F. W. SPERR, JR.

COKE OVEN.

APPLICATION FILED JAN. 31, 1914.

1,097,196.

Patented May 19, 1914.

4 SHEETS—SHEET 1.

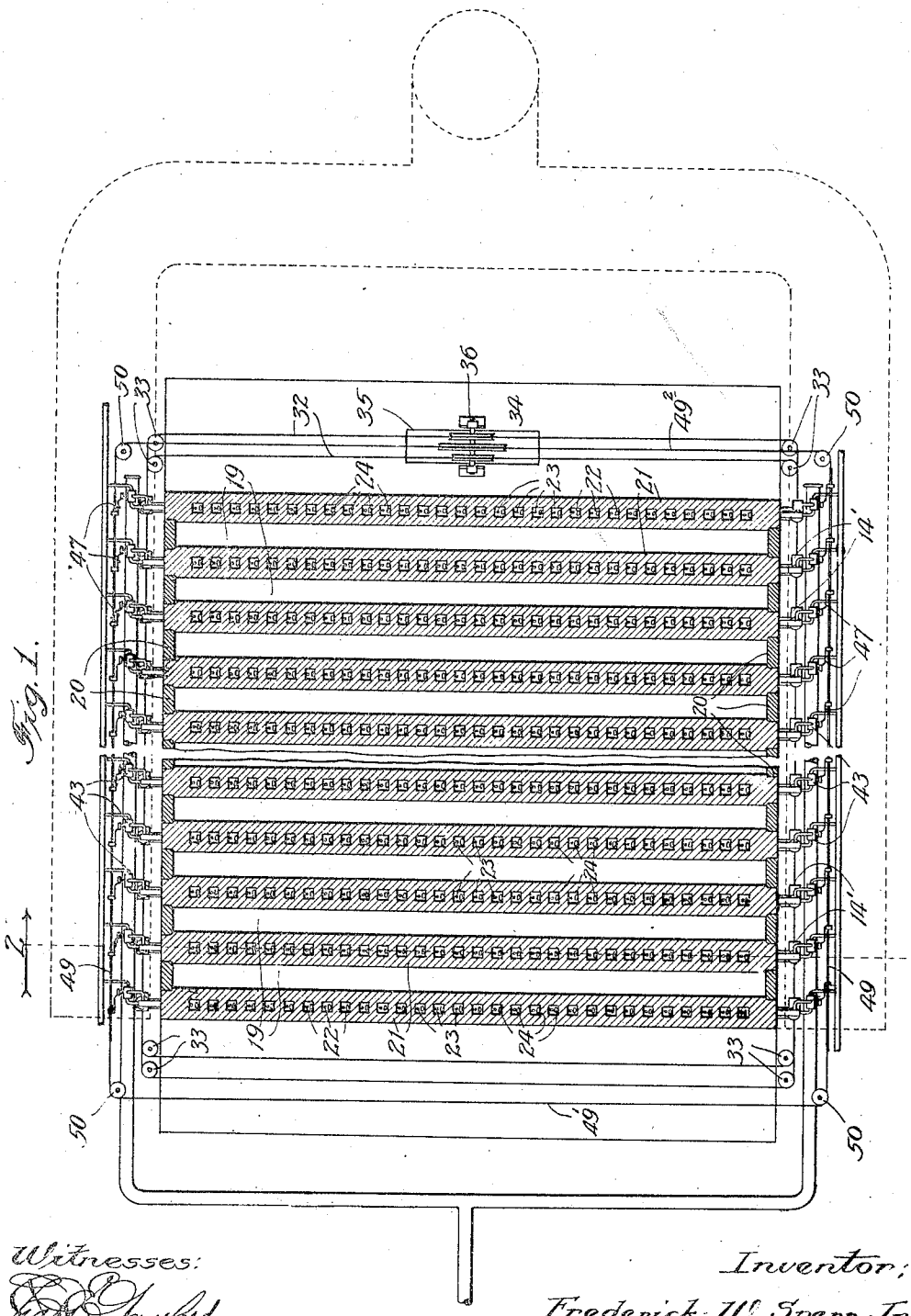


Fig. 1.

