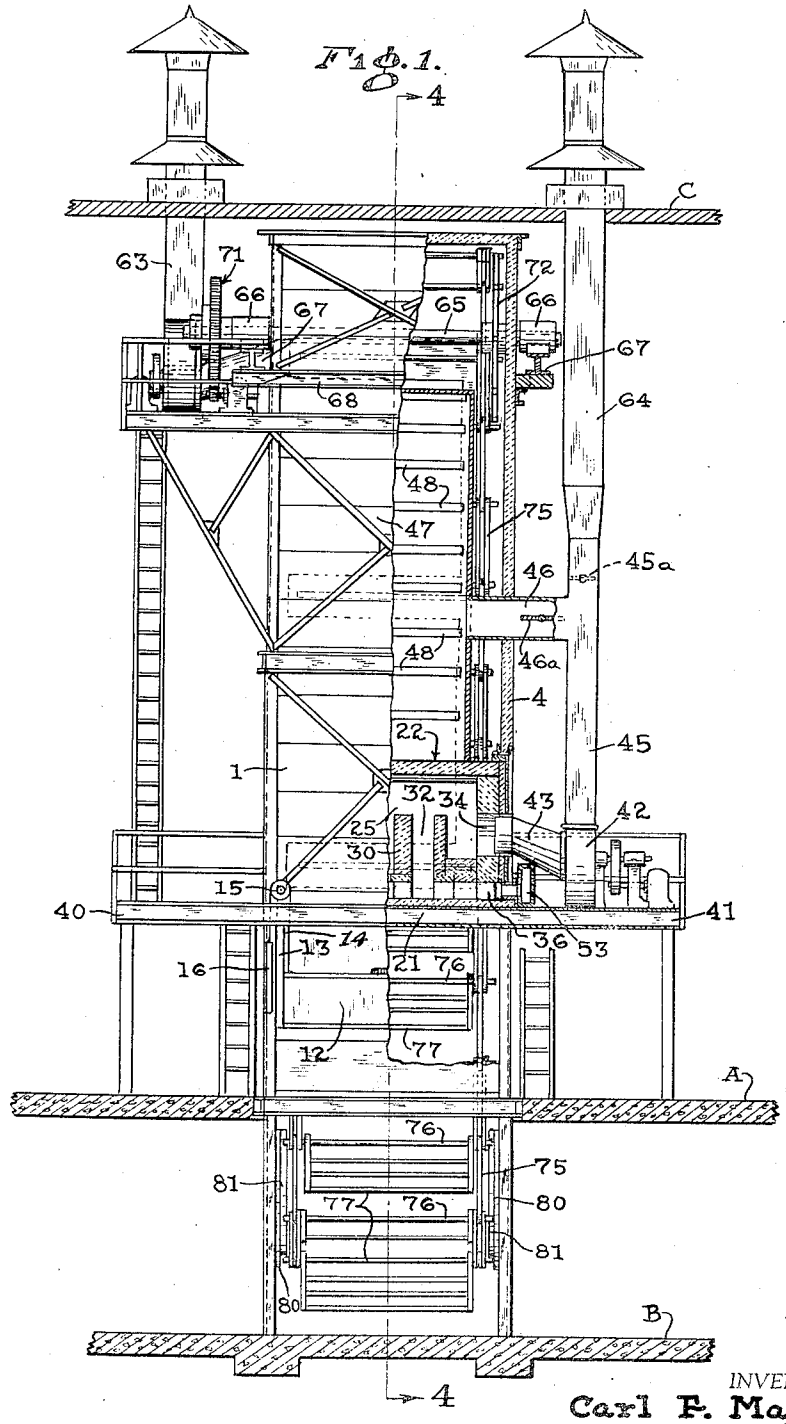
Sept. 30, 1941. C. F. MAYER 2,257,180

OVEN

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Fig. 1.



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Fig. 2.

