	260—679
2,759,885	8/1956	Thompson	202—256

FOREIGN PATENTS

693,228	6/1953	Great Britain.

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