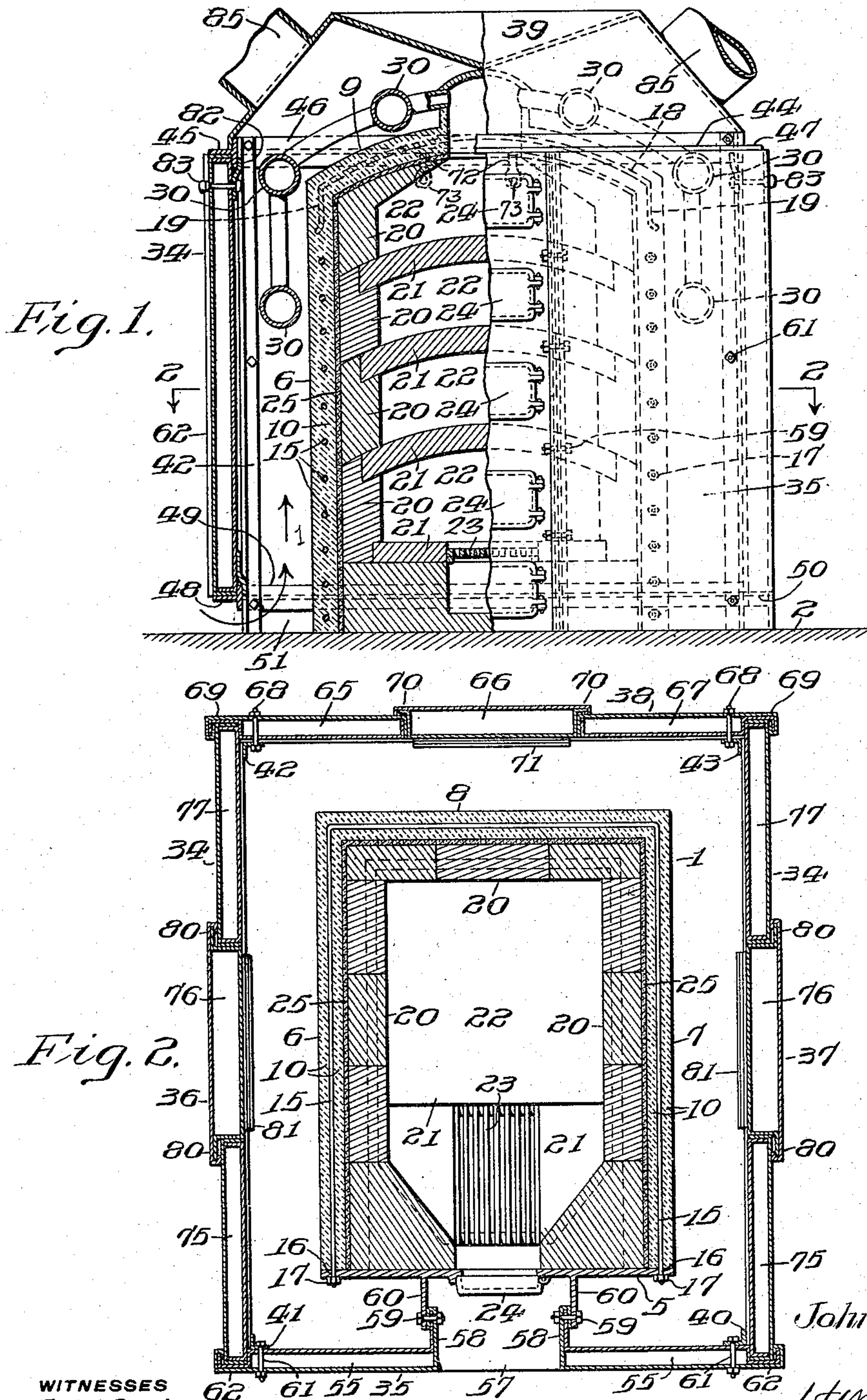


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FURNACE.  
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## FURNACE.

1,167,105.

Specification of Letters Patent.

Patented Jan. 4, 1916.

