L. WILPUTTE.

REGENERATIVE COKE OVEN.

APPLICATION FILED SEPT. 18, 1918.

1,360,609.

Patented Nov. 30, 1920.

3 SHEETS—SHEET 1.

Fig. 1.

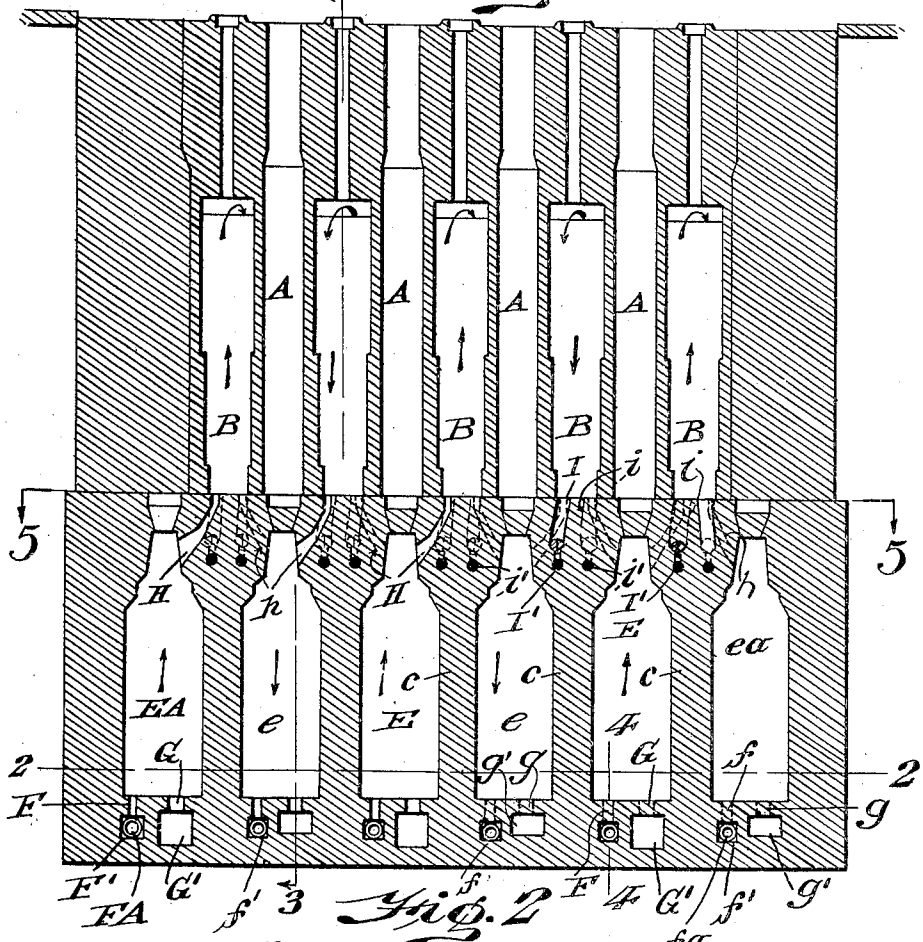
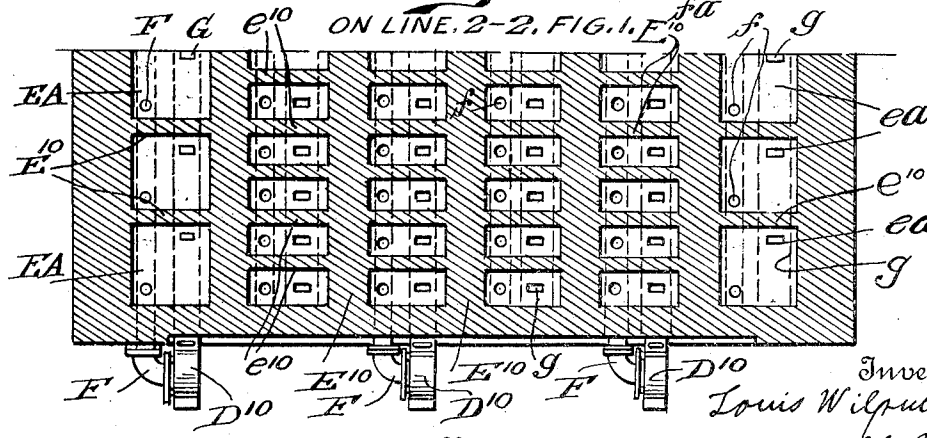


Fig. 2.



