March 17, 1925. 1,529,977

A. A. WICKLAND

CORE OVEN

Filed Aug. 12, 1922 4 Sheets-Sheet 1

Fig. 1

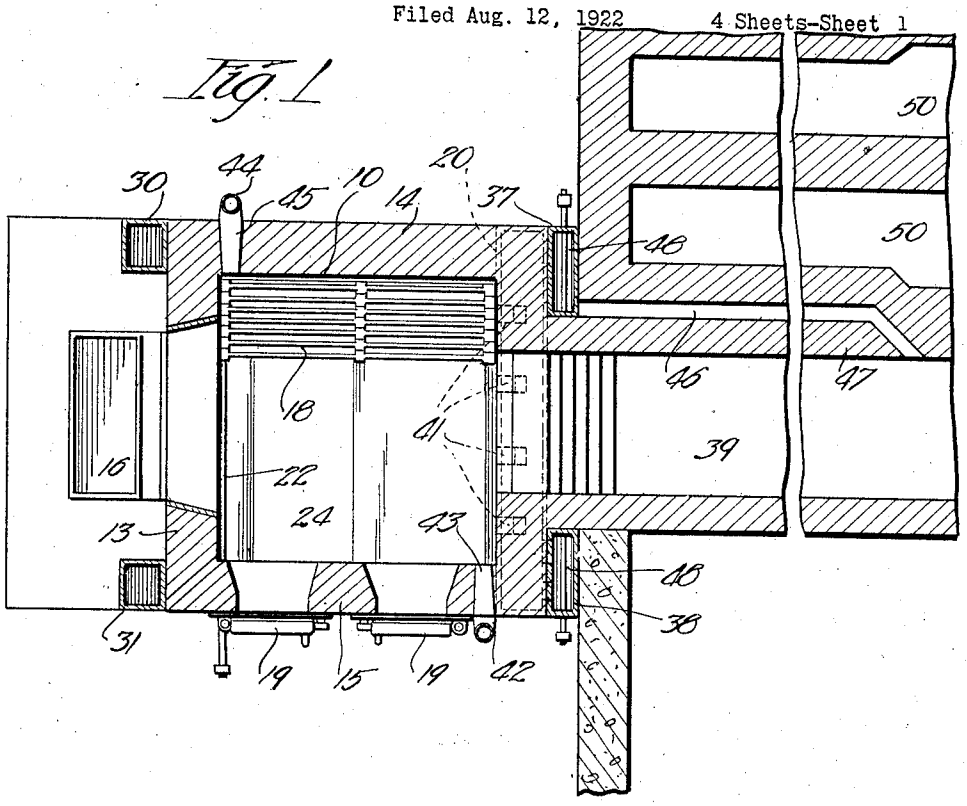
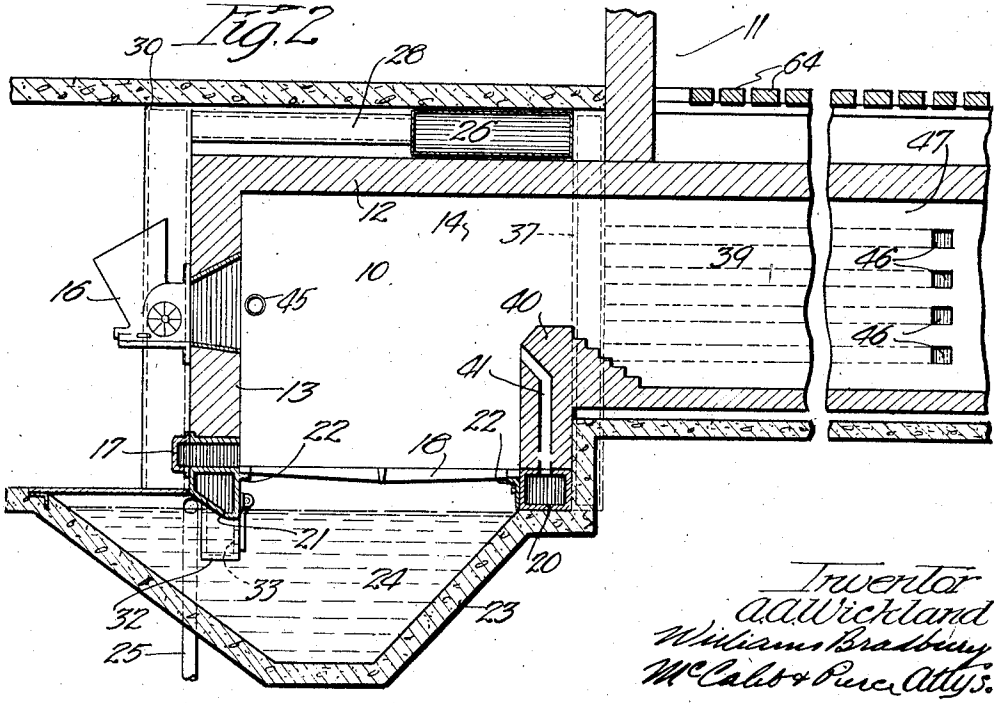


