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[56]

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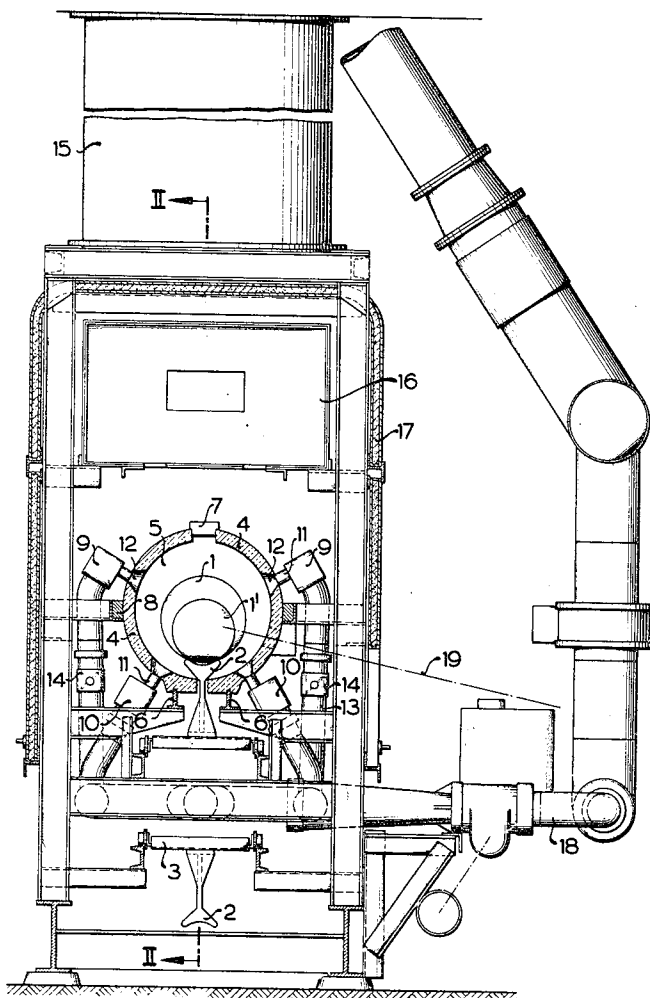
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[54] **FURNACE HEATING APPARATUS**
 5 Claims, 2 Drawing Figs.

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263/3
 [51] Int. Cl. **F27b 9/24**
 [50] Field of Search **263/3, 6, 8**

ABSTRACT: A furnace for heating material such as metal blocks, rods, ingots and the like, consisting of a furnace tunnel through which the material to be heated is guided the tunnel having a wall including openings throughout its total length with a plurality of burners inserted in the openings having their flames directly distributed to the material, and a plurality of consecutive, sectionally arranged fireproof shells disposed on the walls of said furnace tunnel.