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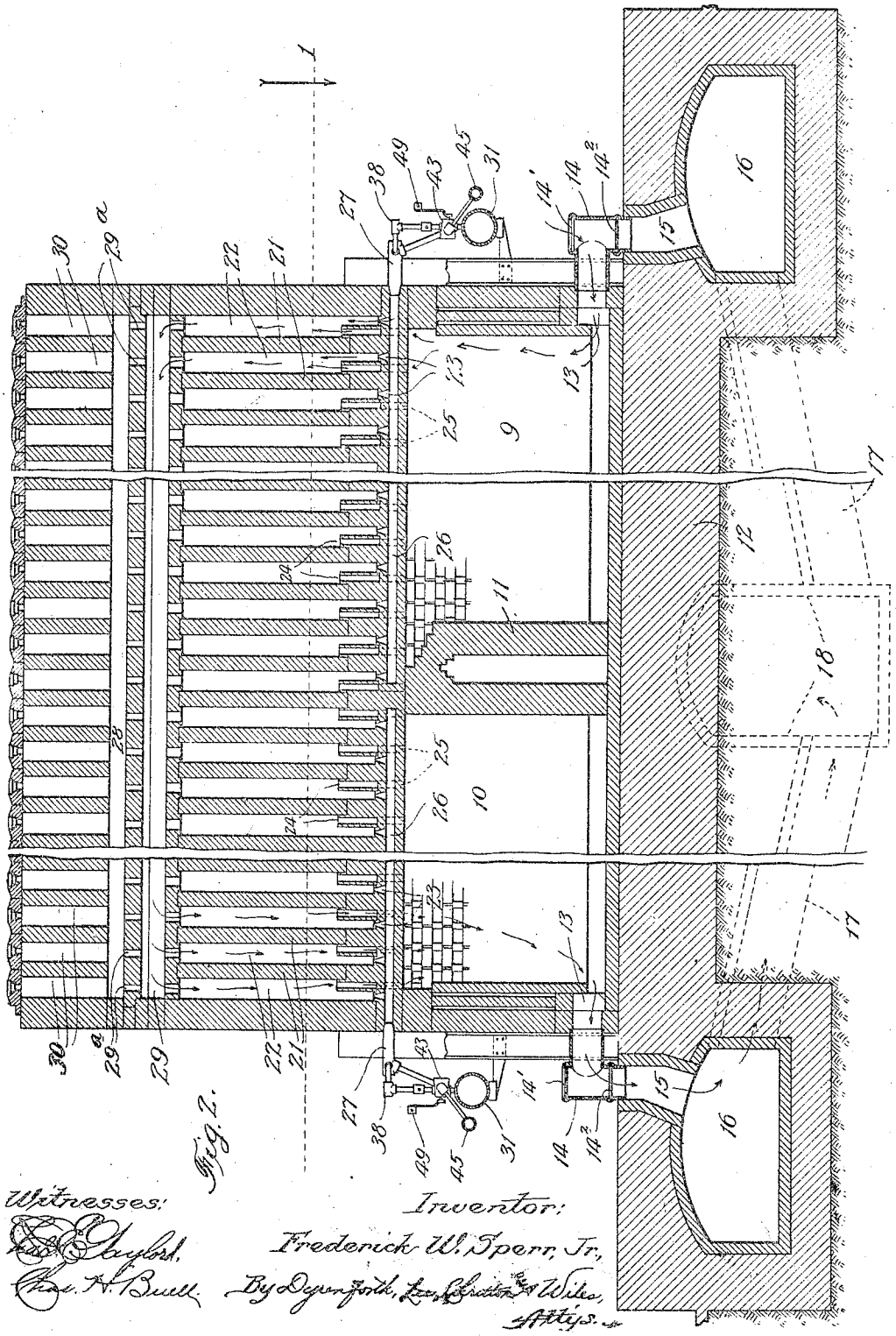


Fig. 2.