Fig. 2



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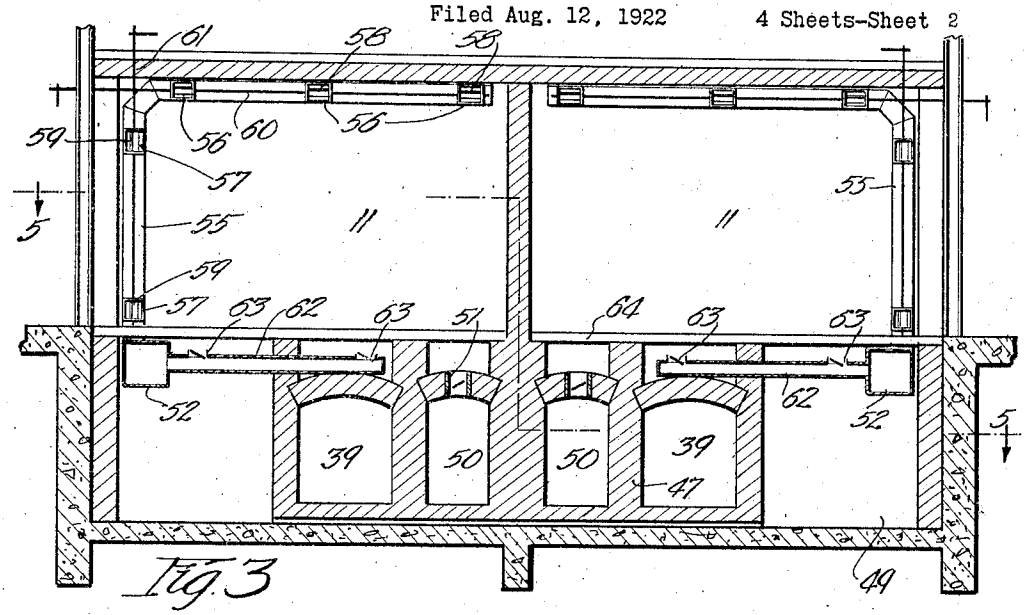