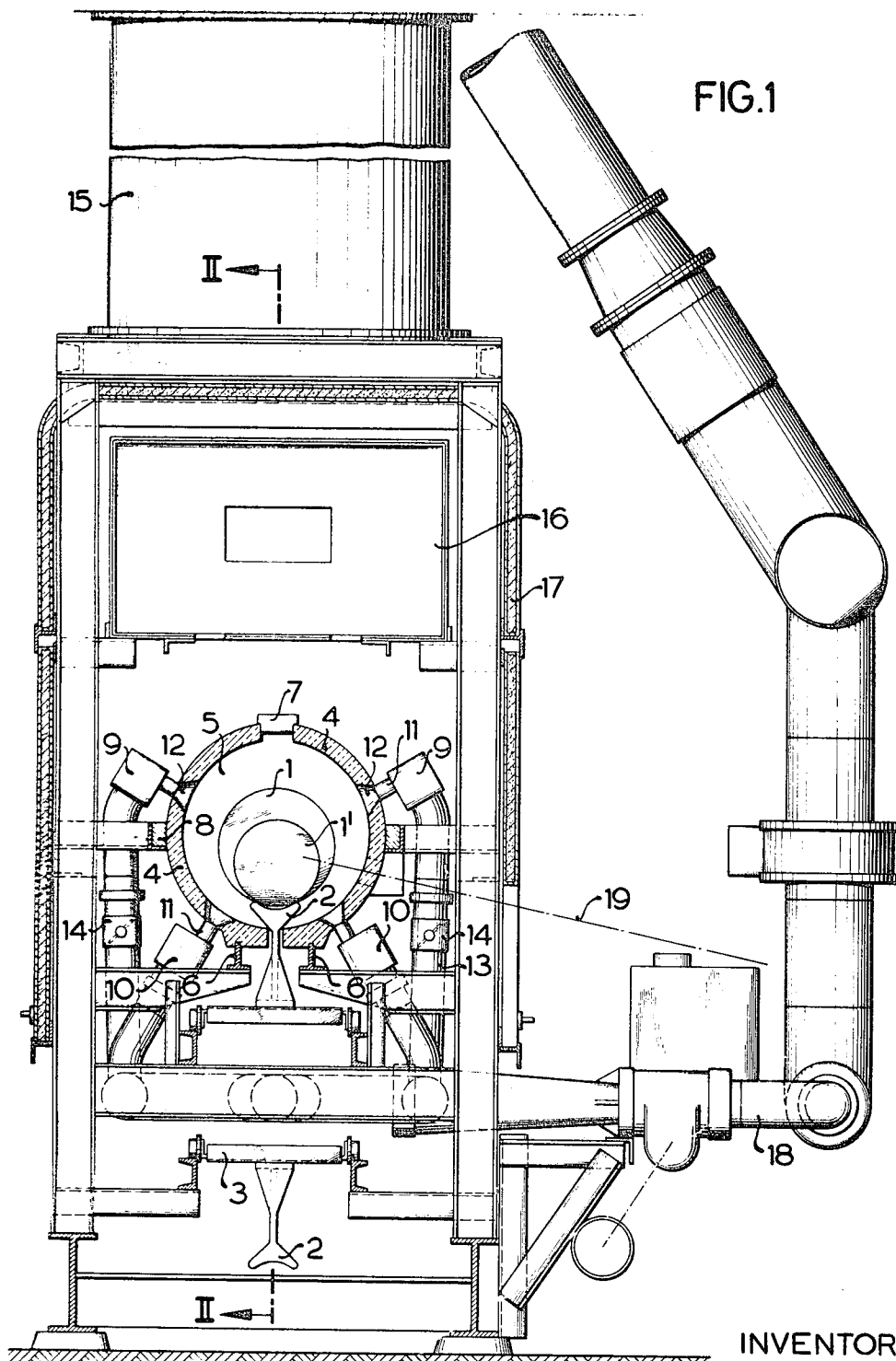


FIG. 1

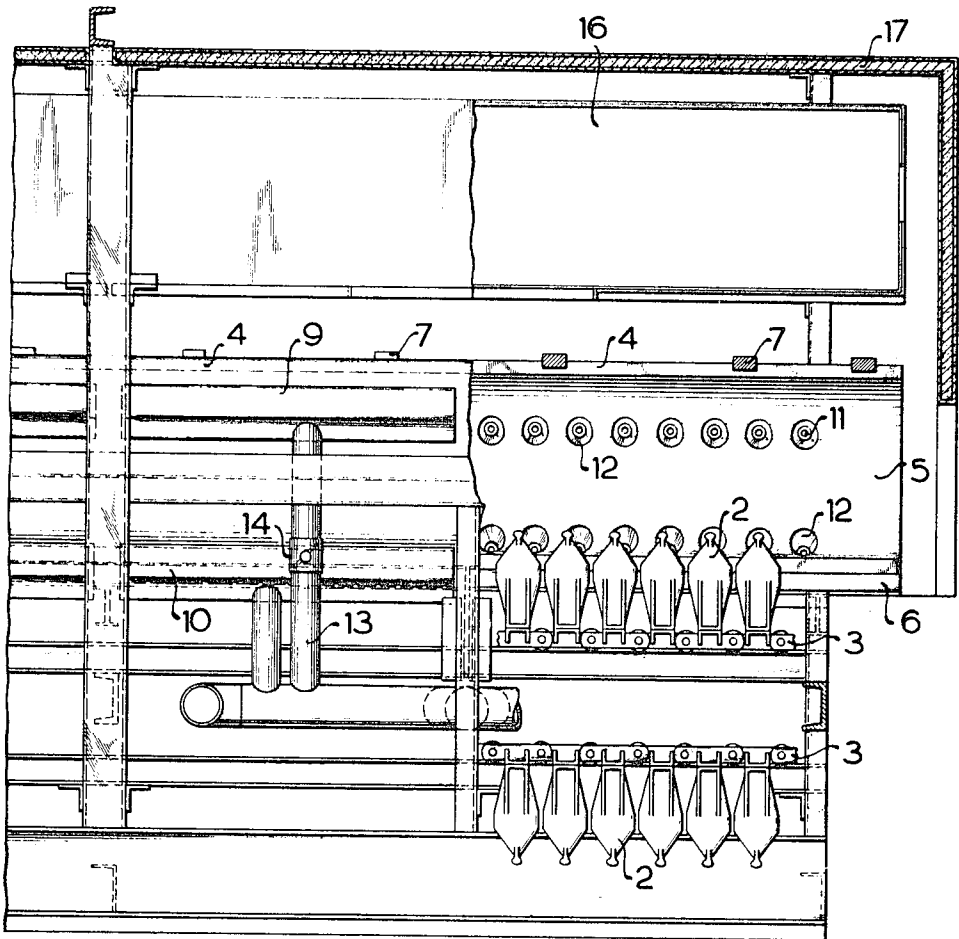
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FIG. 2



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FURNACE HEATING APPARATUS

This invention relates to a heating oven through which metal blocks, ingots, rods, or the like are guided in order to heat the materials to a temperature for a subsequent heat-deforming operation.

The material to be heated is put into an oven tunnel in series sequence, that is, one piece of material is located adjacent to the next. The oven tunnel is provided with a carrying device onto which the material is to be heated is placed, consisting of a conveyor-type chain which transports the material intermittently from a loading station to the charging station for the oven. The oven is heated with gas or a liquid-type fuel. The oven burners are arranged on both sides of the material to be heated throughout the total length of the oven. The flames are directly admitted to the material.

Conventional heating ovens of this type are rather limited in their application and are also not very economical. These conventional types of furnaces generally have a fireproof wall of corresponding thickness which conserves a large amount of heat. Therefore, it is relatively difficult to bring up the heat to the required temperature. This disadvantage is also true when the heating of the furnace is started, and during restarting of the heating, if the heating has been interrupted for some reason. Furthermore, the heating time for the materials is rather long, since only a part of the upper surface of the materials is being used for transmitting the heat to themselves. This disadvantage is caused by the construction of the conventional furnaces.