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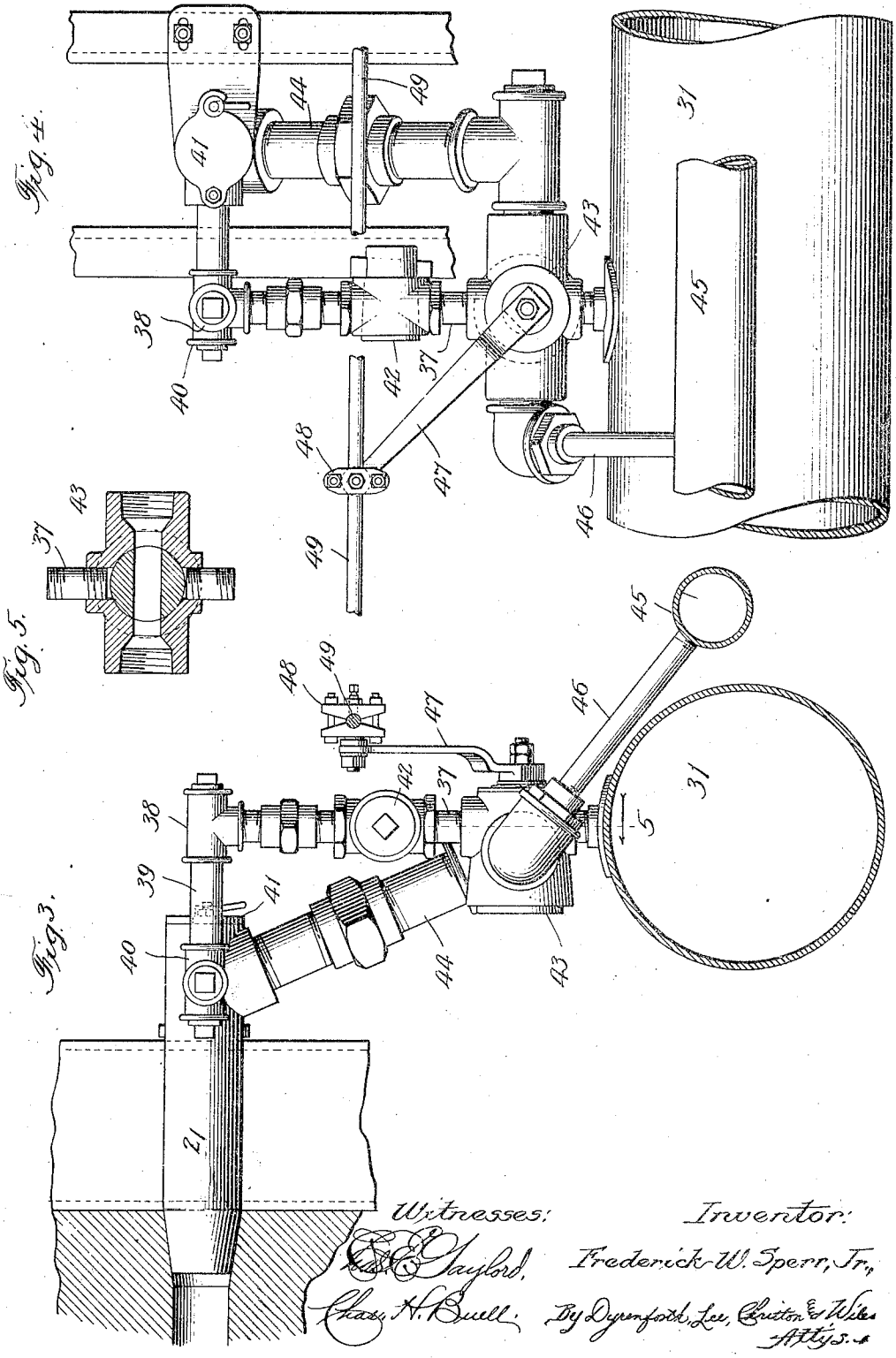
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4 SHEETS—SHEET 3.



