July 26, 1949. L. L. AUSLAND ET AL 2,477,161

WATER-COOLED PANEL FOR OPEN-HEARTH FURNACES

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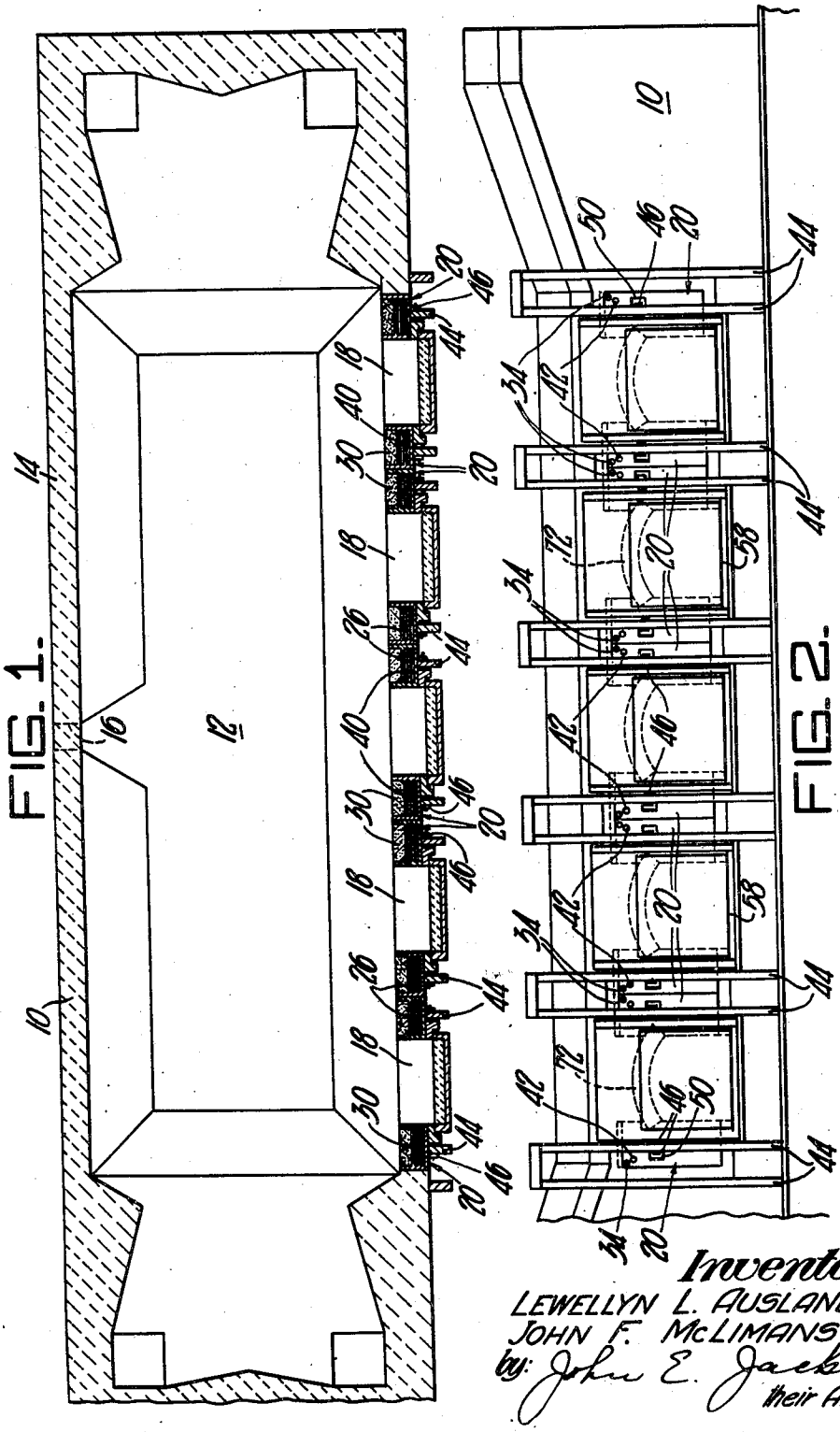


FIG. 1.

FIG. 2.