Fig. 3

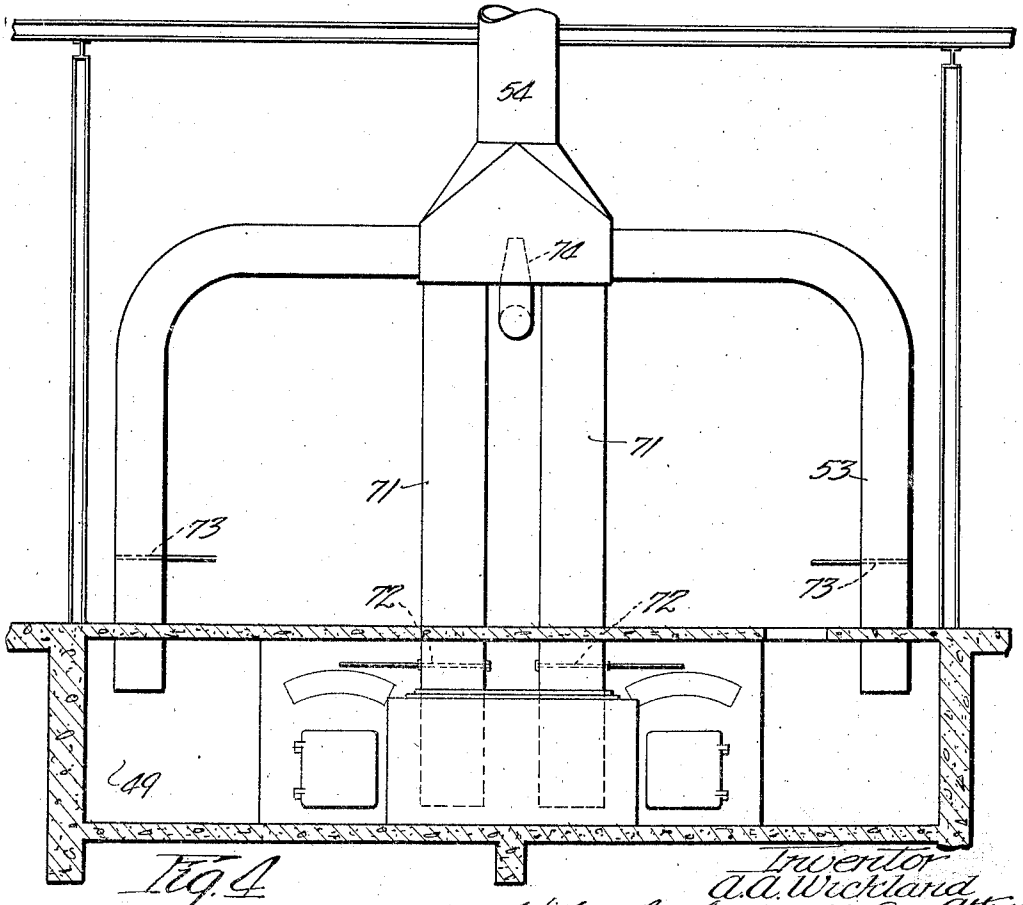


Fig. 4

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CORE OVEN

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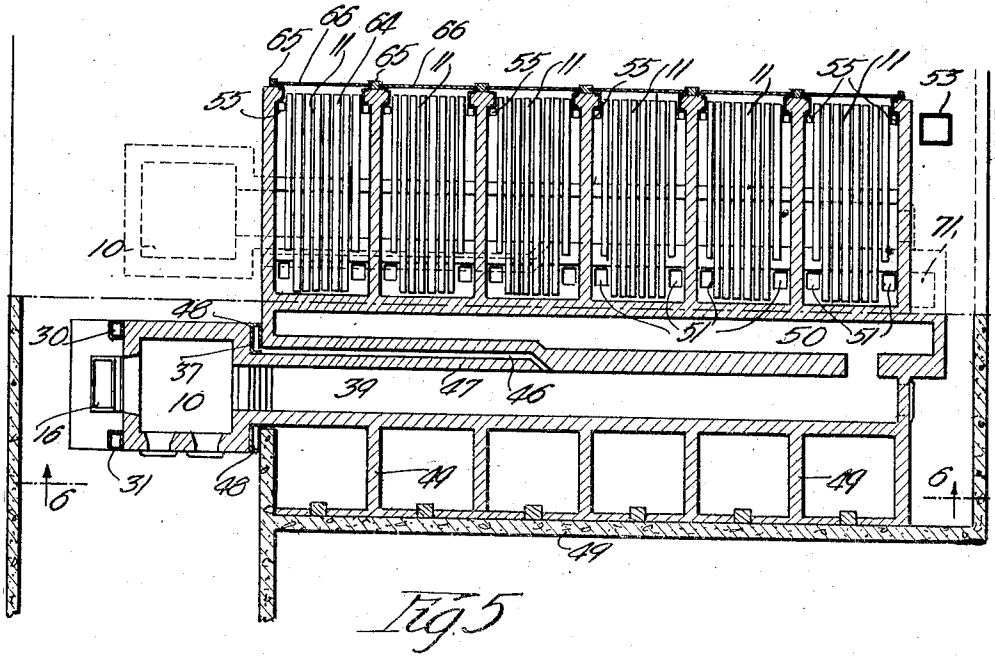