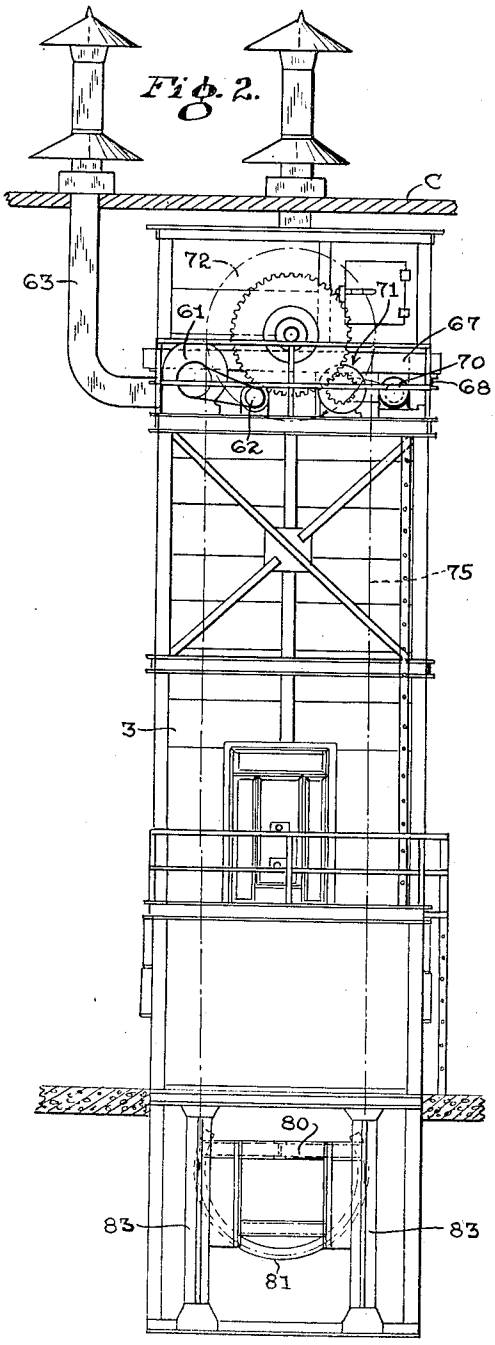
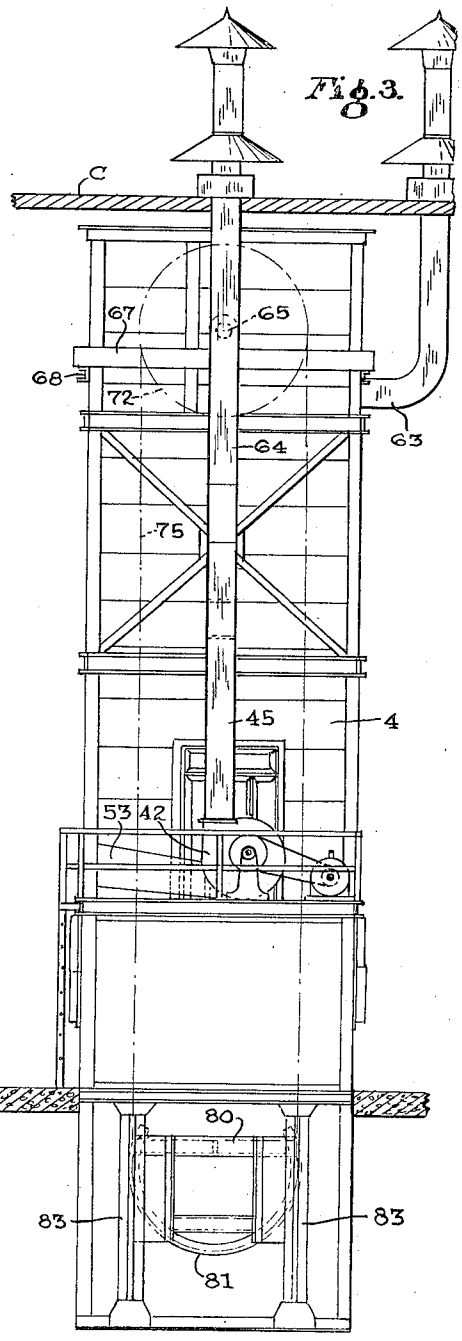


Fig. 3.