Witnesses:

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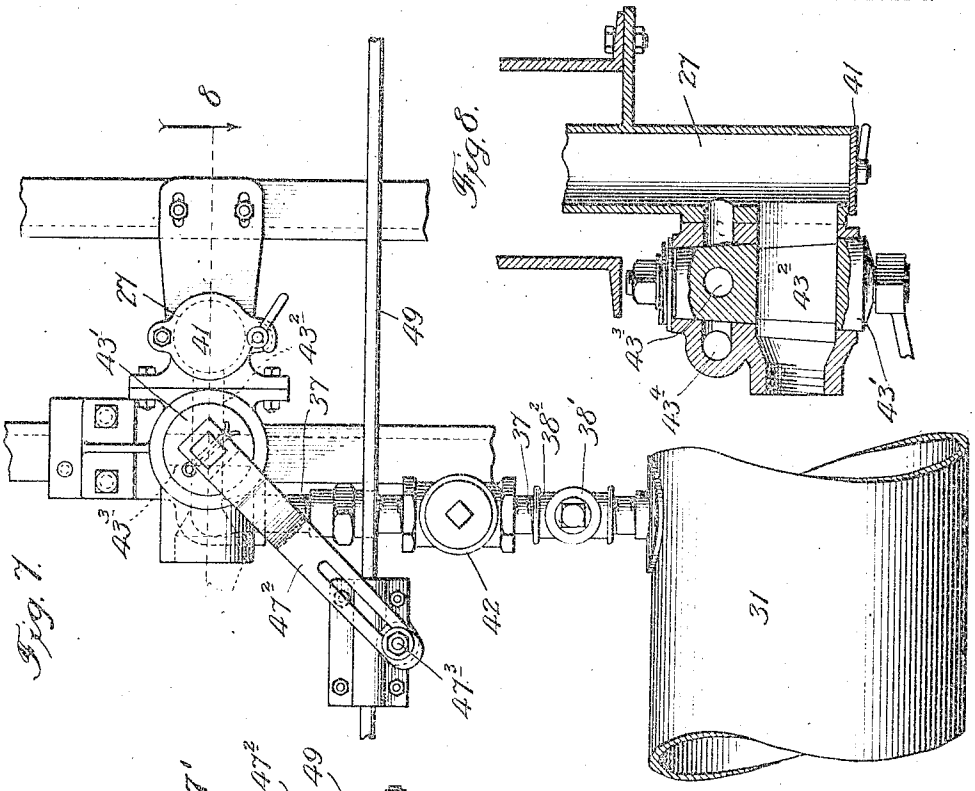
COKE OVEN.

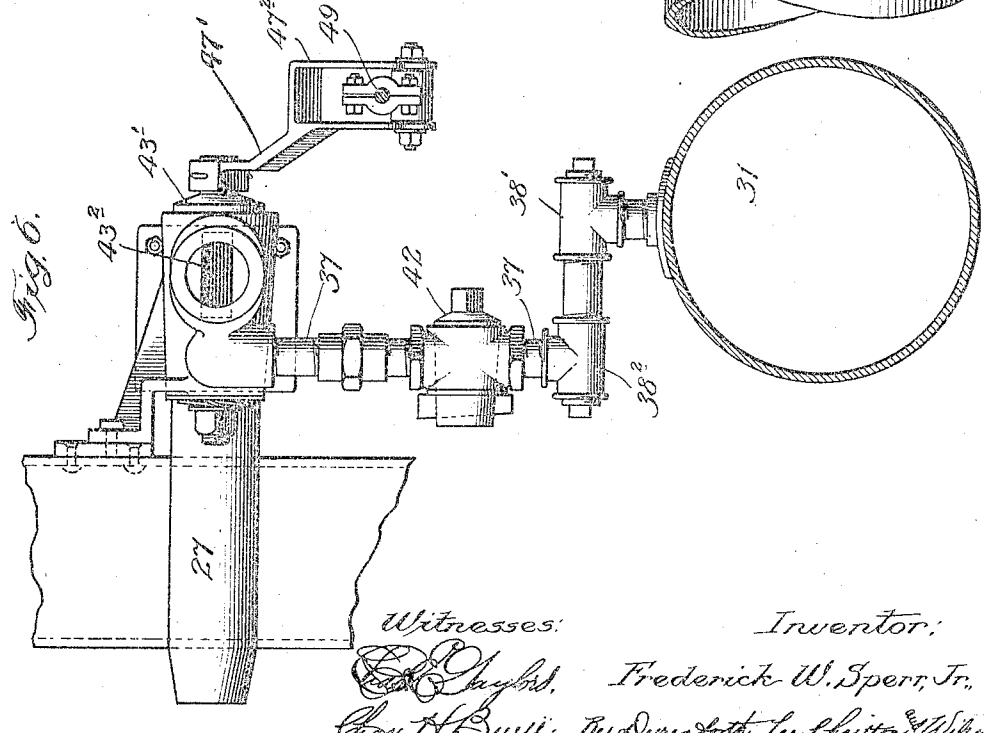
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4 SHEETS—SHEET 4.