Fig 5

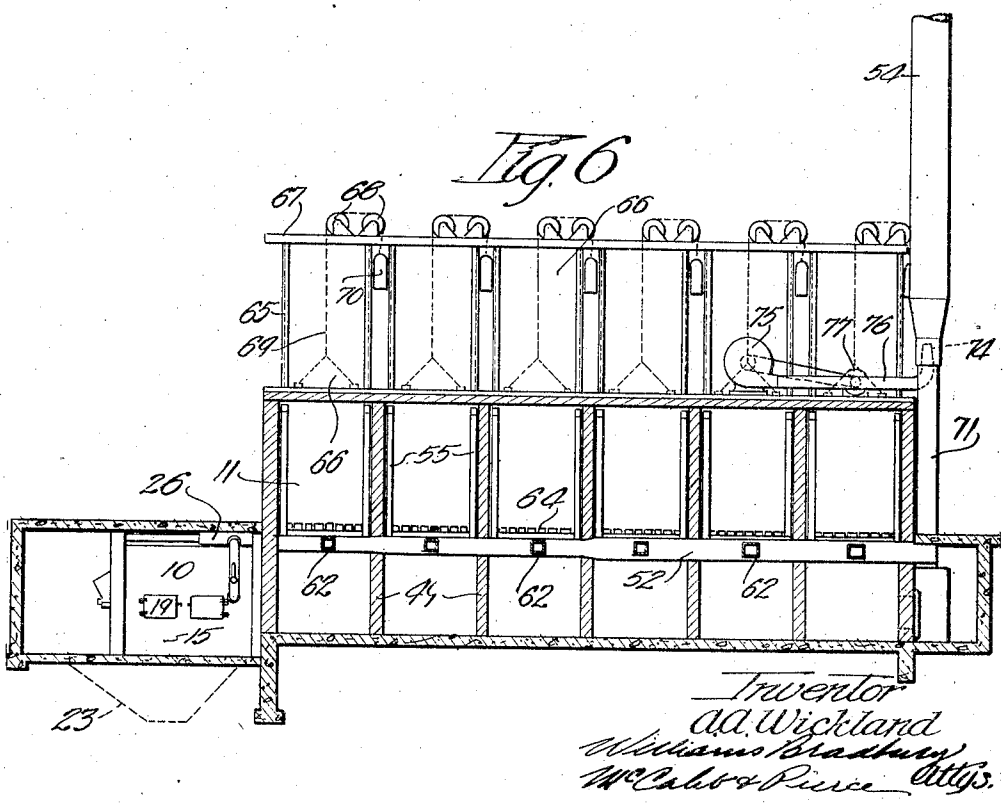


Fig 6

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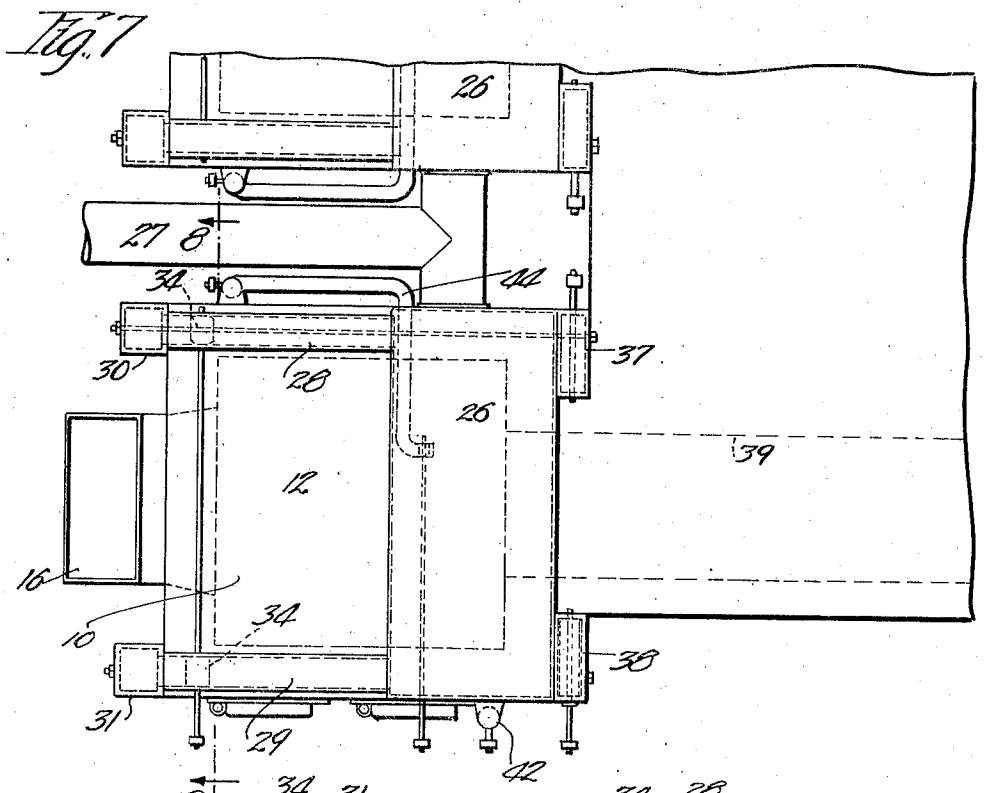
A. A. WICKLAND

CORE OVEN

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Fig. 7



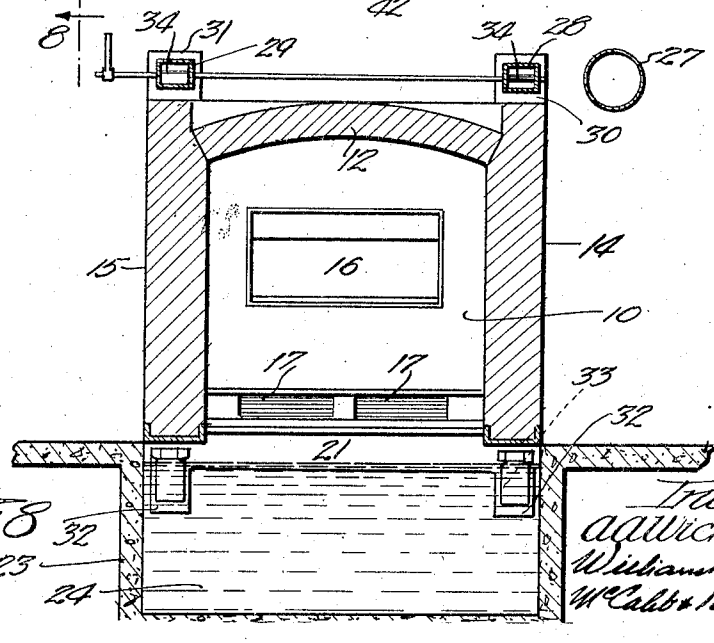


Fig. 8

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Patented Mar. 17, 1925. 1,529,977

UNITED STATES PATENT OFFICE.