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Fig. 4.

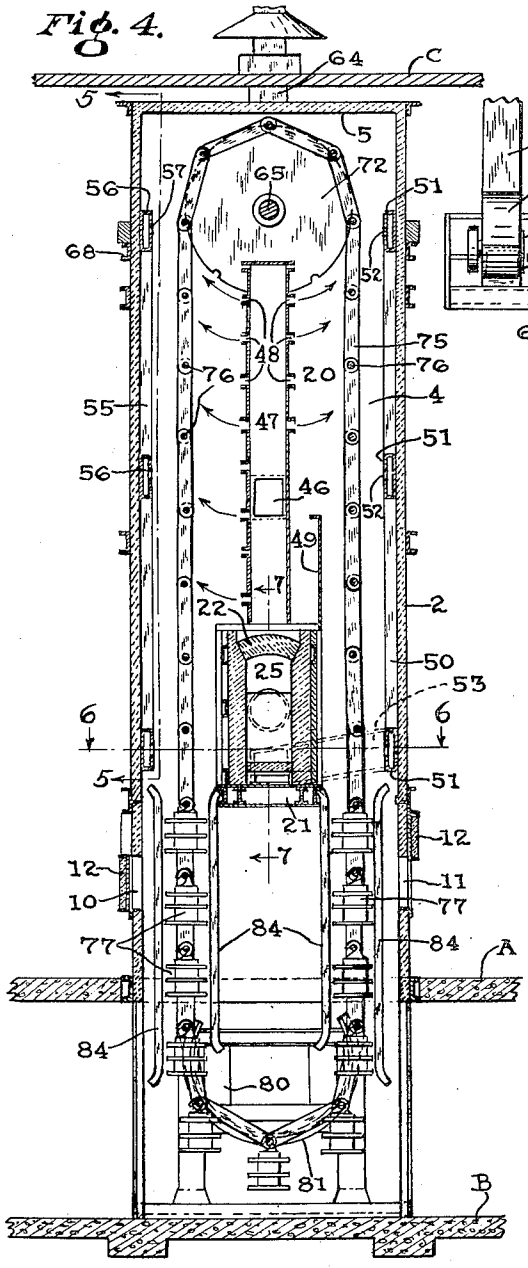
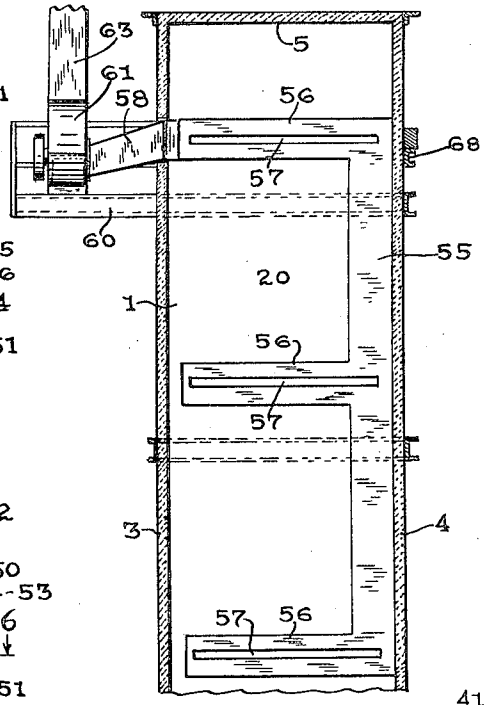


Fig. 5.



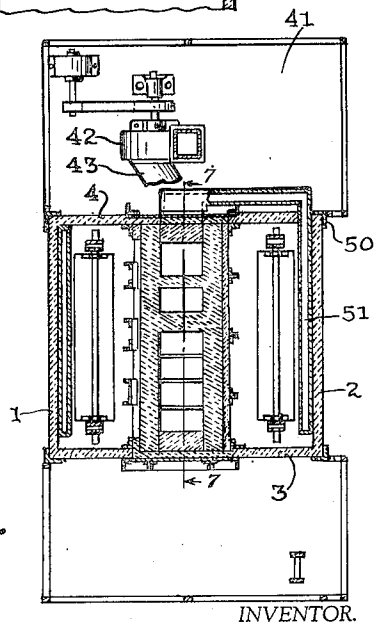


Fig. 6.

