J. O. GRIGGS.

OPEN HEARTH FURNACE.

APPLICATION FILED JULY 7, 1919.

1,353,830.

Patented Sept. 28, 1920.

2 SHEETS—SHEET 1.

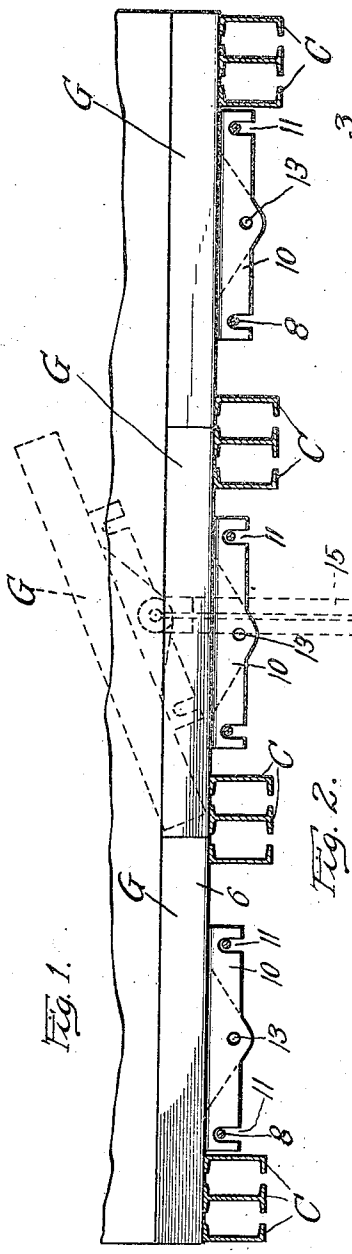


Fig. 1.

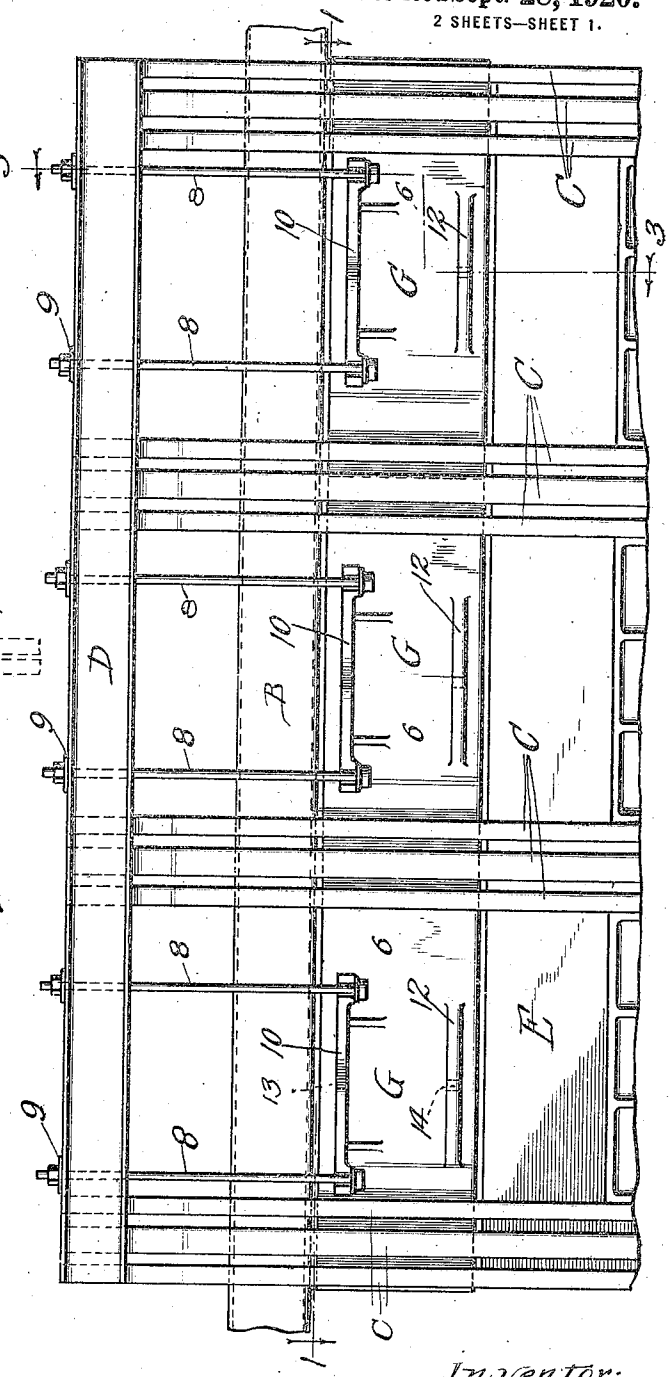


Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 4.