ALGOT A. WICKLAND, OF CHICAGO, ILLINOIS, ASSIGNOR TO CAMPBELL, WYANT & CANNON FOUNDRY CO., OF MUSKEGON, MICHIGAN, A CORPORATION OF MICHIGAN.

CORE OVEN.

Application filed August 12, 1922. Serial No. 581,365.

To all whom it may concern:

Be it known that I, ALGOT A. WICKLAND, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Core Ovens, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to core ovens and particularly to core ovens and heating apparatus therefor in which fuel other than coke is employed. Most of the core ovens used in foundries of the present day are heated by the use of coke. From a standpoint of economy, it has been found very desirable to heat core ovens by fuel other than coke and particularly by the use of bituminous coal, but no satisfactory means of employing bituminous coal in the heating of core ovens has heretofore been devised, as the soot produced by the incomplete combustion of bituminous coal acts to foul the cores.

The object of the present invention is to provide core ovens and a furnace for heating the same in which bituminous coal may be satisfactorily employed.

One of the features of the invention is the provision of means for admitting air to the fire box of the furnace above the fire and directing these air currents in such a direction that they tend to produce a whirling motion of the gases of combustion and air within the fire box, thus thoroughly mixing the incoming air with the gases of combustion and acting to complete the process of combustion.

A further feature and one allied with the one just mentioned is the provision of means for injecting air into the fire box or combustion chamber above the fire adjacent to the edge of the bridge which separates the fire box from the exit flue.

Another feature of the invention is the means provided for causing air which is admitted to the fire box below the fire to engage or pass through a body of water before reaching the fire.

Another feature resides in the manner of so controlling the air supply below the fire as to burn the coal practically to carbon monoxide and then supplying air to the fire box above the fire to complete the combustion of the carbon monoxide to carbon dioxide.

Another feature of the invention is the provision of air passages in the wall of the furnace flue and terminating these passages at one end in the flue.

A still further feature is the provision of air conduits on opposite sides of the fire box which act to conduct the air to the fire box and to the passages in the flue wall above referred to, and the use of these air conduits as tie plates which operate to prevent the spreading of the walls of the fire box.

A still further feature is the means for admitting gases of combustion to the oven and the manner of controlling the escape of the gases from the oven, so that all parts of the oven are substantially equally heated and the moist air or steam from the cores is drawn off and not permitted to collect or remain in any portion of the ovens.

Other features and advantages of the invention will appear from time to time as the description of the invention progresses.

Referring now to the drawings:

Figure 1 is a horizontal transverse section through the fire box and passages therefrom with parts broken away;

Figure 2 is a vertical longitudinal section with parts broken away;

Figure 3 is a transverse section through the ovens and channels;

Figure 4 is a view looking at the rear of the ovens and channels;

Figure 5 is a section substantially on the line 5—5 of Figure 3;

Figure 6 is a section substantially on the line 6—6 of Figure 5;

Figure 7 is a top or plan view of the fire box of one of the furnaces and shows the adjacent parts broken away; and

Figure 8 is a section substantially on the line 8—8 of Figure 7.

It is believed that the novel features of the present invention will be best understood from a detailed description thereof taken in connection with the drawings, in which like reference characters indicate like parts in the several views.

Referring to the drawings (Figure 5), 10—10 indicates the fire boxes of the two furnaces. In the present disclosure, two series of ovens 11 are contemplated, each of which is heated by one of the fire boxes 10.

As stated above in the brief description of the drawings, Figure 5 shows at the lower part thereof the passages under one of the series of ovens and in the upper part thereof shows the other series of ovens. These two series of ovens and the heating equipment therefor are substantially identical, and in the further description of the invention, only one of the series of ovens and its heating equipment will be considered. It should be kept in mind, however, that a series of air passages, such as shown in the lower half of Figure 5, is provided below the ovens, such as shown in the upper half, and that a series of ovens such as shown in the upper half of this figure are provided over the air passages indicated in the lower half of this figure.

We will now consider the fire box or combustion chamber and parts immediately associated therewith. The fire box has the top wall 12, front wall 13 and the side walls 14 and 15 of the usual fire brick construction. Positioned within the front wall 13 is the stoker or coal-feeding device 16, which is adapted to supply coal to the fire box. Below the stoker 16 are the slice doors 17, through which clinkers and other matter may be removed from the grate 18. Within the wall 15 is a pair of stoking and trimming doors 19 through which the coal may be raked level and also through which coal may be introduced when desired. Extending transversely of the fire box at the rear thereof is a substantially rectangular conduit 20, preferably of cast iron, and extending transversely of the fire box at the forward end thereof is a conduit 21, also preferably of cast iron. The grate bars 18, which may be of any preferred construction, are carried by brackets 22 secured to the conduits 20 and 21. Below the fire box is a wall 23 of concrete or other suitable material having a depression 24 therein. The depression 24 within the wall 23 will normally be filled with water substantially up to the dotted line. A drainpipe 25 is provided to limit the height to which the water may rise.