Witnesses:
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UNITED STATES PATENT OFFICE.

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COKE-OVEN.

1,097,196. Specification of Letters Patent. Patented May 19, 1914.

Application filed January 31, 1914. Serial No. 815,763.

To all whom it may concern:

Be it known that I, FREDERICK W. SPERR, Jr., a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Coke-Ovens, of which the following is a specification.

My invention relates to an improvement in the class of coke-ovens in which the oven comprises a battery of retorts, each retort being between parallel series of vertical heating flues and the battery surmounting regenerative chambers, through which the hot gases are passed in periodically reversed direction for adapting the chambers to heat the air used for the combustion.

In the use of a coke-oven of the kind referred to, free carbon deposits in the fuel-passages, clogging them and impairing the oven and its operation; and the primary object of my invention is to provide automatically-operating means for burning out this deposit, preferably with each reversal, referred to, these reversals being ordinarily produced at half-hour intervals, or thereabout.

In the accompanying drawings, Figure 1 is a broken diagrammatic plan view, in section on line 1, Fig. 2, of a coke-oven battery provided with my improvement; Fig. 2 is a broken section on line 2, Fig. 1; Fig. 3 is an enlarged broken view in elevation, partly sectional, showing the valved connections between the gas-main and a steam-conduit along one side of the battery and a "gun" or nozzle leading into one end of a horizontal gas-passage below a series of the heating flues extending along the oven; Fig. 4 is a broken view in side elevation of the mechanism illustrated in Fig. 3; Fig. 5 is a section on line 5, Fig. 3; Fig. 6 is a view like that presented in Fig. 3, but showing a modification; Fig. 7 shows the same modification by a view like that presented in Fig. 4, and Fig. 8 is a section on line 8, Fig. 7.

A coke-oven battery of the kind to which my improvement is applied comprises the following generally-described construction: Checker-chambers 9 and 10, separated by a dividing-wall 11, are built on a substantial foundation 12, and each communicates through a base-opening 13, by means of a T-coupling 14 connecting it with an elbow 15, with a lateral flue 16, extending in the foundation lengthwise of the battery and communicating through branches, as indicated at 17 in Fig. 2, with a central stack-flue 18. Surmounting the chambers 9 and 10 is a battery of retorts 19, closed by removable end-doors 20 and of which any desired number may be provided. The particular battery for which my improvement has been designed contains more than sixty of these retorts. Each retort is between walls 21 containing longitudinal series of vertical heating flues 22 rising from a base containing upwardly-tapering nozzles 23, one at the bottom of each flue; and each flue contains a short air-tube 24 to one side and rising above the nozzle to take the heated air through an opening 25 in said base and mix it at an elevation above the respective nozzle with the gas that is introduced into the flue. Each row of flues 22 has extending underneath it in the aforesaid base, a gas-passage 26, from which the nozzles 23 are fed, this passage being closed at each end by a species of nozzle known in the art as a "gun", 27. The flues 22 in each row discharge at their upper ends into a horizontal passage 29 in a superstructure containing a horizontal passage 28 communicating with the passage 29 through opening 29^a alining with the flues 22 and cap-covered flues 30 extending upwardly from the passage 28 and alining with the openings 29^a.

The gas for heating the ovens comes from two mains 31, 31 extending along opposite sides of the structure. These mains are opened alternately into the guns 27 leading to the opposite ends of the passages 26, and each time one main is thus opened, communication of the opposite main with the guns on that side is closed. In thus opening one main a slide-valve 14′ in the top of the head of each coupling 14 immediately below it is opened to admit air into the adjacent checker-chamber, and at the same time a similar valve 14^2 in the lower end of the same coupling-head is closed. When the valves 14′ on one side are thus opened and the valves 14^2 below them closed, the opposite valves 14′ are closed and the valves 14^2 below them are opened, to produce the usual reversal. The means provided for effecting this reversal of the valves 14′, 14^2 are cables, indicated at 32 in Fig. 1, passing about the oven-structure over suitable guide-sheaves 33 and operated by a set of drums, indicated at 34 in Fig. 1, in a pit 35 at the front end of the structure and supported on a shaft 36.