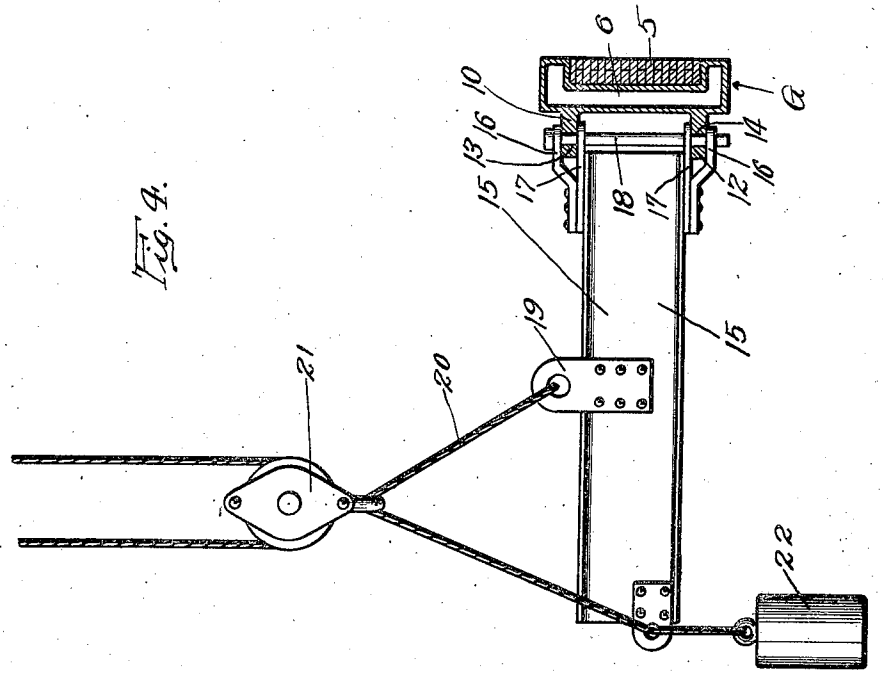
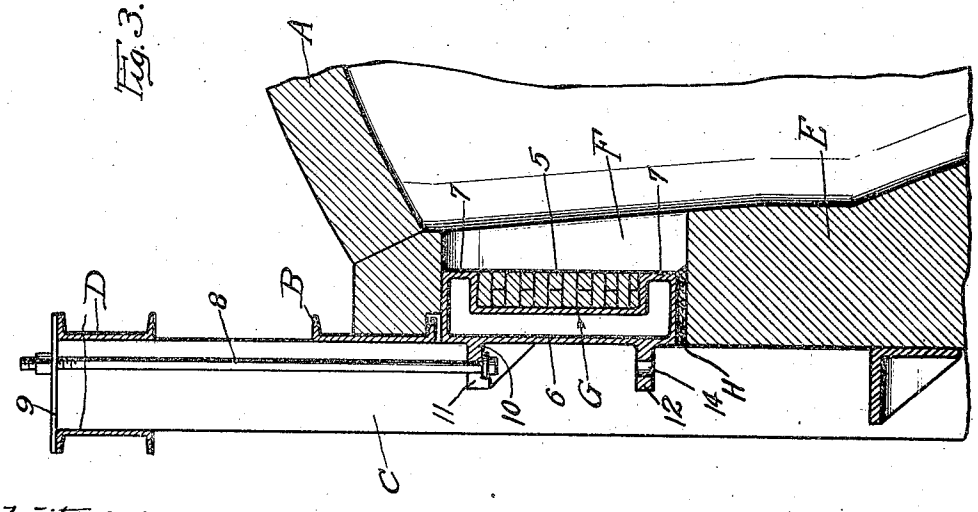


Fig. 3.



Witness:
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UNITED STATES PATENT OFFICE.

JOHN O. GRIGGS, OF YOUNGSTOWN, OHIO.

OPEN-HEARTH FURNACE.

1,353,830. Specification of Letters Patent. Patented Sept. 28, 1920.

Application filed July 7, 1919. Serial No. 308,993.

To all whom it may concern:

Be it known that I, JOHN OLIVER GRIGGS, a citizen of the United States, and a resident of Youngstown, Mahoning county, and State of Ohio, have invented certain new and useful Improvements in Open-Hearth Furnaces, of which the following is declared to be a full, clear, and exact description.