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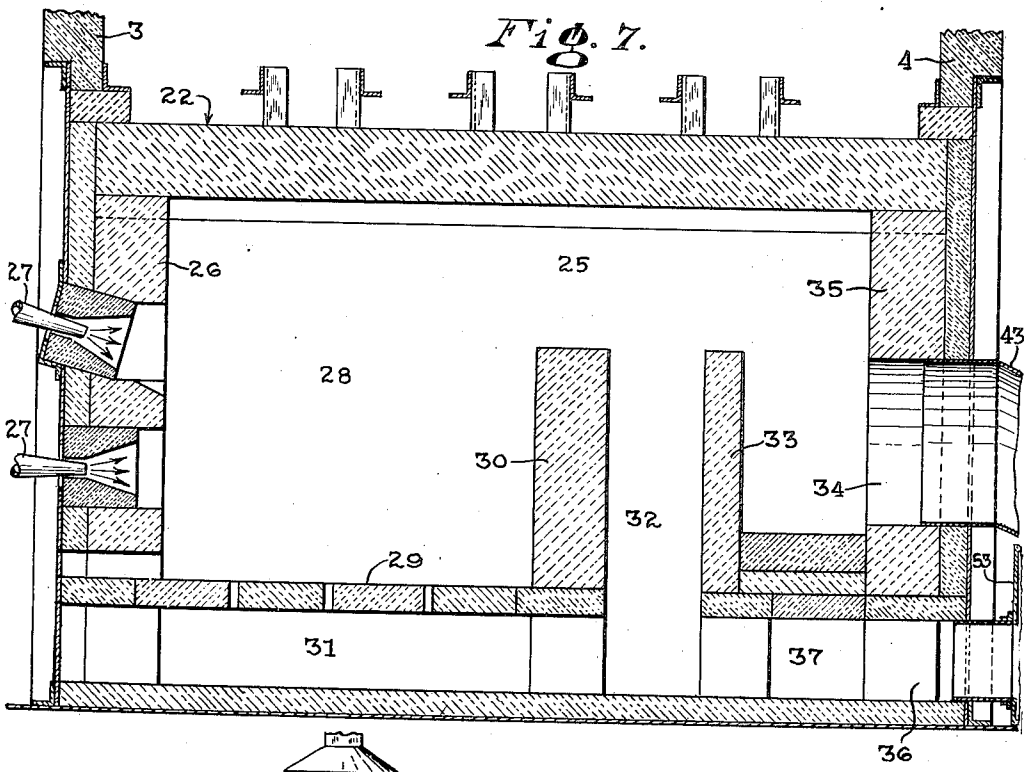
ATTORNEYS.

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OVEN

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Fig. 7.