Positioned on top of the wall 12 is a wind box 26 into which air may be forced through the pipe 27 (see Figure 7). Extending forwardly from the wind box 26 adjacent to the edges of the fire box are the conduits 28 and 29. The conduits 28 and 29 communicate with the vertically extending conduits 30 and 31, respectively, which will preferably be formed of cast iron. The conduits 30 and 31 at the lower ends thereof communicate with the transversely extending conduit 21, previously referred to. Extending downwardly from the transverse conduit 21 at the opposite ends thereof are the extensions 32 which terminate well below the surface of the water within the depression 24. Openings 33 are formed within the extensions 32 below the surface of the water in the receptacle 24. Thus it will be seen that the air forced into the wind box 26 from the pipe 27 will pass downwardly through the conduits 30 and 31 into the conduit 21 and from there either directly into the water or through the extensions 32 and openings 33 into the water within the receptacle 24. Thus the air which is admitted to the fire box below the grate 18 is caused to be saturated with moisture which helps to bring about more perfect combustion of the coal within the fire box and also to prevent the formation of clinkers. Dampers 34 are provided within the air conduits 28 and 29, so that the amount of air supplied to the fire box below the grate may be regulated.

Communicating with the wind box 26 at the opposite side of the fire box from the conduits 30 and 31 are a pair of vertically extending conduits 37 and 38. Conduit 38 communicates at the lower end thereof with the transversely extending conduit 20. The fire box is provided adjacent to the point where the flue 39 leads therefrom with an obstruction or bridge 40, preferably constructed of fire brick. Extending upwardly from the conduit 20 through the bridge 40 is a plurality of air passages 41 which, at their upper ends, communicate with the interior of the fire box, the openings being directed away from the flue 39. Thus air which is maintained under pressure in the wind box 26 passes downwardly through the vertically extending conduit 38, through conduit 20 and air passages 41 and into the fire box, and as the air is directed away from the exit from the fire box, it becomes thoroughly mixed with the gases of combustion and acts to help complete the process of combustion.

A tube 42 has one end communicating with the wind box 26 and the other end with the nozzle 43 which terminates at the inner surface of the fire box adjacent to one corner thereof. Another pipe 44 has one end communicating with the wind box 26 and the other with the nozzle 45 which terminates at the inner surface of the fire box adjacent to the opposite corner thereof. The nozzles 43 and 45 are so arranged that the air forced therethrough is directed substantially parallel to the adjacent walls of the fire box. From an inspection of Figure 1 of the drawings, it will be obvious that the air being injected into the fire box through the nozzles 43 and 45 will tend to cause a whirling motion of the gases and air within the fire box. This whirling motion will be increased by the streams of air coming in through the passages or ducts 41. The streams of air through the ducts 41 will also tend to retard the passage of the gases of combustion from the fire box. Thus it will be seen that the air admitted to the fire

box above the fire will be given time to become thoroughly mixed with the gases of combustion before passing beyond the combustion area. In the preferred operation of the furnace, ordinarily only sufficient air will be admitted to the fire box under the grate to burn the coal to carbon monoxide and the air admitted to the fire box above the fire then acts to complete the combustion of the carbon monoxide to carbon dioxide. The purpose of this procedure is to get as perfect combustion as possible and prevent as far as possible the passage of soot through the flue 39 to the core ovens.

The vertically extending conduit 37 communicates with a plurality of air passages 46 formed within the wall 47 at one side of the flue 39. The passage of air through the ducts or passages 46 operates to convey heat from the wall 47 and also operates to slightly reduce the temperature of the gases passing through the flue 39 and to augment the volume of heated gas which passes to the core ovens. The combustion chamber may be considered as including that part of the flue 39 to the openings from passages 46 as well as the fire box proper. Dampers 48 are provided within the conduits 37 and 38 so as to regulate the flow of air through the air ducts 41 and 46.

The wind box 26, conduits 28, 29, 30, 31, 37 and 38, being immediately adjacent to the walls of the fire box, act to absorb heat from the walls of the fire box and conduct it within the fire box or into the flue extending from the fire box. The fire box walls are materially cooled by this means, and the heat absorbed from the walls acts to preheat the air being injected into the fire box and thus helps to bring about more perfect combustion.

The conduits 31 and 38 and also the conduits 30 and 37 may be joined by bolts or rods extending transversely through the furnace, and thus act as tie plates which prevent spreading of the fire box walls.

