March 31, 1964 G. HIRSCHBERG ETAL 3,127,154

FURNACE CONSTRUCTION

Filed Jan. 11, 1962 2 Sheets-Sheet 1

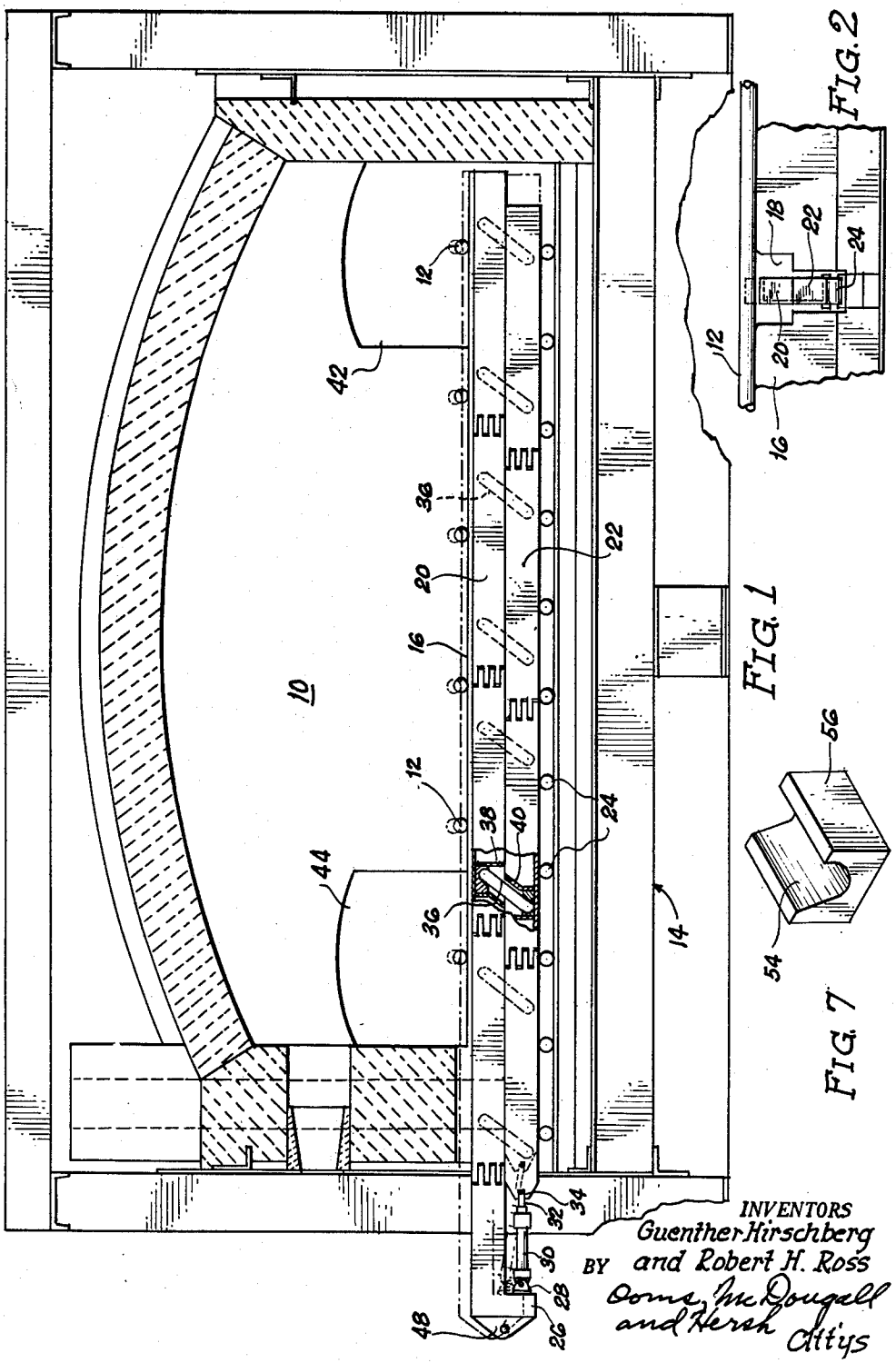

FIG. 1

FIG. 2

FIG. 7

INVENTORS
Guenther Hirschberg
and Robert H. Ross
BY Dorns, McDougall and Hersh
Attys