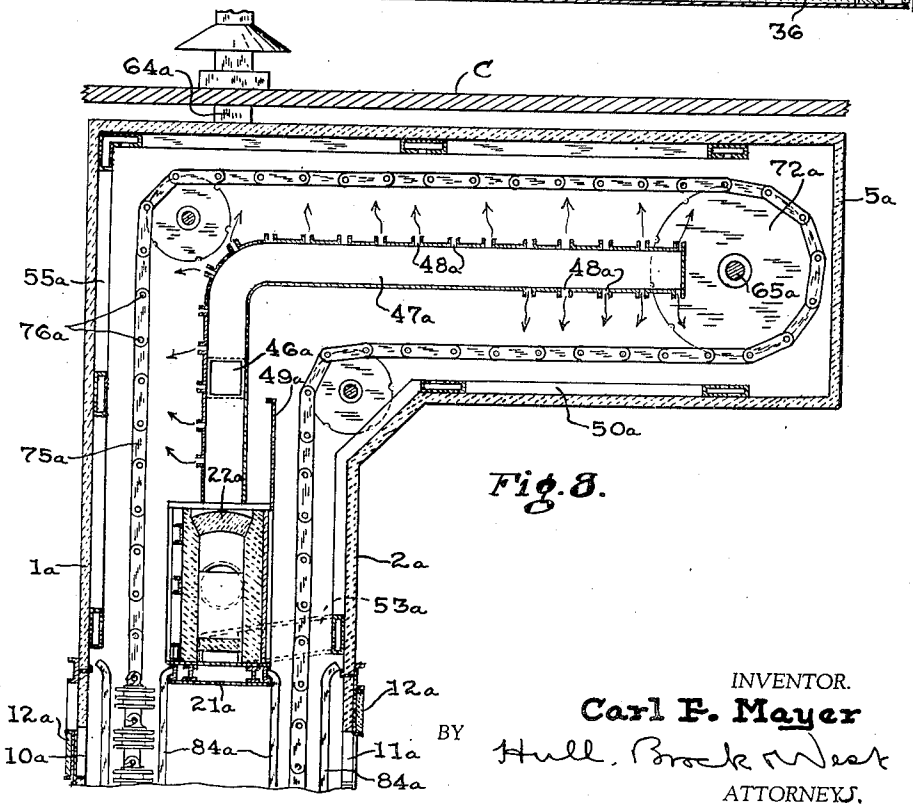


Fig. 8.

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UNITED STATES PATENT OFFICE

2,257,180

OVEN

Carl F. Mayer, Lakewood, Ohio

Application February 24, 1938, Serial No. 192,250

5 Claims. (Cl. 263—8)

This invention relates to ovens of the class used in the industries for baking cores, baking or drying enamel or other surface coatings, heat treating, and similar purposes.

Among the objects of the invention are the attainment, in ovens of the aforesaid class, of greater efficiency with less heat loss and consequently increased economy; a clean atmosphere in the heated chamber to which the articles being treated are exposed; uniformity of temperature and more effective heat distribution and control, and compactness with resultant space saving.

Stated in general terms, the oven of my invention comprises a walled structure inclosing a heated chamber in which the articles being treated are suitably supported, and a housing enclosing a heating or combustion chamber situated within and in spaced relation to the surrounding walls of the heated chamber. Fluid conducting and impelling means is included for withdrawing heated fluid or the products of combustion from the heating or combustion chamber and delivering said fluid or products to the heated chamber, and, in the case of a combustion class of heating means, provisions are made for exhausting the products to the atmosphere at the discretion of the operator, the purpose of such a provision being to divert the products from the heated chamber during the early stages of combustion when the products are laden with an appreciable amount of soot. Provisions are also made for recirculating the fluid from the heated chamber through the heating or combustion chamber, and for exhausting fluid from the heated chamber to the atmosphere at will.

Embodiments of the invention are illustrated in the accompanying drawings, and because of the immense size of structures of this class and the small scale on which they necessarily have to be drawn for the present purpose, I have illustrated the invention more or less diagrammatically, it being deemed sufficient for the reason that the construction of the various elements is of a standard and well known nature.

In the drawings, Fig. 1 is a front elevation, partly in section, of a vertical oven constructed in accordance with the invention; Figs. 2 and 3 are left and right hand side elevations, respectively; Fig. 4 is a central vertical section through the oven on the line 4—4 of Fig. 1; Fig. 5 is a vertical section on the line 5—5 of Fig. 4; Fig. 6 is a horizontal section on the line 6—6 of Fig. 4; Fig. 7 is a central vertical longitudinal section through the heating or combustion chamber and the adjacent portion of the oven, on the line 7—7 of each Figs. 4 and 6, and on a scale considerably enlarged over that of the previous views; and Fig. 8 is a sectional side elevation of a partial horizontal oven constructed in accordance with the invention.