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*To all whom it may concern:*

Be it known that I, JOHN P. OTT, a citizen of the United States, and a resident of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, this application being a division of my original application, filed June 11, 1912, Serial No. 702,980.

The main objects of this invention are, to provide an improved furnace of simple, compact, durable, and relatively inexpensive construction, and which may be readily taken apart for making repairs, for cleaning, or for other purposes; to provide an improved furnace particularly adapted for the slow combustion on natural draft of fine or cheap fuel, such as culm, fine soft coal, peat, coke, sawdust, or other fine fuel; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a fragmentary front elevation, partly in vertical transverse section, of a furnace constructed in accordance with this invention; and Fig. 2 is a horizontal section on line 2—2 of Fig. 1.

Referring to the drawings, one embodiment of this invention comprises a furnace including a hollow body or main portion 1, preferably substantially rectangular and oblong in planular outline and resting upon a suitable flat foundation 2. The body 1 is preferably formed exteriorly of a vertical front plate 5, vertical side walls 6 and 7, a vertical back wall 8 and a longitudinally horizontal and transversely arched top wall 9. The front plate 5 is preferably made of cast iron, or other similar material, and the side, back and top walls are preferably made of a continuous layer or casing 10 of cement or concrete.

For securing the front plate 5 detachably in position, and for reinforcing the side walls 6 and 7 and the back wall 8, a plurality of horizontal rods 15 are embedded in the cement during the course of construction. Each of these rods 15 is preferably in the form of a yoke, which extends longitudinally through the side walls and back wall. The ends of each rod 15 project snugly through apertures 16 provided therefor in the front plate, and each end is pro-

vided with a nut 17 threaded therein outside of the front plate 5 for clamping the front plate in position.

For reinforcing the top cement wall 9 of the body 1, a plurality of horizontally spaced rods 18 are embedded transversely in the cement of this top wall, and each of these rods has downwardly bent ends 19 embedded and suitably anchored in the cement side walls 6 and 7.

The body 1 of the furnace has an interior lining 20 of removable sections of fire brick, or other suitable non-combustible material, surrounded and supported by which are a plurality of vertically spaced longitudinally horizontal fuel trays 21, of fire brick or similar material forming a plurality of intercommunicating combustion chambers 22. The lowest fuel tray is provided with the usual grate 23, below which is the usual ash pit. The front plate 5 of the furnace is provided with a plurality of doors 24 hinged thereto and covering corresponding apertures through the plate, permitting access to the fuel trays.

To permit of the expansion and contraction of the fire brick lining with respect to the reinforced cement casing, a layer 25 of any suitable non-combustible yielding material is interposed between the cement casing and the fire brick lining in contact with each, and to insure the retention of a suitable amount of heat in the combustion chambers 22 for the slow combustion of fine or low grade fuel. The interposed layer 25 is preferably made of material that is a non-conductor or poor conductor of heat, asbestos being the material preferred. This layer 25 completely separates the cement casing from the fire brick lining and prevents the cement casing from adhering to the brick lining, thus leaving the brick lining free to be removed easily from the interior of the furnace for repairs or replacement, without disturbing the cement casing or its non-combustible lining 25.

Outside of and carried by the body 1 of the furnace are a plurality of heating drums 30, which are connected, as usual, to receive gases of combustion from the combustion chambers 22, and to discharge the same into any suitable chimney or outlet.

Surrounding the body 1 of the furnace and the heating drums 30, and spaced



therefrom, is a double outer casing 34 substantially rectangular and oblong in planular outline and consisting of a vertical front wall 35, two vertical side walls 36, 37, a vertical back wall 38, and a top wall or dome 39. The walls of this outer casing are preferably supported by a rectangular frame, preferably made of iron or steel beams and comprising four vertical angle irons, 40, 41, 42, and 43, arranged within the outer casing at its four corners respectively, and the lower ends of which rest upon the foundation 2 of the furnace. The upper ends of these vertical beams are rigidly connected by four horizontal T beams, 44, 45, 46, and 47, forming a horizontal rectangular continuous upper frame, and the lower ends of the vertical beams are suitably connected by horizontal T beams 48, 49, and 50, forming a three-sided rectangular lower frame open in front. All of these T beams are preferably arranged with their base portions in vertical planes, and with their central webs extending outwardly with respect to the furnace from their base portions respectively. The lower frame 48, 49, and 50, is preferably spaced a short distance above the base 2 of the furnace to provide openings 51 for the admission of cold air from the space surrounding the furnace into the space between the double outer casing 34, and the cement inner casing 10 of the furnace.