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FIG. 3.

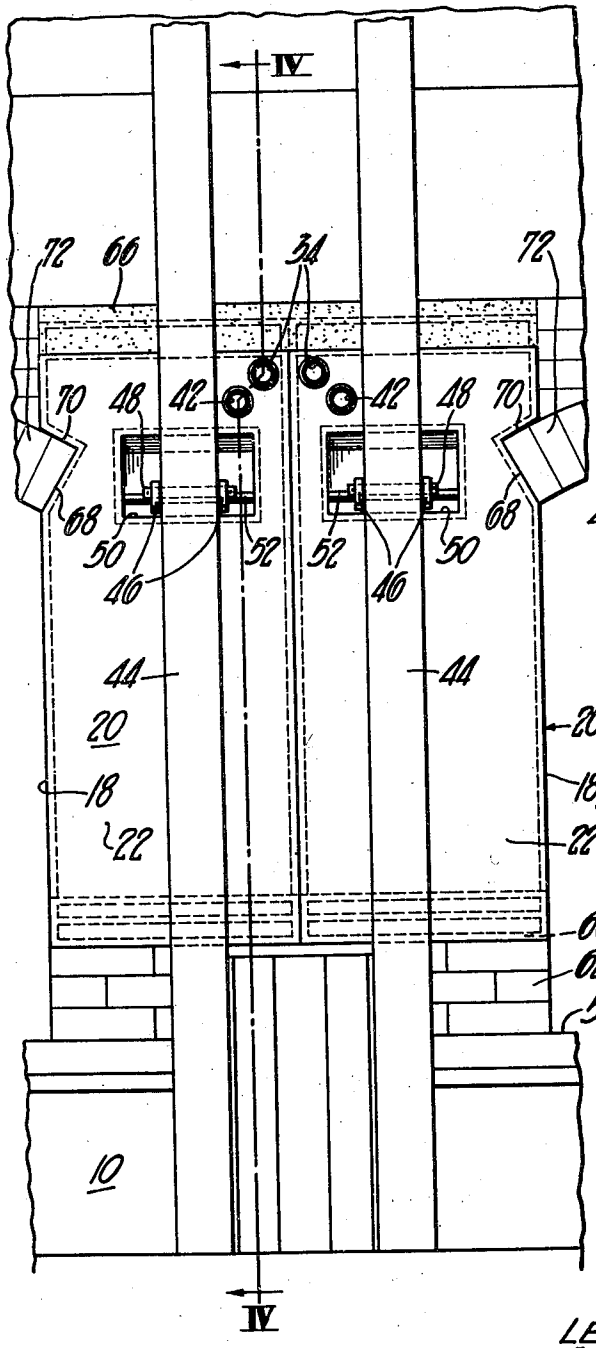
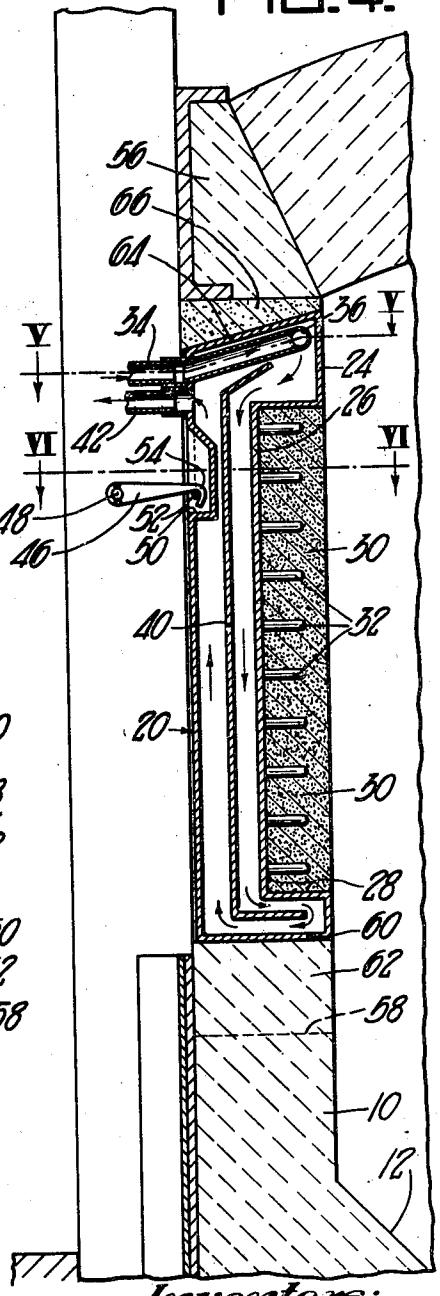


FIG. 4.