The invention relates to open hearth furnaces and it has particular reference to the back walls thereof. Ordinarily the back walls of open hearth furnaces are constructed of firebrick, reinforced by buck-stays, and because of the intense heat developed in such furnaces, the back wall deteriorates in a short time, falls in and causes considerable damage and loss of time. I have overcome these objectionable features by providing auxiliary walls or substitute walls, which can be quickly installed in place when the original wall becomes dangerous or falls in, and such constructions are fully disclosed in my prior applications for patents on shields or auxiliary walls for furnaces, filed October 25, 1918, Serial No. 259,683, and open hearth furnaces, filed January 20, 1919, Serial No. 272,001.

I have found that a great saving of time and labor may be had by providing open hearth furnaces with portable, removable and replaceable back walls, and this invention consists in a removable and replaceable back wall having means whereby it may be readily and easily carried to and from the furnace, and put in place therein or removed therefrom. It further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a view partly in plan and partly in horizontal section of an open hearth furnace embodying a simple form of the present invention, the line of section being shown at 1—1 in Fig. 2; Fig. 2 is a side elevation of a fragment of the furnace; Fig. 3 is a vertical cross section taken on line 3—3 of Fig. 2, and Fig. 4 is a view partly in elevation and partly in cross section of a wall carrying arm, and one of the back wall sections.

Referring to said drawings, the reference character A designates the arch or roof of the furnace, having the usual skew back channel iron beam B along its side edges. C designates the buck stays, and D lengthwise extending beams secured to the tops of the buck stays. Located considerably below the marginal edge of the arch or roof A and skew back channel iron beam is a wall E and between said wall E and skew back channel iron beam is an opening F, extending lengthwise of the furnace in which are removably secured the portable back wall sections G. Said back wall sections are supported behind the buck stays C, and completely close the opening F from end to end. Refractory material H may be used to close any crevices between the back wall sections and adjacent parts of the furnace.

The exact construction of the back wall sections is immaterial to this invention, broadly considered, and if desired they may be water cooled as is clearly set forth in my prior application on open hearth furnaces, filed June 2, 1919, Serial No. 301,257. As illustrated, each section comprises a wall or facing 5 of fire brick or other refractory material and a hollow supporting frame 6 therefor which acts as a water jacket, through which water is circulated to cool the back wall. The frame 6 has a rectangular shoulder or projection 7 surrounding the fire brick or facing 5, and the fire bricks are securely held in place in the frame-like projection and with said jackets constitutes the back wall. The water jacket of the frame 6 may be dispensed with, if desirable, but it prolongs the life of the back wall, and enables me to use a cheaper grade of fire brick in the back wall.

The back wall sections G may be removably supported in any suitable manner, and I have illustrated rods 8 for this purpose, which are suspended from the beams D by cross bars 9. The back wall sections G have horizontal webs or flanges 10 formed thereon with which the lower ends of the rods engage, and preferably said webs are formed with notches 11 in their forward edges whereby the rods may be quickly connected to the sections in installing them in place. The lower ends of the rods may be formed with heads engaging the lower sides of the webs, and nuts may be secured upon the threaded upper ends of the rods which may be tightened to draw the sections up against the roof.

Below the web of each back wall section is a web or flange 12, and in said webs 10, 12 are formed alined apertures 13, 14, the

purpose of which will be presently explained.

In case any section or all of them become deteriorated after long continued usage and there is danger of the bricks falling into the furnace, or if they have fallen in, such section or sections may be instantly replaced by a fresh one, without the necessity of shutting down the furnace and permitting the heat to "freeze" and become solidified, it being understood that the heat issuing from a break or opening in the wall is so intense that it is practically impossible for workmen to approach closely while exposed to this extreme heat. With the present invention it is unnecessary for the workmen to approach the opening in the wall, but the worn section may be removed and replaced by workmen located far enough away from the opening in the furnace wall to be comfortable. This I have accomplished by providing a wall carrying arm 15 of substantial construction, capable of supporting a back wall section, and which may be transported by a crane or other hoisting machinery such as is commonly used in plants employing open-hearth furnaces. Said arm is provided with perforated ears 16, 17 arranged in pairs as shown in Fig. 4, that are arranged to be slipped over the webs 10, 12 of any back wall section, and removably and pivotally connected thereto by a pin 18. The arm 15 is provided, intermediate its ends, with an apertured bracket 19 to which may be secured a cable or other connection 20 that is attached to the crane hook 21, the cables of which pass up to the drum mechanism of the crane. A counter-weight 22 is attached to the end of the arm opposite the one carrying the back wall section, and if desired the cable 20 may be attached to the arm at the counter-weight to prevent it from suddenly tipping up the other end when the load is removed.