The vertical walls of the double outer casing 34 of the furnace are preferably formed of a plurality of readily removable hollow sections of sheet metal, which are detachably secured to the rigid rectangular frame, 40 to 50. Of these walls, the front wall 35 is preferably formed of two vertical hollow sections 55 arranged in the same vertical plane upon opposite sides respectively of the front of the furnace and spaced apart horizontally to provide an opening 57 for access to the doors 24 of the furnace. Each of these front sections 55 is provided on its inner vertical margin with a flange 58, preferably integral therewith and formed by bending and bringing the opposite sides of the section together. This flange 58 projects rearwardly from its section toward the body of the furnace and is detachably clamped adjacent its inner edge, by means of bolts 59, to a vertical flange 60 provided therefor, and which projects outwardly from and is preferably integral with the front plate 5 of the body of the furnace. The outer vertical margin of each of these front sections 55 is detachably, by means of bolts 61 or otherwise, secured to the corresponding vertical angle iron 40 or 41, and is preferably provided with a flanged extension 62, preferably integral therewith forming a rearwardly opening transversely rectangular channel adapted to receive the vertical front marginal portion

of a side section of the outer casing. The extension 62 is preferably formed by bringing the two sides of the section together and bending them to form the channel. The upper ends of these front sections fit snugly in the lower angle formed between the base and the web of the corresponding horizontal T beam 44.

The back vertical wall of the outer casing is preferably formed of three hollow sections 65, 66 and 67, arranged consecutively in horizontal series in the same vertical plane. These sections fit snugly between and are held against displacement vertically or horizontally inwardly by the horizontal central webs and the vertical base portions of the two corresponding horizontal T beams 46 and 49.

The outer vertical marginal portion of each of the outer back sections 65 and 67 is detachably secured by means of bolts 68 to the corresponding vertical angle iron 42 or 43, and the sides of the section are brought together and bent to form a flanged extension 69, preferably integral therewith forming a forwardly opening transversely rectangular channel adapted to receive a vertical edge of a side section. The central section 66 of the back wall is provided upon its outer side with two oppositely disposed vertical marginal flanges 70 which engage against the outer surfaces of the adjoining hollow sections to hold the latter sections in position. The marginal flanges are preferably formed by bringing the two opposite side walls of the section together, and overlapping the edge of one side wall with the marginal portion of the other side wall. The central section 66 is held detachably against withdrawal rearwardly by means of a suitable flange 71 rigidly secured to the inner surface of the central section adjacent the lower margin thereof and overlapping the inner surface of the corresponding lower T beam, and by means of corresponding rotatable fingers 72 engaging the inner surface of the upper T beam and rigidly mounted on rotatable bolts 73 extending through the section whereby the fingers 72 may be rotated into or out of engagement with the inner surface of the upper T-beam. The central section preferably has a short amount of movement vertically between its T beams to permit of its ready removal or adjustment.

Each side wall 36 and 37, of the outer casing, is preferably composed of three hollow sections, 75, 76 and 77, arranged consecutively in horizontal series in the same vertical plane. Each of these sections fits between and is held against displacement vertically or horizontally inwardly by the corresponding T beams 45 and 48 or 47 and 50. The central one, 76, of these sections, is similar in construction to the central sec-