In the form of the invention illustrated in Figs. 1 to 7 I have shown an oven of the vertical type which extends from the top to the basement floor of a building, the ground floor being designated A; the basement floor B, and the roof C. The respective front and rear walls 1 and 2 of the oven, and the opposed side walls 3 and 4 thereof, extend from the floor A to a point near the roof C where they are capped by a top wall 5. These walls are insulated, and in practice, are made up of slabs of insulating material sheathed in sheet metal and held together by a frame of structural iron work designated generally by the numeral 6, and shown as extending from the top of the oven to the basement floor B. About waist-high above the floor A the front wall 1 is provided with a so-called loading opening 10, and the rear wall with an unloading opening 11, that are adapted to be closed by doors 12, guided for vertical movement in operative relation to the openings by suitable rails 13, and supported by chains or cables 14 that are trained over sheaves 15 and are connected to counterbalancing weights 16.

The space enclosed by the previously mentioned insulated walls 1 to 5, is designated 20 and may be termed the heated chamber wherein the articles to be treated, as cores that are to be dried and baked, are suitably supported and through which they are moved in a manner, and by means, later to be described. Extending horizontally across the oven from one side wall to the other about head high above the floor A and in substantially equally spaced relation to the front and rear walls is a structural frame 21 that supports a housing 22 of suitable refractory material, such as fire brick, that encloses a heating chamber 25. In the present embodiment, this is a combustion chamber whose front wall 26 (Fig. 7) is provided with openings through which are projected the nozzles of oil burners 27. Combustion occurs within the fire-box 28, above a bottom wall or grate 29 and in front of a back wall 30, and the main supply of air is drawn in through a passageway 31, below the bottom wall or grate 29, and through a vertical duct 32, rearwardly of the back wall 30, to where it joins the products of combustion as

they pass from the firebox to the rear of a cross wall 33 on their way to an outlet opening 34 in the rear wall 35. The last mentioned wall is also provided with a fluid inlet opening 36 that communicates through a passage 37 with the previously mentioned vertical duct 32.

Suitably supported adjacent the side wall 3, and in the plane of the frame 21, is what may be termed a heater platform 40, and a fan platform 41 is supported in the same plane adjacent the opposite wall 4. The latter platform supports a fan or blower 42, shown as of the centrifugal type, and the inlet of the snail-shell casing is connected, by a conduit 43, with the outlet opening 34 of the combustion chamber housing. The outlet of the fan casing is connected to a vertical conduit 45, that rises to the rear of the oven and at a suitable height is provided with a lateral extension or branch 46 that leads in through the side wall 4 of the oven and joins a fluid distributor 47 about midway of its height. The distributor is in the form of a sheet metal casing that is rectangular in plan and rises substantially midway between and parallel with the front and rear walls 1 and 2 from a point immediately above the housing 22 to the top region of the heated chamber 20. The front and rear walls of the distributor have transverse slots 48, those of the front wall being spaced suitable distances apart from top to bottom of the distributor while those of the rear wall extend from the top to nearly half way down the distributor. Rising from the rear side of the heating or combustion chamber housing 22 in spaced relation to the adjacent wall of the distributor 47 is a shield 49.

Suitably supported within the heated chamber 20 adjacent the rear wall thereof is a system of conduits that comprise what may be termed a recovery manifold 50 having, in laterally extending portions 51 thereof, entrance slots 52. Adjacent its lower end, the manifold is provided with an outlet extension 53 that leads outwardly through the side wall 4 above the fan platform 41 and thence laterally and is connected to the fluid inlet opening 36 in the rear wall 35 of the housing 22 of the heating or combustion chamber.

A similar system of conduits is suitably supported within the heated chamber 20 adjacent the front wall 1 and constitutes what may be termed an exhaust manifold 55 (Fig. 5) within the transverse branches 56 of which are openings or slots 57, and the outlet 58 of said manifold extends out through the side wall 3 above a platform 60 and has connection with the inlet of an exhaust fan 61 which, with its driving motor 62 (Fig. 2), is supported by said platform. The exhaust fan 61 is shown as of the centrifugal blower type and the outlet of the casing is connected to a flue or stack 63 that rises through the roof C.

Here it may be explained that the previously mentioned conduit 45 that leads from the outlet of the casing of fan 42 communicates above the branch 46 with a stack or flue 64 that rises through the roof C. Beyond its point of communication with the lateral extension of branch 46, the conduit 45 is equipped with a damper 45a, and a damper 46a is situated in said extension or branch.