Any number of the back wall sections may be furnished with a furnace, and may be stored conveniently close to the furnace. When the fire brick of a back wall section burns out, or has deteriorated to such an extent as to be unfit for further use, the arm 15 is attached to a fresh section, the hook of the crane attached to the arm 15 and the section moved to a place adjacent the worn section. The arm is then detached from the fresh section, raised by the crane and attached to the worn section by sliding the ears 16, 17 over the webs 10, 12, and thrusting the pin 18 through the apertures thereof. The bolts 8 are then removed from the web 10 and the weight of the section is then borne by the counter-weighted arm 15. The crane is then operated to first push the back wall section into the furnace far enough to disengage it with adjacent sections or other parts of the furnace, after which the crane is moved lengthwise of the furnace until one end of the back wall section clears the adjacent buck stays, whereupon the crane is moved transversely of the furnace to draw the back wall section out through the opening in the back wall. While being drawn out one end will strike the buck stays but the other end is free to move out through the opening, the buck stay acting as a fulcrum about which the section is swung by the crane to pull it out through the opening. When removed, it is lowered, the arm detached therefrom and attached to the fresh section and the latter raised and inserted through the opening. While inserting it, it may be placed at an angle to the arm so as to pass freely between the buck stays and when it has been inserted far enough to clear the buck stays the crane is moved lengthwise of the furnace to bring one end of the section behind the buck stays (see dotted lines in Fig. 1) and then moved transversely of the furnace, thus pulling the section forward into place between adjacent sections or other parts of the furnace. The rods 8 are thereupon attached to the web 10, the nuts thereon tightened up, and the arm detached from the section. When a water jacket is used, the water connections are made as explained in my prior application. The fire brick in the used section may be replaced with new fire brick and thus the frame of the section may be used repeatedly.

It will be seen that injured back walls may be instantly replaced, permitting the heat to go on during the short time required to replace the injured section, that the life of the furnace is increased and that the operation thereof may be practically continuous until the furnace is completely worn out.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

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

1. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure capable of being inserted in place and removed therefrom, and means for supporting said sections behind the buck stays, detachably connected with the sections.

2. In an open hearth furnace, having a

back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure capable of being inserted in place and removed therefrom and having at least one face composed of refractory material, and means for supporting said sections behind the buck stays, detachably connected with the sections.

3. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure capable of being inserted in place and removed therefrom and having a wall of refractory material carried by a frame and means for supporting said sections behind the buck stays, detachably connected with the sections.

4. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections, adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure, capable of being inserted in place and removed therefrom and having a wall of refractory material carried by a water jacket, and means for supporting said sections behind the buck stays, detachably connected with the sections.

5. In an open hearth furnace, having a back wall opening extending lengthwise thereof and buck stays crossing said opening, a plurality of portable water-cooled back wall sections, adapted to be arranged, end to end, behind said buck stays to close said openings, each section comprising a rigid structure capable of being inserted in place and removed therefrom, and means for supporting said sections behind the buck stays, detachably connected with the sections.

6. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections, adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure, capable of being inserted in place and removed therefrom, there being upper and lower apertured webs on the outer faces of said sections for attachment to supporting means, and to traveling handling means.

7. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections, adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure capable of being inserted in place and removed therefrom, there being webs on the outer faces of the sections, and an arm capable of attachment to said webs substantially as and for the purpose set forth.

8. In an open hearth furnace, having a back wall opening extending lengthwise thereof, and buck stays crossing said opening, a plurality of portable back wall sections, adapted to be arranged, end to end, behind said buck stays to close said opening, each section comprising a rigid structure, capable of being inserted in place and removed therefrom, there being webs on the outer faces of the sections, and a counterweighted movable arm having a detachable connection with said webs, substantially as and for the purpose set forth.

9. In an open hearth furnace, the combination of the furnace arch and buck stays, of removable and replaceable rigid back wall sections, set end to end behind said buck stays, and means for removably supporting said sections behind the buck stays.

10. In an open hearth furnace having spaced buck stays at its back wall, a portable, removable and replaceable back wall extending behind said buck stays and a dirigible arm detachably secured thereto, whereby said wall may be handled in removing it or replacing it in the furnace behind said buck stays.

11. In an open hearth furnace having spaced buck stays at its back wall, a portable, removable and replaceable back wall extending behind said buck stays and a counterweighted dirigible arm detachably secured thereto, whereby said wall may be handled in removing it or replacing it in the furnace behind said buck stays.

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