As represented in Fig. 2, the gas-main and

valve 14′ at the right-hand side of the oven are open. Gas enters the passages 26 open on that side, by way of the guns 27 and discharges through the nozzles 23 into the flues 22; and air enters the previously-heated checker-chamber 9 and passes through the openings 25 and tubes 24 for mixture with the gas. The burning fuel-mixture rises through the flues 22 above the regenerative chamber 9 and passes down the flues 22 at the opposite side of the wall 11 into the chamber 10 to heat the latter, and the gases of combustion pass to the stack through couplings 14, elbows 15, side-flue 16, branches 17 and stack-flue 18. As will be understood, by closing the one main 31 and corresponding valve 14′ and opening the valve 14^2 below, and at the same time opening the opposite main 31 and corresponding valve 14′ and closing the valve 14^2 below, the operation is reversed. When the coal, with which the retorts 19 are filled, is reduced to coke, the doors 20 are removed and the coke is rammed out of them from one end, in a usual manner.

The construction and operation of the coke-oven battery, as thus far described, are well known in the art and do not require more detailed description herein.

The fuel-gas deposits free carbon in the passages 26, which tends to accumulate toward their inner ends and in the adjacent nozzles 23, thus choking the latter and tending to pass all the fuel through the outer nozzles into the corresponding flues 22, with the effect of introducing heat so intense into these flues as to soften and even melt the fire-brick of the structure. To obviate this, it is the ordinary practice to remove the caps covering flues 30, and insert rods through them into the flues 22 for dislodging the accumulated carbon from the clogged nozzles 23 to open them. This, however, is an unsatisfactory practice and tends, besides, to fracture the nozzles by poking them with the rods. To overcome this difficulty, I provide means for burning out the accumulations of free carbon thus deposited, and this preferably with each reversal of the fuel-gas; and following is a description of the means for the purpose illustrated in the drawings: Referring to Figs. 3 and 5, a pipe 37 rising from the main 31 terminates at its upper end in a T-coupling 38 plugged at its outer end and connected at its inner end by a pipe 39 with the inner end of a T-coupling 40, plugged at its outer end and having its stem connected with a side of the projecting section of the gun 27, the outer end of which is shown to be closed by a swinging door 41. In the pipe 37 is provided, for safety purposes, an ordinary shut-off valve 42 and below the latter a rotary valve 43, that shown being of the two-way tapering variety. A diagonally-extending pipe 44 connects the gun 27 with the casing of the two-way valve. At 45 is shown a header, for steam or compressed air from any suitable source (not shown), having a pipe-connection 46 with the casing of the valve 43. As will be understood, the header 45 is provided on each side of the battery to extend parallel with a gas-main 31, and each gun 27 is provided with its own valve 43 and connections shown in Fig. 3. Handles 47 on the outer ends of the valves on each side of the battery have clamp-connections, like that shown at 48, with rods 49 having their corresponding ends connected together by cables 49′, 49^2 working on guide-sheaves 50, the cable 49^2 passing about the central drum shown on the shaft 36.

When the valves 43 open a gas-main to the pipes 37, they close communication between the pipes 44 and 46, which latter as well as the header 45 may be wholly omitted if it be desired merely to admit the external atmosphere through the pipes 44 to the guns 27, as is accomplished by the modified construction illustrated in Figs. 6 to 8, inclusive. In this modified form of my improvement each pipe 37 contains a shut-off valve 42 and has the connected T-couplings 38′ and 38^2 connecting it with a main 31. This pipe leads at its upper end into a side of the casing of a tapering plug-valve 43′ having a port 43^2 for admitting air into the gun, and a port 43^3 (Fig. 8), extending at a right-angle to the port 43^2 and coinciding with an annular chamber 43^4 in the valve-casing, opening to a gun 27 and into which the gas-pipe 37 discharges. The bent arm 47′ extending from the valve 43′ and affording means for turning it, terminates in a bracket 47^2 fastened to the clamp about the rod 49, the bracket being longitudinally slotted, as shown in Fig. 2, to adapt the arm to be moved in the arc of a circle, on its stud-connection 47^3 with the clamp, in turning the valve. As will be seen of the modified construction, when the port 43^2 is open to admit air into the gun 27, the port 43^3 is closed to exclude the gas, and vice versa.