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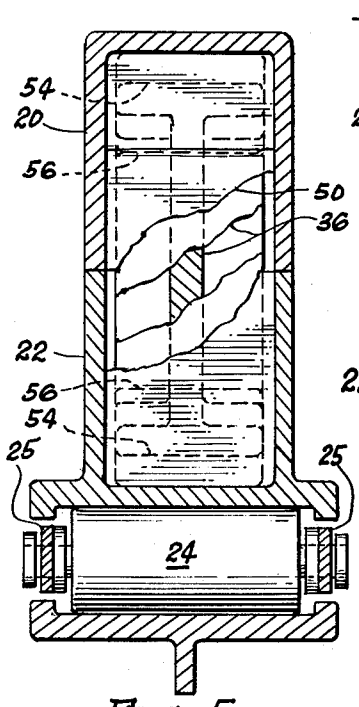

FIG. 5

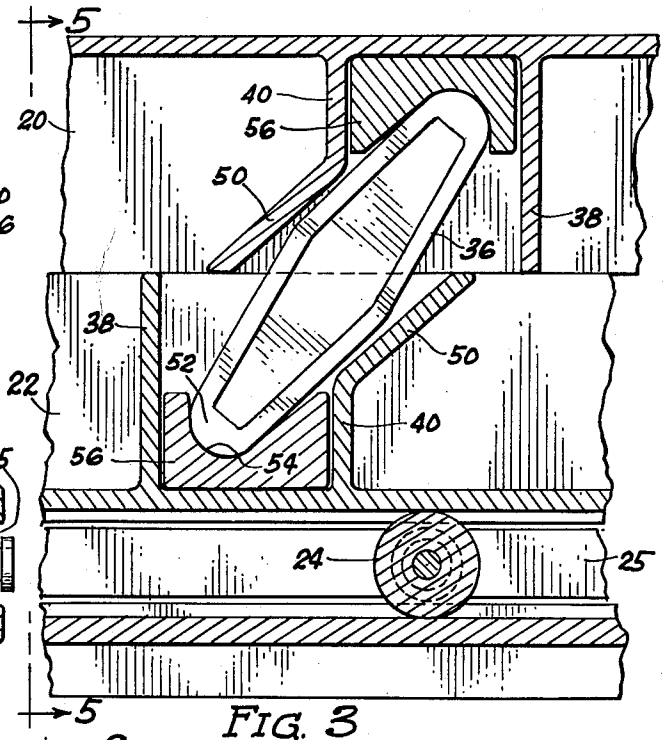

FIG. 3

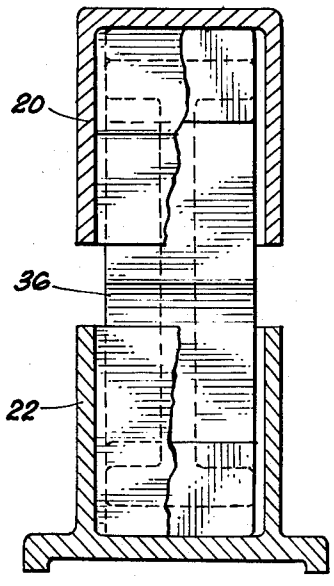

FIG. 6

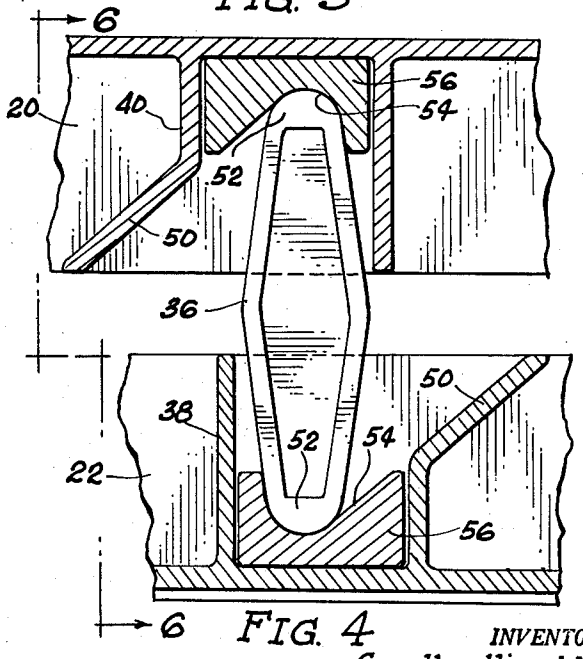

FIG. 4

INVENTORS
Guenther Hirschberg
BY and Robert H. Ross

Dorn, McDougall and Hersh
Attys

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FURNACE CONSTRUCTION

Guenther Hirschberg, Chicago, and Robert H. Ross, Wheaton, Ill., assignors to Flinn & Dreffein Engineering Co., Chicago, Ill., a corporation of Illinois

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5 Claims. (Cl. 263—6)

This invention relates to a furnace construction and it relates more particularly to improved means for moving the work within a furnace from one location to another.