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3 SHEETS—SHEET 2.

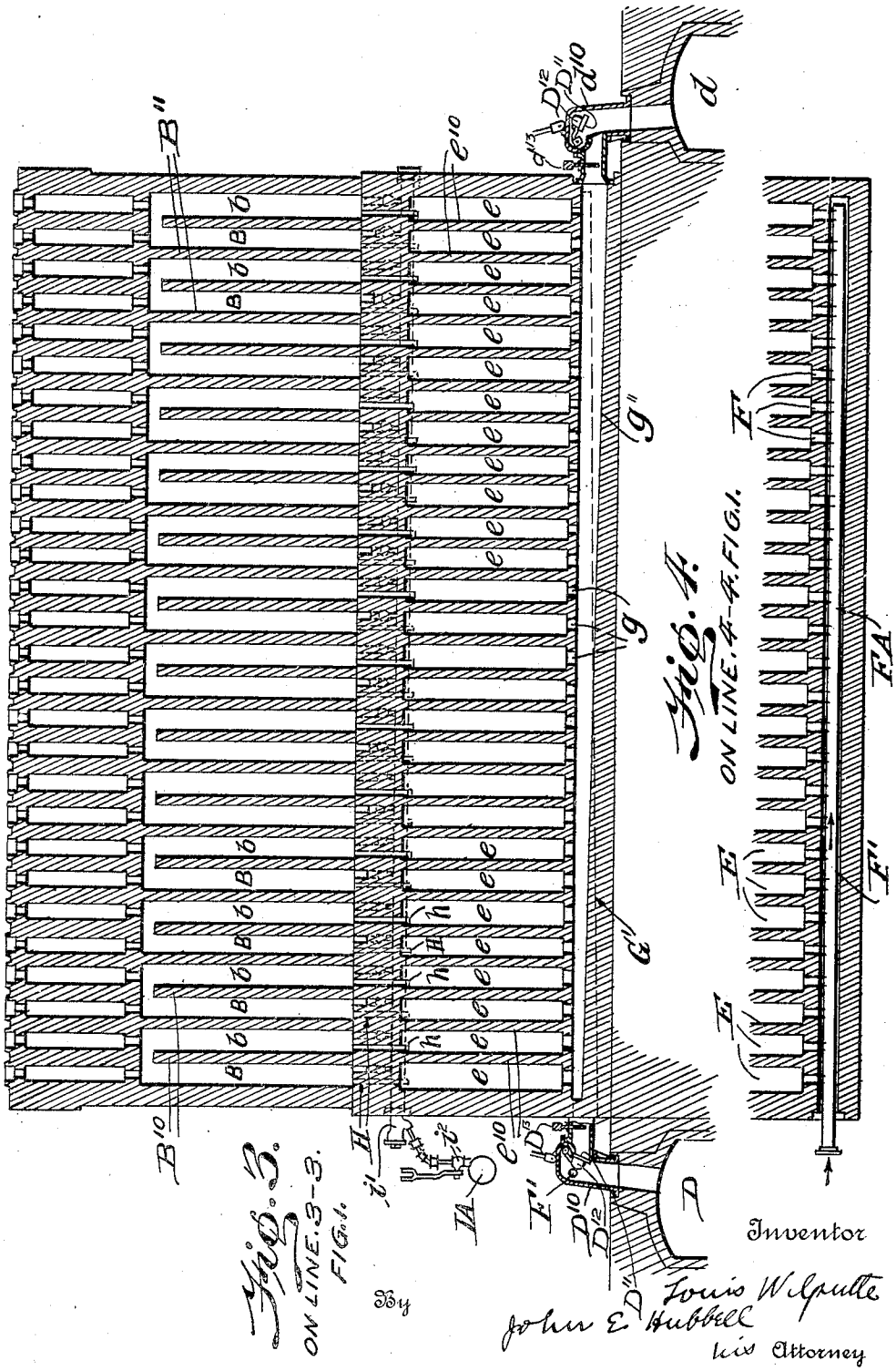


Fig. 4.

ON LINE 4-4, FIG. 1.

Fig. 3.

ON LINE 3-3, FIG. 1.

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3 SHEETS—SHEET 3.