In the operation of the battery the shaft 36 is turned periodically to work the cables 32 for reversing the action. In each reversal the two rods 49 are shifted in opposite directions to turn the valves 43 or 43′, whichever form be used, on one side of the battery to shut off the gas-supply and open the guns on that side to the air or steam, and on the other side to admit the gas to the guns thereon and shut off the supply of air or steam; and, as will be understood, with each shift, the cables 32 properly set the valves 14′ and 14^2 on each side of the battery.

With each opening of valves 43 or 43′, steam or air, as the case may be, is introduced through the guns on the respective side of the battery into the passages 26 in

the direction contrary to the flow of the products of combustion of the fuel, and the fluid thus introduced soon consumes any deposit of free carbon in those passages and the nozzles 23, thereby always keeping them clear and avoiding the impairment of the oven referred to.

I realize that considerable variation is possible in the details of construction of my improvement thus specifically shown and described, and I do not intend by illustrating certain specific embodiments of my invention to be limited thereto; my intention being in the following claims to claim protection upon all the novelty there may be in my invention as broadly as the state of the art will permit.

What I claim as new and desire to secure by Letters Patent is:—

1. In a regenerative coke-oven battery, the combination with the fuel-passages underneath the heating-flues, provided with means for reversing the burning operation, of valves for admitting combustion-promoting fluid into said passages for consuming carbon-deposits therein, and means for opening said valves on one side of the battery when the fuel-supply is shut off on the same side.

2. In a regenerative coke-oven battery, the combination with the fuel-passages underneath the heating-flues, provided with means for reversing the burning operation, of valves operatively connected with the reversing means for admitting combustion-promoting fluid into said passages for consuming carbon-deposits therein, and means for operating said valves on one side of the battery when the fuel-supply is shut off on the same side.

3. In combination with a coke-oven structure having a battery of retorts surmounting checker-chambers, each retort being between series of heating flues provided with gas-passages beneath them containing guns in their outer ends, air-ducts in opposite sides of the structure leading to the checker-chambers, provided with valves, gas-mains on opposite sides of the structure having pipe-connections with said guns, valves in said connections opening alternately to the mains and to a combustion-promoting fluid-supply, and means for reversing the burning operation of the oven by reversing said air-duct valves and the valves in said connections to admit the gas and shut off said fluid-supply on one side of the oven while shutting off the gas and admitting said fluid-supply on the opposite side.

4. In combination with a coke-oven structure having a battery of retorts surmounting checker-chambers, each retort being between series of heating flues provided with gas-passages beneath them containing guns in their outer ends, air-ducts in opposite sides of the structure leading to the checker-chambers, each provided with an upper and a lower valve, gas-mains on opposite sides of the structure having pipe-connections with said guns, rotary valves in said connections opening alternately to the mains and to the outer air, and means for reversing the burning operation of the battery by reversing said upper and lower valves and turning said rotary valves to admit the gas from one main and shut off the air on one side of the oven while shutting off the gas from the other main and admitting the air on the opposite side.

5. In combination with a coke-oven structure having a battery of retorts surmounting checker-chambers, each retort being between series of heating flues provided with gas-passages beneath them containing guns in their outer ends, air ducts in opposite sides of the structure leading to the checker-chambers, each provided with an upper and a lower valve, gas-mains on opposite sides of the structure having pipe-connections with said guns, rotary valves in said connections opening alternately to the mains and to the outer air and provided with handles, and means for reversing the burning-operation of the oven by reversing said upper and lower valves and turning said rotary valves to admit the gas from one main and shut off said air on one side of the oven while shutting off the gas from the other main and admitting the air on the opposite side, said means including cable-connected rods with which said valve-handles are connected.

FREDERICK W. SPERR, Jr.

In presence of:
A. C. Fischer,
F. A. Florell.