There are many occasions when it is desirable to transport materials to different locations in a furnace. Thus, many large furnaces are designed whereby hotter and colder zones are developed, and it is the practice of the industry to move the work from one zone to another in a heat treating cycle. Furthermore, ideally uniform heating of work can be accomplished if the respective pieces are moved in a series of steps from an entry end to an exit end in the furnace.

Many devices have been developed which will accomplish moving of materials in a furnace. Devices for this purpose must be capable of operating at extreme temperatures and must be controllable from outside the furnace. In order to accomplish this, mechanisms of relatively complex construction have been resorted to, and this has led to undue expense and severe maintenance problems.

A further drawback of existing mechanisms relates to the supporting structure for the mechanisms. In many cases, it has been necessary to pass supporting structure through the furnace bottom and to provide pits beneath the furnace to permit access to this structure. This is, necessarily, an expensive operation and, in addition, constructions of this type tend to develop drafts in the furnaces due to holes in the bottom.

It is an object of this invention to provide improved means for furnace constructions which are capable of moving the work within the furnace from one location to another.

It is an additional object of this invention to provide a means for relocating work within a furnace which is relatively simple in construction and operation and which does not require undue expense in its installation or in its maintenance.

It is a further object of this invention to provide a work relocating means within a furnace which is provided with an operating and supporting structure which does not pass through the furnace bottom whereby pits beneath the furnace can be avoided and drafts through the furnace will not develop.

These and other objects of this invention will appear hereinafter and, for purposes of illustration, but not of limitation, specific embodiments of this invention are shown in the accompanying drawings in which:

FIGURE 1 is a vertical elevation of a furnace construction provided with the mechanisms of this invention;

FIGURE 2 is a detail end view of the beam construction forming part of the mechanisms of this invention;

FIGURE 3 is a detail side elevation;

FIGURE 4 is a detail side elevation similar to that shown in FIGURE 3 with the upper beam shown in its raised position;

FIGURE 5 is a vertical section taken about the line 5—5 of FIGURE 3;

FIGURE 6 is a vertical section taken about the line 6—6 of FIGURE 4; and

FIGURE 7 is a detail perspective view of a removable bearing insert employed in the practice of this invention.

The mechanisms of this invention are provided in a

furnace construction which has a closed bottom and which is provided with upstanding supporting means for maintaining the work in the furnace in a horizontal plane. Channel means which are disposed between adjacent supporting means are employed for locating the means employed for transferring the work from one location to another. The means employed for transferring the work comprise upper and lower beams which are horizontally disposed within the channels. Bearing means with concave seats are disposed in corresponding parts of the upper and lower beams and linking bars having convex ends pivotally interfit with the bearing seats. The linking bars are of a length sufficient to maintain the beams in spaced apart relation when the bars and their respective seats are aligned in a vertical plane. Means are provided for horizontally shifting the upper and lower beams relative to each other whereby the linking bars can be moved to and from a vertically aligned position. When the linking bars are vertically aligned, they are adapted to hold the upper beam above the supporting means for the work, at which time the interconnected upper and lower beams can be horizontally moved relative to the supporting means. Accordingly, the work on the supporting means can be carried with the upper and lower beams to a new location.

With a mechanism of the type described, there is no need for providing any supporting structure beneath the furnace. With this arrangement, no expensive pits need be placed beneath the furnace, and no holes are formed in the furnace bottom which would initiate drafts in the furnace. Furthermore, it will be apparent that the entire beam assembly making up the inventive mechanism can be replaced without cooling the furnace. There is no need for workmen to move into the furnace and maintenance of the mechanism is, accordingly, greatly facilitated.

In a preferred practice of this invention, the bearing seats for the linking bars are provided as inserts which can be removed from the upper and lower beams. With an arrangement of this nature, there is no actual wear imparted to the beams themselves, only the bearing inserts and linking bars can wear out, and these can be easily replaced.

Additional means are provided which cooperate with the above described mechanisms to insure ease of maintenance and smooth operation in the apparatus. Specifically, a roller bed is provided at the bottom of the channels and the lower beam is adapted to rest on the roller bed. The rollers can be readily removed and replaced when necessary. In addition, a piston arrangement is preferably provided for reciprocating the interconnected upper and lower beams when it is desired to shift these beams with respect to each other. In accordance with this invention, the piston means and associated cylinder are pivotally connected to the upper and lower beams whereby the piston and cylinder assembly is adapted to move in a vertical plane while providing shifting movement in the upper and lower beams.