Extending transversely through the oven a suitable distance below the top wall 5 is a shaft 65 whose ends, outwardly beyond the side walls of the oven, are journaled in bearings 66 that are supported by cross members 67 of a frame 68 that surrounds the oven a short distance above plane of the platform 60. A motor 70 (Fig. 2), mounted on that platform, has driving connection with the shaft 65 through gearing designated 71.

Secured to the shaft 65 inside the heated chamber 20 and near the side walls of the oven are large sprocket wheels 72 over which an endless conveyor is engaged. The conveyor comprises opposed chains 75 that are connected together by cross bars 76, and suspended from each cross bar 76 is a work support or rack 77, the rack herein shown including a series of shelves or trays for the support of cores that are to be dried or baked. The work supports or racks are omitted from the upper portion of the heated chamber 20 for the purpose of avoiding confusion. Obviously they extend entirely about the conveyor. At the bottom of the oven is so-called "take-up" device comprising a frame structure 80, that includes two arcuate guides 81 in substantially the planes of the sprocket wheels 72 and wherewith parts at the ends of the bars 76 engage. The frame member 80 is supported for vertical movement within uprights 83 and by its weight keeps the conveyor taut while allowing for expansion and contraction of the chains 75.

Where the work carriers or racks 77 pass the loading and unloading openings in the front and rear walls of the oven, they are restrained from undue lateral movement by vertical guides 84, the same being suitably supported from the oven walls.

In preparing the oven for use, the oil burners 27 are turned on and lighted and, characteristic of such combustion means, considerable smoke and soot attend the initial period of operation and this condition prevails until the walls of the combustion chamber and other parts of the furnace become heated. Also considerable dust and dirt may be stirred up and mixed with the products at the beginning of the fire until such foreign elements are carried off and disposed of. Therefore, until the combustion apparatus is operating with a clean fire of the desired high temperature, the damper 45a is opened and the damper 46a closed, so as to exhaust the soot and dirt laden products through the flue or stack 64. When the combustion apparatus becomes heated and is operating with a clean fire, the damper 46a is opened and the damper 45a closed so as to divert the products of combustion through the branch 46 into the distributor 47 by which they are properly diffused throughout the upper region of the oven by reason of the arrangement of the slots 48. As is customary in such structures, the exposed conduits through which the heated fluid is circulated may be insulated by a covering of asbestos or the like, so that heat losses at these points are negligible. From what has been said, it is evident that the maximum amount of heat is delivered to the chamber 20. To further increase the efficiency of the apparatus, the gradually cooling fluid is drawn off through the manifold 50 and returned through the conduit 53 to the combustion apparatus where it is reheated and joins the products of combustion and is recirculated. When desired, the motor 62 that drives the fan 61 may be set in action to cause said fan to exhaust the fluid through the manifold 55 and stack 63.

The driving mechanism for the conveyor is

now set in motion, as by turning current into the motor 70, which causes the conveyor to travel in a direction to lift the racks 77 along the front wall of the oven past the loading opening 10 and, of course, lower the racks on the other side where they pass the unloading opening 11. The operation may be intermittent or continuous. In the latter case, the conveyor traveling at a relatively low speed—the doors 12 are left open and the workmen place the green cores on the shelves or trays of the racks or carriers 77 as they pass the loading opening 10, while other workmen remove the baked cores from the racks as they pass the unloading opening 11. As the green cores rise from the loading station past the housing 22 of the heating chamber they are raised in temperature by heat radiated from the housing and thereafter by the heat of convection throughout the region of the slots 48. Drying progresses at a proper rate of speed as the cores ascend and by the time they descend beyond the slotted area of the rear wall of the distributor, the baking is completed. During their continued descent the cores lose a high percentage of their heat and are cool enough for removal when they reach the opening 11. Shortly after the work passes the last slot 48 on the rear side of the distributor it is protected from radiant heat from the lower portion of the distributor by the shield 49 and the proximity of the housing of the heating chamber will have no appreciable influence on the work because of a jacket of insulation that is applied to the adjacent wall of the housing, as appears in Fig. 4.