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FIG. 5.

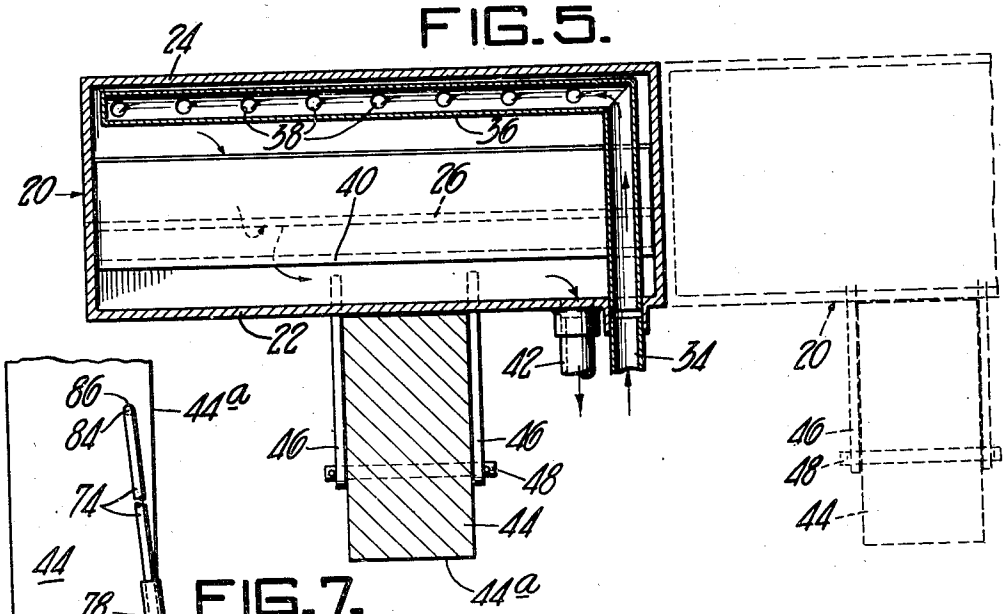


FIG. 7.

FIG. 6.

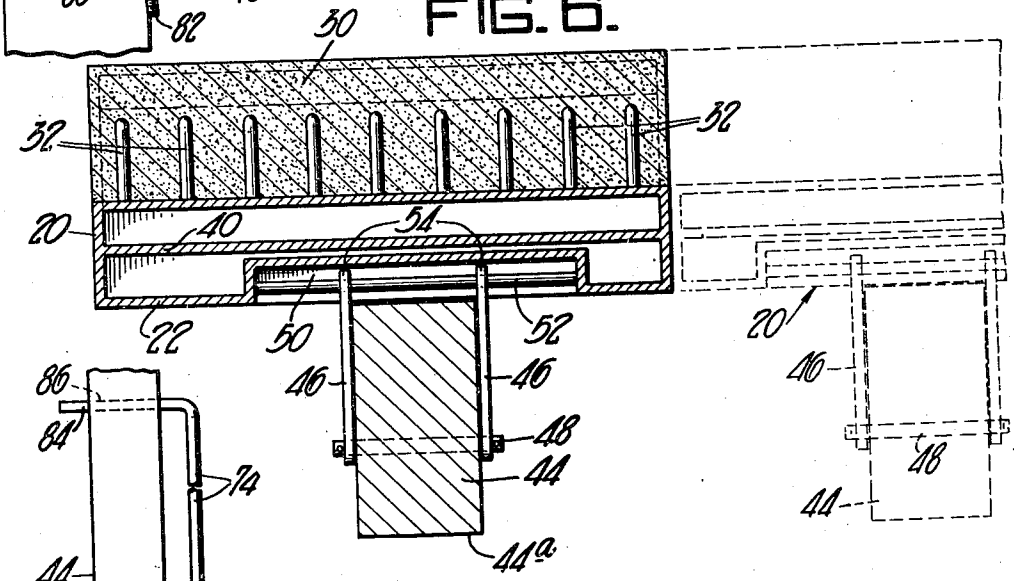


FIG. 8.