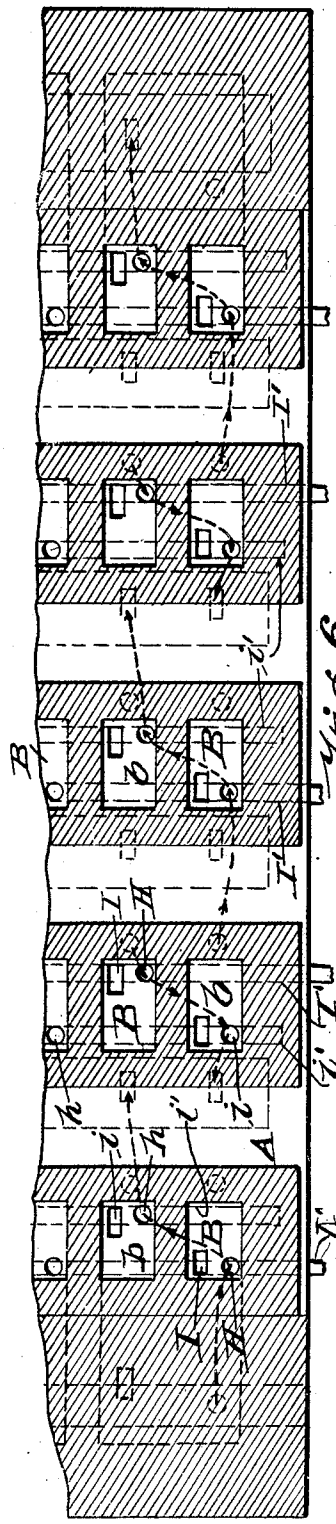


Fig. 6.

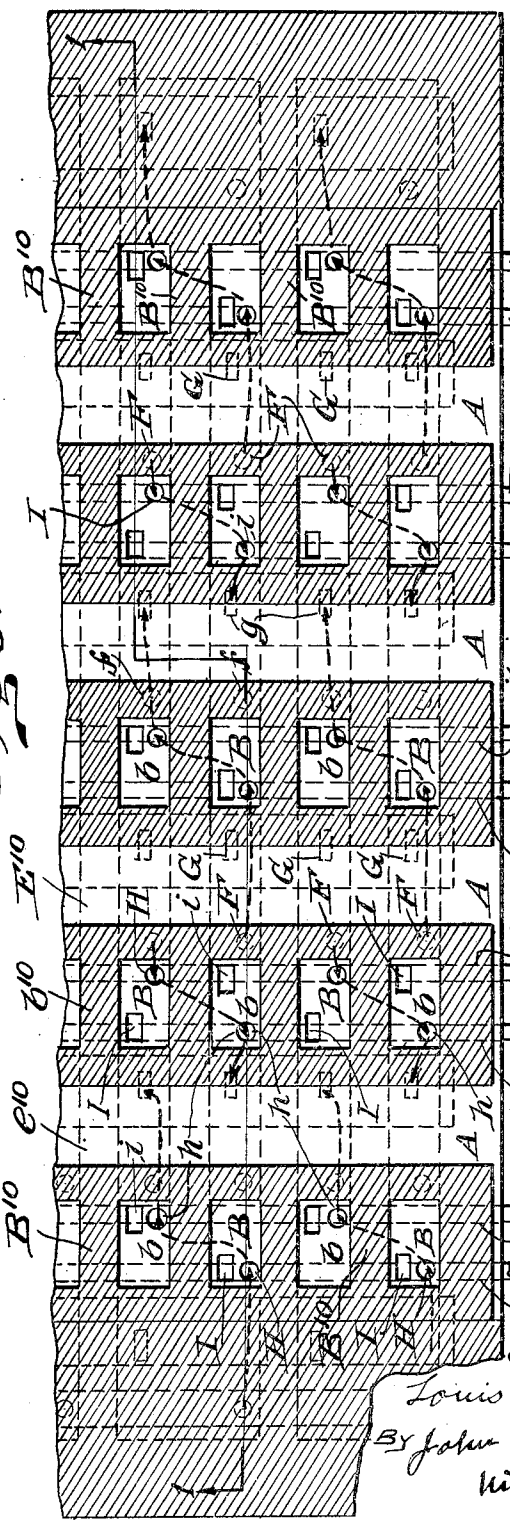


Fig. 5.