Where a building is too low to accommodate a vertical oven of the required capacity, or where such capacity would necessitate a vertical oven of impracticable height, the oven may be, in part, a horizontal oven, as illustrated diagrammatically in Fig. 8, where the elements, corresponding to those of the previously described vertical structure are designated by the same reference characters, augmented by the exponent *a*. In all essential structural respects the two embodiments may be identical, and the operation is precisely the same in both instances.

Having thus described my invention, what I claim is:

1. An oven comprising an elongated walled structure enclosing a heated chamber, a housing enclosing a heating chamber situated within said structure in spaced relation to the top, bottom and side walls thereof and hermetically sealed against direct intercommunication with the heated chamber, a fluid distributor and a fluid recovery duct in said heated chamber, a fluid conducting and impelling means for withdrawing fluid from the heating chamber and delivering it to the distributor, fluid conducting means for receiving fluid from the recovery duct and delivering it to the heating chamber, conveyor guide means in the heated chamber, an endless conveyor supported by said guide means and encircling the aforesaid housing, and article supports sustained by the conveyor.

2. An oven comprising an elongated vertically arranged walled structure enclosing a heated chamber, a housing enclosing a heating chamber situated within said structure in spaced relation to the top, bottom and side walls thereof and hermetically sealed against direct intercommunication with the heated chamber, a fluid distributor in the heated chamber above said housing, a fluid recovery duct adjacent one of said side walls, a fluid exhaust duct adjacent the other of the side walls, a fluid conducting and impelling means for withdrawing fluid from the heating chamber and delivering it to the distributor, fluid conducting means for receiving fluid from the recovery duct and delivering it to the heating chamber, a conveyor guide in the heating chamber above the fluid distributor, an endless conveyor supported by said guide and encircling the aforesaid housing, and article supports sustained by the conveyor.

3. An oven comprising an elongated walled structure enclosing a heated chamber, a housing enclosing a heating chamber situated within said structure in spaced relation to the top, bottom and side walls thereof and hermetically sealed against direct intercommunication with the heated chamber, a fluid distributor in the heated chamber, a fluid recovery duct and a fluid exhaust duct also in said heated chamber, a fluid conducting and impelling means for withdrawing fluid from the heating chamber and delivering it to the distributor, fluid conducting means for receiving fluid from the recovery duct and delivering it to the heating chamber, conveyor guide means, in the heated chamber, an endless conveyor supported by said guide means and encircling the aforesaid housing, and article supports sustained by the conveyor, opposed walls of the structure having, respectively, a loading opening and an unloading opening in the vicinity of said housing.

4. An oven comprising an elongated vertically arranged walled structure enclosing a heated chamber, a housing enclosing a heating chamber situated within the structure in spaced relation to the top, bottom and side walls thereof, a fluid distributor in the heated chamber above said housing, a fluid recovery duct adjacent one of said side walls, a fluid exhaust duct adjacent the other of the side walls, a fluid conducting and impelling means for withdrawing fluid from the heating chamber and delivering it to the distributor, fluid conducting means for receiving fluid from the recovery duct and delivering it to the heating chamber, a conveyor guide in the heating chamber above the fluid distributor, an endless conveyor supported by said guide and encircling the aforesaid housing, article supports sustained by the conveyor, the walled structure having loading and unloading openings, and means for preventing appreciable lateral movement of the conveyor in the region of said openings.

5. An oven comprising a walled structure enclosing a heated chamber, a housing enclosing a combustion chamber situated within said structure, means for delivering fuel and air to the combustion chamber, said chamber having an outlet for the products of combustion and an inlet for fluid, fluid impelling means connected to said outlet for withdrawing the products of combustion from the combustion chamber, a fluid distributor discharging into the heated chamber, a stack, fluid conducting means for delivering the products of combustion to the stack and to said distributor, damper means controlling the passage of the products to the stack and to the distributor, a fluid recovery duct leading from the heated chamber to said inlet of the combustion chamber, an exhaust conduit leading from the heated chamber, and fluid impelling means associated with said exhaust conduit.

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