The accompanying drawings will serve to provide a more detailed explanation of the improved furnace construction of this invention. FIGURE 1 illustrates a furnace 10 in which some work, illustrated as the bars 12, is to be heat treated. As an example of the capabilities of the structure of this invention, it can be assumed that the work is to be moved from the right hand section of the furnace to the left hand section. It will be apparent, however, in considering the following description, that the mechanisms of this invention can be employed in various conventional furnaces and can be used for moving material in any direction and in steps of different magnitudes.

Associated with the bottom section 14 of the furnace

there are provided upstanding supporting means comprising piers 16. Channels 18 are formed between adjacent piers and upper and lower beams 20 and 22, respectively, are adapted to be located within the channels 18. The lower beam 22 is adapted to rest and is movable on a roller bed made up of rollers 24. Spacers 25 (see FIGS. 3 and 5) serve to maintain proper location of the rollers.

The upper beam 20 is provided with a downwardly extending portion 26 at one end. Pivotally secured to the portion 26 by means of a bracket 28 is a hydraulic cylinder 30. The cylinder 30 is provided with a piston 32 which is pivotally connected at 34 to the lower beam 22. It will be apparent that these mechanisms could be located in reverse positions.

A plurality of linking bars 36 are disposed within compartments formed by partitions 38 and 40 in the upper and lower beams. The linking bars are of a length sufficient to maintain the beams in spaced apart relation when the bars are aligned in a vertical plane. The hydraulic cylinder and associated piston are adapted to shift the upper and lower beams relative to each other, whereby the upper beam will be raised when the bars 36 are vertically aligned. As the upper beam is raised, the hydraulic cylinder 30 and piston 32 are adapted to pivot at their ends while performing the reciprocating functions.

Any conventional means (not shown) can be connected to the beam 20 at 48 in order to move the upper and lower beam assembly over the roller bed. The means connected at 48 can be any manually operated or automatically driven device which will permit horizontal movement of the beam assembly during relocation of the work in the furnace or during positioning of the assembly.

FIGURES 3 through 7 illustrate in detail the mounting for the linking bars 36. As shown in FIGURE 3, the linking bars 36 are adapted to be angularly disposed when the upper and lower beams are in engagement. Angular flanges 50 on the partition 40 permit angular positioning of the bars.

The convex end 52 of the bars 36 is adapted to fit into corresponding concave seats 54 formed in the bearing inserts 56. It will be apparent that the interengagement of the linking bars and bearing inserts will provide for smooth operation of the apparatus. It will also be apparent that a means is provided for readily adjusting the height to which the upper beam can be extended. Thus, the length of the linking bars 36 can be extended as desired, and it will be obvious that these bars can be replaced with a minimum of effort.

In a typical operation of the described mechanisms, the work 12 is brought into the furnace through door 42, moved in steps through the furnace until opposite exit door 44. It will be apparent that two or more beam assemblies can be employed depending on the size of the work.

Movement of the work is accomplished by first operating the cylinder 30 whereby the forward stroke of the piston 32 will move the lower beam 22 to the right relative to the upper beam 20. The work 12 will be raised to the dotted line position shown in FIGURE 1 and the upper and lower beams will be retained in this position while means connected at 48 are made operative to move the beam assembly to the left over the roller bed. When the work has been moved one step, the piston 32 is retracted and, therefore, the top surface of the upper beam will pass beneath the top surface of the piers 16. Accordingly, the work 12 will again come to rest on the piers at a new location in the furnace. The work opposite door 44 can be withdrawn and a new bar inserted opposite door 42.

The provision of the walking beam assemblies in the manner described avoids drafts due to openings in the furnace floor and the "chimney effect" is, therefore, eliminated. The only opening occasioned by the location of the assemblies in accordance with this invention is at the side and tendency for severe drafts is, therefore, reduced.

Suitable flexible seals are available for further reducing heat loss.

The design of the bars 36 and the inserts 56 provides for smooth dependable operation in the apparatus. Virtually all the wear during operation is taken up by these members and, therefore, maintenance is kept to a minimum. Alternative forms for the bars and bearing seats are also contemplated. Thus, the seats could be flat or convex, while the ends of the bars are given a square shape. Accordingly, sliding friction would be eliminated since the bars would effectively "roll" over the seats.

The linking bars and bearing inserts can be replaced by raising the upper beam beyond the length of the bars 36 for access to the interior compartments. New rollers 24 can similarly be substituted, since the roller bed is accessible if the beam assembly is moved out of the furnace.

Obviously, two or more of the beam assemblies described can be employed in a single furnace. The plural units can be easily adapted for simultaneous operation. Furthermore, it will be understood that means other than the specific piston arrangement can be employed for moving the upper and lower beams relative to each other and the linkage between these beams is interchangeable.