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UNITED STATES PATENT OFFICE.

LOUIS WILPUTTE, OF NEW ROCHELLE, NEW YORK, ASSIGNOR OF TWO-THIRDS TO ALICE A. WILPUTTE, OF NEW ROCHELLE, NEW YORK.

REGENERATIVE COKE-OVEN.

1,360,609. Specification of Letters Patent. Patented Nov. 30, 1920.

Application filed September 18, 1918. Serial No. 254,650.

To all whom it may concern:

Be it known that I, LOUIS WILPUTTE, a citizen of the United States, and resident of New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Regenerative Coke-Ovens, of which the following is a specification.

My present invention relates to the type of regenerative coke ovens having horizontal coking chambers separated by intervening heating walls formed each, with a series of vertical flues connected in pairs at their upper ends; and the general object of my invention is to provide an improved arrangement of the regenerators and regenerator connections for supplying preheated air alternately to the two flues of each connected pair.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention and the advantageous features possessed by it, reference should be had to the accompanying drawings and descriptive matter, in which I have illustrated and described preferred embodiments of my invention.

Of the drawings:

Figure 1 is an elevation in section on the broken line 1—1 of Fig. 5.

Fig. 2 is a partial plan in section on the line 2—2 of Fig. 1.

Fig. 3 is an elevation in section on the broken line 3—3 of Fig. 1.

Fig. 4 is a partial elevation in section on the line 4—4 of Fig. 1.

Fig. 5 is a partial plan in section on the line 5—5 of Fig. 1; and

Fig. 6 is a view taken similar to Fig. 5 illustrating a modified construction.

In the drawings, and referring first to the construction shown in Figs. 1–5 inclusive, the coke oven shown, comprises a plurality of horizontally elongated coking chambers A, separated by heating walls, each of which is divided into a series of flues B and *b*. As shown in Fig. 3, each flue B is separated from the adjacent flue *b* at its right by a wall B^{10} which terminates at its upper end below the tops of the flues B and *b*, so that the pair of flues B and *b* between which each wall B^{10} is located, are connected at their upper ends. Each pair of flues B, *b*, thus connected at their upper ends, is separated from adjacent pairs of flues B, *b* by a wall B^{11}.

Each heating wall is carried by a supporting or pillar wall C. Below the coking chambers and between the pillar walls C, are series or rows of regenerator chambers E and *e*. The chambers E or *e* in each row are separated from one another by division walls E^{10} or e^{10} lying in the same plane as the flue division walls B^{10} and B^{11}. The regenerator chambers E alternate with the regenerator chambers *e* in a direction transverse to the lengths of the heating walls. The row of regenerator chambers E between one adjacent pair of pillar walls C are connected to the flues B in the two heating walls above the pillar walls C by channels or ports H. Similarly the row of regenerator chambers *e* between an adjacent pair of pillar walls C are connected by ports *h* to the flues *b* in the two heating walls above these pillar walls. It will be understood that each of the regenerator chambers E and *e* is connected to a flue B or *b* lying between the division walls B^{10} and B^{11} which are immediately above the side walls B^{10} or b^{10} of the corresponding regenerator spaces E or *e*.

As shown in the drawings, there are a series of regenerator chambers *ea* at one end of the battery connected by ports *h* to the flues *b* in the one adjacent heating wall; and at the other end of the battery there are a series of regenerator spaces EA connected by ports H to the flues B in the one adjacent heating wall. The regenerator chambers EA and *ea* differ from the chambers E and *e* in that there are but half as many of these in a row, and in that each of the regenerator chambers EA and *ea* is conveniently made twice as wide, measured parallel to the length of the oven chambers and heating walls, as a regenerator chamber E or *e*. It will be understood, of course, that the checker brick (not shown) is piled in the usual manner in the different regenerator chambers E and *e*.