We will now describe the passages leading from the fire box to the oven, the arrangement of the ovens and the passages through which the gases are conducted from the ovens. As seen in Figure 5, there is positioned on one side of the flue 39 a series of supporting walls 49, the principal function of which is to support the outer ends of the ovens. Lying adjacent to the flue 39 is a flue 50 which communicates with the flue 39 at its end remote from the fire box. The flue 50, as seen in Figure 3, passes immediately below the inner ends of the ovens. The flue 50 is provided in the top thereof with a plurality of openings 51, two for each oven, which permit the hot gases passing from the fire box to enter the ovens. Extending across under the ends of the ovens remote from the flue 50 is an air conduit 52 which communicates at one end with the conduit 53 leading to the stack 54. Communicating with the conduit 52 are the upwardly and transversely extending conduits 55. Each of the ovens is provided with two of these conduits 55, one being positioned at each of its corners over the conduit 52. From an inspection of Figure 3, it will be noted that the conduits 55 pass upwardly adjacent to one side of the oven and then transversely across the top thereof. Each of the conduits 55 is provided with a plurality of openings 56 and 57. Dampers 58 are provided to control the passage of the gases through the openings 56 and dampers 59 are provided to govern the passage of gas through the openings 57. The dampers 58 may be operated by a single operating rod 60 and the dampers 59 may be controlled by an operating rod 61, or means may be provided for operating the dampers separately. Extending longitudinally under the bottom of each of the ovens 11 is a conduit 62 provided with a plurality of openings 63. The conduit 62 communicates with the conduit 52 and thus the suction created therein by means of the conduit 52 being joined to the stack 54 will act to draw the gases from within the oven downwardly through the openings between the channel bars 64 which form the floor of the oven and into the conduit 62. Thus it will be seen that through the medium of the conduits 55 and openings therein and the conduit 62 and openings therein, the gases within the ovens are drawn from a plurality of different points in the oven at separated regions, and by controlling the amount of air which passes through these several conduits and openings by means of the dampers provided, air may be exhausted practically equally from the various parts of the oven, thus preventing the accumulation of a quantity of moist air in any particular region of the oven.

The ovens are provided at their forward edges with the channel bars 65 which are adapted to receive the edges of the vertically sliding doors 66. The channels 65 may be extended upwardly beyond the tops of the oven, as indicated in Figure 6, and thus form a support for the super-structure 67 which carries the counter balancing pulleys 68. 69 indicates a chain or other device, one end of which may be secured to a door 66, the other end being secured to a counter balancing weight 70, or any other desired device.

Extending downwardly from the stack 54 is a pair of pipes or conduits 71, each of which communicates with one of the conduits 50 at its end remote from the fire box 10. Dampers 72 are provided within the conduits 71. Thus, when the fire is being started within the furnace, the dampers 72 may be opened and the dampers 73 within

the conduits 53 closed, giving a direct draft from the furnace. The dampers will remain in this position until the brick work of the furnace is brought to a temperature above the ignition point of the gases, so that complete combustion may be secured and thus avoid a deposit of soot in the core ovens. When, however, the fire is burning sufficiently, the dampers 72 may be closed and the dampers 73 opened, thus causing the gases from the fire box to pass through the core ovens on their way to the stack 54.

It will be noted that the conduit 52 through which the hot gases are drawn from the ovens is located immediately below the slatted floors of the ovens. Therefore, the heat from this conduit will act to a certain extent to assist in maintaining the oven hot.

In order to create a forced draft in the stack 54 when found desirable or necessary, an injector nozzle 74 is inserted in the stack with its open end pointing upwardly. The nozzle 74 is connected with a blower 75 through the medium of the tube 76. The blower 75 may be driven in any desired manner, but preferably by means of an electric motor indicated at 77.

The gases within the combustion chamber which result from the combustion of the coal will be at a temperature of approximately 2,200°. The air admitted to the combustion chamber above the fire does not act to materially lower the temperature of the gas for the reason that it brings about further combustion. The air, however, admitted to the flue 39 through the air passages 46 acts to materially decrease the temperature of the gases passing through the flue. The decrease of temperature brought about by introduction of the air through passages 46 and the loss of heating due to conduction through the walls of the various passages, reduce the temperature so that the gases have a temperature of between 700° and 800° at the time they enter the core ovens. This temperature has been found satisfactory for drying or baking the cores. The air in the ovens is saturated with moisture due to the evaporation of the moisture from the cores. This moist air is being constantly removed from the ovens through the various exit openings provided in the different parts of the oven, thus constantly bringing the hot relatively dry air into contact with the cores to be baked.

The present arrangement, by providing means for properly controlling the supply of air to the fire box both below and above the fire, operates to bring about very perfect combustion, thus practically eliminating all soot, etc. Also, the provision of means for controlling the quantity of air admitted to the fire box and also to the flue and for controlling the rapidity of the passage of the gases into the ovens permits the ovens to be maintained at approximately the most satisfactory temperature.

Although in the drawings and in the above description, applicant has confined himself to what he considers the preferred embodiment of his invention, it is to be understood that various modifications are contemplated, and the invention should, therefore, be limited merely by the scope of the appended claims.