In referring to "upstanding supporting means" for the work in the following claims, it will be understood that use is contemplated of spaced apart piers or the like which extend above the furnace floor and which are capable of receiving between them the beam construction of this invention. Alternatively, the "upstanding supporting means" can extend from the bottom of channel depressions formed in the furnace floor whereby the beam construction will lie beneath the normal floor level, while the work will rest directly on the floor.

It will be understood that various modifications can be made in the above described furnace construction which provide the characteristics of this invention without departing from the spirit thereof, particularly as defined in the following claims.

We claim:

1. In a furnace construction having a closed bottom, upstanding supporting means provided for maintaining the work in the furnace in a horizontal plane, and channel means disposed between adjacent supporting means, the improvement comprising means for moving said work within said furnace from one location on said supporting means to another, said moving means including upper and lower beams horizontally disposed within at least one of said channel means, said beams defining open interior portions, substantially vertically disposed partition walls formed transversely of the length of said partitions in said interior portions to thereby define a plurality of bearing receiving compartments therein in spaced-apart relationship along the length of each of said beams, removable bearing inserts with concave seats disposed within said compartments and secured against lateral movement with respect to their associated beams by means of their engagement with said partition walls, linking bars having convex ends pivotally interfitting with said seats, said bearing inserts being held within said compartments by reason of their engagement with said linking bars, said linking bars having a length sufficient to maintain said beams in spaced apart relation when the bars and their respective seats are aligned in a vertical plane, means connected to said lower beam for horizontally shifting said beams relative to each other, said linking bars being adapted to hold the top of said upper beam above the top of said supporting means whenever the beams are disposed in said spaced apart relation, a roller bed made up of a plurality of rollers mounted for rotation in the bottom of said channel means, said roller bed supporting said lower beam, means connecting said upper and lower beams and means associated with said connecting means for horizontally moving the upper and lower beams over said roller bed.

2. A construction according to claim 1 wherein the means for horizontally shifting said beams include a hydraulic cylinder and piston, said piston being operatively connected to said lower beam for reciprocating said beam, and said furnace construction further including means for restraining said upper beam during shifting movement of the lower beam.

3. A construction according to claim 2 wherein said piston is pivotally connected to said lower beam and the cylinder is pivotally connected to said upper beam whereby the cylinder and piston are movable in a vertical plane when the relative shifting movement of said beams occurs.

4. In a furnace construction having a closed bottom, upstanding supporting means provided for maintaining the work in the furnace in a horizontal plane, and channel means between adjacent supporting means, the improvement comprising means for moving said work within the furnace from one location on said supporting means to another, said moving means including upper and lower beams horizontally disposed within at least one of said channel means, substantially vertically disposed partition walls formed in said beams to provide a plurality of bearing receiving compartments therein, removable bearing means disposed in said compartments, linking bars pivotally interfitting with said bearing means, said bearing means being held within said compartments by reason of their engagement with said linking bars, said linking bars having a length sufficient to maintain said beams in spaced apart relation when the bars and their respective bearing means are aligned in a vertical plane, said linking bars being adapted to assume an angularly disposed position when said upper beam rests on said lower beam, means for horizontally shifting said beams relative to each other, said linking bars being adapted to hold the top of said upper beam above the top of said supporting means whenever the beams are disposed in said spaced apart relation, and means for horizontally moving the upper and lower beams together.

5. In a furnace construction having a closed bottom, upstanding supporting means provided for maintaining the work in the furnace in a horizontal plane, and channel means between adjacent supporting means, the improvement comprising means for moving said work within the furnace from one location on said supporting means to another, said moving means inlucding upper and lower beams horizontally disposed within at least one of said channel means, substantially vertically disposed partition walls formed in said beams to provide a plurality of bearing receiving compartments therein, removable bearing means disposed in said compartments, linking bars pivotally interfitting with said bearing means, said linking bars having a length sufficient to maintain said beams in spaced apart relation when the bars and their respective bearing means are aligned in a vertical plane, said linking bars being adapted to assume an angularly disposed position when said upper beam rests on said lower beam, means for horizontally shifting said beams relative to each other, said linking bars being adapted to hold the top of said upper beam above the top of said supporting means whenever the beams are disposed in said spaced apart relation, means for horizontally moving the upper and lower beams together, and wherein one of said partition walls for each of said compartments includes an angularly directed flange portion, said flange portion being disposed at the same angle as said linking bars when they assume said angularly disposed position, the other wall for each of said compartments being adapted to support said linking bars when they are disposed in said vertical plane.

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