Beneath each row of regenerator spaces E and EA are located channels or conduits F′ and G′. Each channel F′ preferably receives an iron air supply pipe FA formed with discharge orifices which register with the brickwork ports F, opening into the lower end of the corresponding row of re-

generator spaces E or EA. Similarly each channel G′, which serves as a waste heat channel is connected to each of the regenerator spaces above it by a corresponding port G. All of the waste heat channels G′ are connected, each through a corresponding valve casing D^{10} to a tunnel D running transversely to the length of the coking chambers at one side of the battery, and as shown the outer end of each air pipe FA is connected to the corresponding valve casing D^{10} through a port F^2 in the latter. A valve member D^{11} is mounted in each valve casing D^{10} between the port F^2 and the corresponding channel G′. These valve members D^{11} are connected to the usual reversing mechanism (not shown) and serve, when in their closed positions, to cut off communication between the waste heat channels G′ and the tunnel D. Advantageously the valve members D^{11} are provided with portions D^{12} closing the corresponding ports F^2 when the valve members D^{11} are moved to permit communication between the channels G′ and the tunnel D. Similarly, beneath each row of regenerator chambers *e* and *ea* is located a pair of channels *f′* and *g′* which connect by corresponding ports *f* and *g* to the regenerator chambers above them. The channels *g* are connected by valve casings d^{10} to a tunnel *d*, running lengthwise of the battery at the opposite side of the latter from the tunnel D. The channels *f′* preferably receive iron air supply pipes *fa*, similar to the air pipes FA and connected to the valve connections d^{10} as the air pipes FA are connected to the valve casings D^{10}; and in each valve casing d^{10} is mounted a valve member D^{11} similar in construction and operation to the valve member D^{11} in each valve casing D^{10}. D^{13} and d^{13} represent draft regulating dampers in the valve casings D^{10} and d^{10} respectively.

Advantageously the channels G′ and *g′* are tapered in the direction of their lengths to insure an approximately uniform flow velocity of the waste gases through the channels G′ and *g′* at all points along the lengths of the channels. The ports G and *g* as well as the discharge orifices in the iron air pipes FA and *fa* are proportioned to insure the desired distribution of flow among the different heating flues and regenerator spaces.

Combustible gas is supplied, when required, to the lower end of each flue B through a port I and the usual removable gas nozzle therein from a corresponding "gas gun" or gas supply passage I′, there being one of these supply channels I′ in the upper portion of each pillar wall C. Similarly each flue *b* receives combustible gas at the proper times through a corresponding port *i* and the usual removable gas nozzle from a gas gun or channel *i′* located in the upper portion of the corresponding pillar wall C.

In the arrangement shown in Figs. 1 and 5 all the gas guns I′ and *i′* are connected through corresponding valved connections, one of which, marked i^2, is shown in Fig. 3, to a gas supply main IA located at one side of the battery. In the construction partially shown in Fig 6, the gas guns I′ all project at one side of the battery and are connected to a gas main at that side of the battery, while the gas guns *i′* project from the opposite side of the battery and are connected to a gas main lying at that (opposite) side of the battery. The different arrangements of the gas guns shown in Figs. 5 and 6, result in certain difference in the arrangement of ports I and *i* in constructions shown in Figs. 5 and 6. These arrangements are clearly shown, and will be readily understood by those skilled in the art, from the drawings and need not be described in further detail.

Air and gas are supplied to the lower ends of all of the various flues B during one period or stage of operation, while during the following stage of operation air and combustible gas are supplied to the lower ends of all the flues *b*. The valves D^{10} and d^{10}, the valves controlling the supply of gas to the gas guns I′ and *i′*, and the valves (not shown) controlling communication between the tunnels D and *d* and air blower or fan, and a stack or other suction creating device being manipulated in the usual way to bring about a reversal of flow at the usual intervals of, say one-half hour each.

In the condition of the apparatus shown in the drawings air and gas are being supplied to the lower ends of the flues B. The tunnel D is then disconnected from the stack, and receives air from a fan or blower, while the tunnel *d* is disconnected from the source of air supply and is connected to a stack or other draft suction creating device. The valves D^{11} in the valve casings D^{10} are set to close communication between the tunnel D and the waste heat channels G′ and to permit air to pass from tunnel D through ports F^2 into the air supply pipes FA. In this condition of the apparatus the valve members D^{11} in the valve casings d^{10} are in the position in which they open communication between the waste heat channels *g′* and tunnel *d*, and in which they close communication between tunnel *d* and the air pipes *fa*. The air thus permitted to pass into the air supply pipes FA is discharged from the latter through the ports F into the lower ends of the various regenerator chambers E and EA. The air passes upward through the regenerator chambers E and EA and is thereby heated. The heated air passes out of the chambers E and *ea* into the flues B through the ports H. The preheated air