Having now described my invention, what I consider is new and desire to secure by Letters Patent of the United States is:

1. The combination with a core oven, of a furnace for heating said oven, including a fire box, and means for causing air supplied to the fire in said fire box to bubble up through water before being admitted to the fire box.

2. The combination with a core oven, of a furnace for heating said oven, including a fire box, and means for causing air supplied to the fire in said fire box to bubble up through a body of water under the fire box before being admitted thereto.

3. The combination with a plurality of core ovens, of a furnace for heating said ovens, including a fire box, a flue extending from said fire box toward said oven, a channel adjacent to said flue and communicating therewith at its end remote from the fire box and also communicating with said ovens, and a wall between said flue and channel having air passages therein communicating with said flue.

4. In combination, a core oven having an apertured floor, a furnace for heating said oven including a fire box, a flue extending from said fire box to said oven for conveying the gases of combustion to said oven, and an exhaust conduit extending substantially centrally under said floor adjacent thereto and having openings for drawing gases down through said floor.

5. In combination, a plurality of core ovens, a furnace for heating said ovens, including a fire box, a flue extending from said fire box under said ovens, and a channel adjacent to said flue and communicating therewith at its end remote from said fire box, said flue being provided with openings positioned under the floor of said ovens.

6. In combination, a core oven, a furnace for heating said oven, including a fire box, a flue extending from said fire box to said oven, an exhaust conduit communicating with said oven, a stack, a stack extension conduit joining said stack to said flue intermediate said fire box and oven, a second stack extension conduit joining said stack to said exhaust conduit, and dampers within said stack extension conduits, respectively.

7. In combination, a core oven, a furnace for heating said oven including a fire box, a first flue leading from said fire box, a second

flue connecting with the far end of said first flue and doubling back alongside said first flue, outlets from said second flue to said oven, a stack, means operable to direct the products of combustion from said first flue to said stack without traversing said second flue and said oven and means for compelling the products of combustion to traverse said second flue and said oven before passage to said stack.

8. In combination, a plurality of core ovens, a furnace for heating said ovens, including a fire box, a flue extending from said fire box under said ovens, said flue being provided with openings positioned under the floor of said ovens, an exhaust conduit having upper portions disposed adjacent the tops of said ovens for exhausting the upper portions thereof, and lower portions disposed below the floor of said ovens for exhausting the lower portions thereof, and a stack communicating with said exhaust conduit.

9. In combination, a plurality of core ovens, a furnace for heating said ovens, including a fire box, a flue leading from said fire box, a channel connecting with the far end of said flue and doubling back above said flue and under said ovens, a wall separating said flue and said channel, and an air passage extending through said wall and opening into said flue.

10. In combination, a plurality of core ovens, a furnace for heating said ovens, including a fire box, a flue extending from said fire box under said ovens, a channel adjacent to said flue and communicating therewith at its end remote from said fire box, said channel being provided with openings positioned under the floors of said ovens, an exhaust conduit opening into the upper part of each core oven for exhausting the upper area thereof, a lower exhaust conduit opening into each of said core ovens below the floor thereof for exhausting the lower part of said oven down through said floor, an exhaust manifold connecting with said exhaust conduits, a stack, a second flue forming a passageway between said first flue and said stack in shunt of said ovens, dampers in said second flue and in said exhaust manifold and means for stimulating the draught through said stack.

11. The combination with a core oven, of a furnace for heating said oven, including a fire box, a flue leading from said fire box, a bridge between said fire box and said flue, means for causing air supplied to the lower portion of said fire in said fire box to bubble up through a body of water before being admitted to the fire box, means for injecting air into said fire box adjacent the edge of said bridge, said air being directed toward the interior of said fire box, and means for injecting air into said fire box above the fire, said air being admitted at opposite sides of said fire box and so directed as to produce a whirling motion of the gases within said fire box.

12. The combination with a core oven, of a furnace for heating said oven, including a fire box, an air manifold extending across the top of said fire box, a bridge in said fire box, an air passageway discharging from said bridge adjacent the upper portion thereof, an air conduit connected between said manifold and said air passageway, and air conduits connecting with said air manifold and extending down across the front of said fire box for discharging into said fire box below the grate.

13. The combination with a core oven, of a furnace for heating said oven, including a fire box, a flue leading from said fire box, a bridge between said flue and said fire box, a water receptacle below said fire box, an air manifold, an air passageway in said bridge discharging adjacent the upper edge thereof, a conduit connecting said air manifold with said air passageway, a pair of nozzles discharging into said fire box from opposite sides thereof to cause a whirling motion of the products of combustion, conduit means connecting said nozzles with said manifold, air outlets below the water level in said water receptacle for causing air to bubble up through said water into said fire box, and conduit means connecting said air outlets with said air manifold.

In witness whereof, I hereunto subscribe my name this 9th day of August, 1922.

ALGOT A. WICKLAND.

Witnesses:
DAGMAR PETERSON,
ALICE M. BERTONCINI.