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WATER-COOLED PANEL FOR OPEN-HEARTH FURNACES

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Application August 1, 1944, Serial No. 547,580

2 Claims. (Cl. 122—498)

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The present invention relates to an improvement in an open hearth steel making furnace construction, and particularly to the provision of a novel type of front wall characterized by the inclusion therein of prefabricated water-cooled panel units adapted to be detachably incorporated in the front wall of the furnace between the charging door openings thereof and detachably connected to the buck-stays of the furnace.

An embodiment of the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a horizontal section through an open hearth furnace incorporating the herein claimed improvements.

Figure 2 is an elevation of the front wall of the improved furnace.

Figure 3 is an enlarged fragmentary elevation of the front wall of the furnace.

Figure 4 is a vertical section on line IV—IV of Figure 3 illustrating means for detachably securing the water-cooled panel unit to the buck-stays of the furnace.

Figures 5 and 6 are horizontal sections taken on the correspondingly numbered lines of Figure 4.

Figures 7 and 8 are detail views of a rigging for facilitating the installation of the prefabricated panel units.

Heretofore the walls of an open hearth furnace have usually been built up of refractory brick laid up in a manner well known to skilled furnace bricklayers. When repairs to the walls have been required during the campaign of the furnace, it has been necessary to shut down the furnace temporarily and clean out much of the eroded brickwork and to manually replace it. To avoid materially cutting down the production of a given furnace, it is necessary that the period of shut-down for the purpose of making repairs be as short as possible. Accordingly the furnace is allowed to cool down only to a sufficient degree to permit workmen to enter without being burned or overcome by the heat.

It is known to those skilled in the art that under ordinary conditions the furnace is never allowed to cool down to a point where it is comfortable for a human being to work therein. The heat is so intense that it is frequently necessary for the operators to wear asbestos protective garments. A given workman can work within the hot furnace for a very short time interval, and separate shifts of men are required for a given repair job. Under the present invention the length of time the workmen are required to remain in the furnace is materially cut down.

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Thus the repairmen are required to spend considerably less time under the extreme temperature conditions.

Referring in detail to the embodiment of the invention illustrated, reference numeral 10 represents a somewhat conventional form of an open hearth steel making furnace having the usual hearth 12, the usual form of back wall 14, and the usual tapping hole 16. The present improvement is directed particularly to the front wall, which includes a plurality of charging door openings 18, the portions of the front wall between the openings comprising hollow prefabricated water-cooled panels indicated generally at 20. These panels are adapted to be installed and removed as a unit, so as to lessen the time required to make repairs.

Each prefabricated panel unit comprises an outer wall 22, and an inner metallic wall 24 and 26 offset outwardly to provide a recess 28 to receive a lining of refractory filling material 30 such as chrome patch cement. This refractory filling is bonded to the unit and held in place by anchorage means such as pins 32 welded to and projecting inwardly from the wall 26.

Cooling water enters each panel unit by way of a pipe 34 which communicates with the distributor pipe 36 located within the unit and provided with a plurality of discharge orifices 38. Within the hollow chamber of each unit there is a baffle wall 40 adapted to compel the cooling water to circulate in a tortuous path, as indicated by the arrows in Figure 4. The cooling water thus leaves each panel unit by way of an outlet pipe 42 which discharges into a suitable sump or storage tank (not shown). The water-cooled panel units of our invention are adapted to be readily incorporated in open hearth furnaces of otherwise conventional design. For this reason we provide means for detachably securing the units to the conventional buck-stays of a furnace. As shown in the embodiment of the invention illustrated, such conventional upright buck-stays are shown at 44 in the drawings. To each buck-stay we provide a plurality of hook-like members 46 pivotally mounted on rods 48 suitably secured to the buck-stays. The outer wall 22 of each water-cooled unit is formed with a recess 50 which is spanned by a rod 52 adapted to be engaged by the hooked end 54 of the member 46.