thus entering the lower ends of the flue B ignites the combustible gas then being supplied to the lower ends of the flue B through the ports I from the gas guns I′ which then receive their gas from the corresponding external gas supply main. In this condition of operation the gas guns *i′* are disconnected from the gas supply main. The burning gases ignited at the lower ends of the flue B pass upward through the latter, thence over the tops of the flue walls B^{10} into the flues *b*, following downward through the latter and out through the ports *h*. The hot products of combustion leaving the flues *b* through the ports *h*, enter the regenerator chambers *e* and *ea* and after imparting a large portion of their heat to the checker brick in those regenerator chambers issue from the latter through the ports *g* into the channels *g′*, through which they pass to the valve casing d^{10} and through the latter into the tunnel *d*.

It will be apparent from the previous description of the apparatus, as well as from the arrows on Figs. 5 and 6 that each row of regenerator chambers E between an adjacent pair of pillar walls supplies preheated air to the flues B in the two heating walls at each side of the row of regenerators, while each row of regenerators *e* receive the products of combustion from the flues *b* of the two heating walls at the opposite sides of the row of regenerators *e*. When the direction of the flow is reversed, air is supplied from the tunnel *d* to the air supply pipes *fa*, passes from the latter to the regenerator chambers *e* and *ea*, is pre-heated therein, and passes out of these chambers through the ports *h* into the flues *b*, while combustible gas is then supplied to the lower ends of the flues *b* by the gas guns *i′*. The burning gases ignited at the lower ends of the flues *b* then pass upward through the latter, downward through the flues B, and from the latter through the ports H to the regenerator chambers E and EA and out of the latter through the ports G, channels G′ and valves D^{10} into the tunnel D.

Since each of the flues B and *b* is connected to but one regenerator chamber, it is only necessary to insure the proper supply of air to each "on" regenerator chamber, and the proper supply of gas to the lower end of the flue to which each "on" regenerator chamber is connected to insure the proper distribution of flow among all the flues and regenerator chambers. The supply of combustible gas may be regulated in the usual manner by the use of interchangable nozzles of proper size, and the supply of air to the regenerators is primarily regulated by the sizes of the discharge orifices in the iron air supply pipes FA and *fa*. When a change in the distribution of air is desired these iron air supply pipes may be withdrawn and the discharge orifices restricted or enlarged as required. To avoid undesirable pressure differences in the various flues and passages, the off-take channels G′ and *g′* are preferably tapered, as previously described, and the ports G and *g* should be properly proportioned. In addition to the simplicity and positive control, of the distribution of air and gases, obtained with the present invention it is to be observed that the oven and regenerator construction is simple and compact, and that the oven brickwork may be constructed in accordance with accepted and tested principles of design and construction.

While in accordance with the provisions of the statutes I have illustrated and described the best forms of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a coke oven comprising horizontal coking chambers, intervening heating walls divided into vertical flues connected in pairs at their upper ends and provision for periodically supplying gas to the lower end of one flue of each pair, and at alternate periods to the lower ends of the other flues, the improvement which consists in a separate regenerator chamber connected to the lower end of each flue.

2. In a coke oven comprising horizontal coking chambers, intervening heating walls divided into vertical flues connected in pairs at their upper ends, oven supporting walls parallel to and beneath the heating walls, and provisions for periodically supplying gas to the lower end of one flue of each pair and at alternate periods to the lower ends of the other flues, the improvement which consists in a separate regenerator chamber for each flue, said regenerator chambers being arranged between said supporting walls, and successive flues in each heating wall being connected to regenerator chambers at opposite sides of the supporting wall beneath that heating wall.

3. In a coke oven comprising horizontal coking chambers, intervening heating walls divided into vertical flues connected in pairs at their upper ends, oven supporting walls parallel to and beneath the heating walls, and provisions for periodically supplying gas to the lower end of one flue of each pair and at alternate periods to the lower ends of the other flues, the improvement which consists in a separate regenerator chamber for

each flue, said regenerator chambers being arranged between said supporting walls and successive flues in each heating wall being connected to regenerator chambers at opposite sides of the supporting wall beneath that heating wall, an air supply conduit and a waste gas conduit beneath the row of regenerator chambers located between an adjacent pair of supporting walls, and separate ports connecting the lower end of each regenerator chamber to said air supply and waste heat conduits.

LOUIS WILPUTTE.