tion 66, hereinbefore described, of the back wall, and is provided, as hereinbefore described, with two oppositely disposed vertical marginal flanges 80 integral therewith, which engage against the outer surface of the adjoining sections 75 and 77. The central side section 76 is also provided with a flange 81 rigid therewith which overlaps and engages the corresponding lower T beam 48 or 50 and with fingers 82 substantially similar to fingers 72 rigidly mounted upon the inner ends of rotatable bolts 83 substantially similar to bolts 73 extending through the sections, the fingers being arranged to be readily rotated by the bolts into or out of engagement with the inner surfaces of the corresponding upper T beam 45 or 47 in a manner similar to that previously described in connection with central section 66. The outer sections 75 and 77 fit snugly in the corresponding channels formed by the flanged extensions 62 and 69, and are held securely in position solely by the corresponding central section 76. From the foregoing, it is evident that by simply turning the bolt 83, the central section 76, and then the adjoining sections 75 and 77, may all be readily removed, and that all of the sections of the outer casing may be easily and quickly detached and removed to permit access across to the interior portions of the furnace, or for any other purpose.

The top wall or dome 39 of the outer casing preferably telescopes snugly over the upper portion of the upper rectangular frame, and rests upon the central webs of the T beams 44, 45, 46 and 47 composing the frame. The usual pipes 85 lead from the dome to deliver the heated air from the furnace.

It has been found in actual practice that a furnace constructed in accordance with this invention possesses many advantages over furnaces as heretofore constructed. For instance, by having the inner casing 10 constructed of cement or concrete, it has been found that it has less tendency to warp or crack or become otherwise misshapen, under the influence of heat, than in a construction where this casing is formed of brick or other materials. It is well known that when brick are used to form a casing for a furnace, numerous braces must be applied to hold the brick in place, but under the most favorable conditions, it is difficult to prevent the brick walls from cracking or spreading. It has also been found that when reinforced cement or concrete is used, as hereinbefore described, a much thinner wall or inner casing is required than when brick is used, and that the cement or concrete wall radiates heat with great efficiency.

As the reinforced concrete construction reduces the extreme dimensions of a furnace having a given capacity for the consumption

of fuel, it has been found possible to provide a comparatively wide heating space between the outer hollow casing and the cement casing and to arrange heating drums in the space, below the top of the concrete casing, as shown in Fig. 1, thus reducing the head room required by a furnace of a given capacity and occupying a given floor space.

It is to be noted that the front plate 5 of this improved furnace may be quickly removed, and that, after the front plate 5 has been removed, the inner lining of fire brick 20, the fuel trays 21 and the grate 23 may be quickly removed, without disturbing the reinforced cement casing 10, or its non-combustible lining 25.

Although only a single form has been illustrated in which this invention may be embodied, it is to be understood that the invention is not limited to any specific construction but may be applied in various forms, without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. A furnace comprising a hollow cement body portion having an open front end, a detachable front plate extending over said end, reinforcing means embedded in said cement and holding said plate in position, a lining of fire brick arranged within said body portion, and means between said fire brick and said body portion adapted to prevent said body portion from adhering to said fire brick.

2. A furnace comprising a hollow cement body portion having an open front end, a detachable front plate extending over said end, reinforcing means embedded in said cement and holding said plate in position, a lining of fire brick arranged within said body portion, and yielding non-combustible means between said fire brick and said body portion adapted to prevent said body portion from adhering to said fire brick.

3. A furnace comprising a hollow cement body portion having an open end and including vertical substantially parallel cement side walls, a vertical cement end wall connecting said side walls and integral therewith, a cement top wall connecting the uppermost portions of said side walls and said end wall, and integral therewith, a substantially vertical metallic front plate extending over said open end, a plurality of substantially horizontal vertically spaced reinforcing rods each of which is in the form of a yoke passing through said side walls and said back wall and having its ends passing through said front plate and provided outside of said front plate with means for clamping said front plate against said cement walls, a plurality of transverse rods



each of which extends through said top wall and has its ends turned downwardly and embedded in the upper portions of said side walls respectively, a fire-brick lining within  
5 said hollow body portion and including substantially vertical side walls, a substantially vertical back wall, a substantially vertical front wall, and a top wall, and a yielding non-combustible cellular layer of material

between each of said cement walls and said 10 fire-brick lining.

In witness whereof, I have hereunto set my hand, this 26th day of November, A. D. 1912.

JOHN P. OTT.

Witnesses:

A. I. GARDNER,  
ALEXANDER PARK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."