Each water-cooled panel 20 is of such a height that it extends from the portion immediately below the skew brick 56 near the roof of the furnace, almost to the level or plane 58 of the bottom of the door openings, the space between the

level 58 and the lower wall 60 of the panel unit being filled with one or more courses of brickwork 62 and the space between the top wall 64 of the panel unit and the under-side of the skew brick 56 being conveniently filled with chrome patch cement or other suitable furnace refractory material, as indicated at 66. Thus it will be understood by those skilled in the art that when it is necessary to make repairs to the front wall of the furnace the water-cooled panels can be removed bodily as separate units, and previously prepared or prefabricated replacement panel units can be readily installed. Each prefabricated panel unit is provided with a notched portion defined by inclined walls 68 and 70 which furnish convenient supports for the brickwork arches 72 constituting the top walls of the door openings. In most instances the brickwork over the door opening will be eroded to such an extent that it will be necessary to replace it at the same time that the panels are being replaced. If this brickwork is not to be replaced it is necessary to provide a temporary support for the arch to prevent all of the brickwork from falling while the panel is being replaced.

To facilitate the quick installation of the water-cooled panel units, we find it advantageous, although not absolutely essential, to utilize the installation rigging shown in Figures 7 and 8. This rigging comprises an L-shaped rod 74, to the lower end of which there is secured a plate 76 having a pipe-like sleeve 78 welded or otherwise secured thereto, the plate being adjustably supported by a nut 80 screwed on the threaded end 82 of the rod. The upper leg 84 of the rod is bent to a substantially horizontal position, and is adapted to be inserted in a hole 86 located at any convenient point in the buck-stay below the detachably secured hook 46. In using this rigging the panel unit is positioned on the plate 76 and the unit is pushed forward clear of the edge 44a of the buck-stay, as shown in Figure 7. The plate 76 with the panel unit supported thereon is then rotated so that the outer face of the panel unit is parallel with the inner face of the buck-stay. When thus positioned the member 46 is dropped so that the hooked end 54 thereof engages the retainer bar 52. Suitable temporary supports such as bricks or blocks are then placed under the panel unit to temporarily hold it in place, whereupon the plate 76 is lowered or removed and the portion 84 of the bar 74 is disconnected from the buck-stay. Thereafter a permanent course or two of brick are laid up to fill the space between the door opening level 58 and the under-side 60 of the panel unit. The refractory filling 66 is then inserted to close the space between the bottom of the skewback and the top of the panel unit.

It will be appreciated by those skilled in the art that the invention shown and described provides

means whereby rapid repairs can be made to the front walls of an open hearth furnace and thus eliminate the necessity of men working for long periods of time under elevated temperature conditions. Thus the comfort of the workmen will be greater and the time necessary for making repairs will be minimized. It will be understood that when the refractory material such as chrome patch cement or the like burns out in any given panel, the panel is removed as a unit and a previously prefabricated panel unit is substituted for the burned-out or damaged unit. The invention will provide better front wall conditions throughout the campaign of the furnace, since there will be an incentive for frequent repairs so as to maintain optimum furnace conditions, since the repairs can be made more frequently because of the ease and comparative comfort for the workmen engaged in this task.

Various modifications may be made without departure from the invention as defined in the appended claims.

We claim:

1. An open hearth furnace having a front wall formed with a plurality of charging door openings, an arch over each door opening, vertical buck-stays bearing on the outside of said front wall between said openings, the front wall portions between each adjacent pairs of said openings comprising hollow metallic water-cooled readily removable panel units whose inner faces are recessed and lined with non-metallic refractory material, each of said panel units having a recess in the outer upper part thereof, a rod spanning said outer recess and carried by the panel, and anchorage means pivotally mounted on one of said buck-stays and having a hook portion extending over said rod for detachably connecting said panel to said buck-stays.

2. An open hearth furnace according to claim 1 in which each of said panels has a notched recess therein adjacent the door opening associated therewith for supporting the arch of said charging door opening.

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