The long heating times of conventional furnaces also require that they be relatively long in length. Therefore, difficulties are encountered when different types of materials are to be heated having different heating times. Because of the high level of heat conservation in furnace walls and the relatively small concentration of heat transmitted directly to the material, a large amount of fuel is consumed.

Another disadvantage of conventional furnaces is that, in most cases, the heat distribution across the cross section of the material to be heated does not meet the requirements for its subsequent deformation. For example, if the heated material is to be deformed by a metal tube extruding press, it is necessary that an even rotational-symmetric temperature is transferred to the material. The same problem exists when flat ingots are to be heated in the same furnace while also requiring an even rotational-symmetric heat transfer. The uneven heating of the material in conventional furnaces is largely due to the unfavorable position of the burners, their unfavorable or limited adjustments, the arrangement of the material transport device which travels into the furnace, and the false air which flows between the furnace walls and the underside of the material-carrying device. Another disadvantage of conventional furnaces is that the temperature is not always evenly distributed over the total length of the material, so that ingots which have to be pressed by a metal tube extruding press will not be deformed properly.

This invention provides a furnace which overcomes the above-described disadvantages of conventional furnaces by optimal use of the fuel, achieves, excellent results. To shorten the heating time and lower the fuel consumption, the furnace of the invention has an enlarged upper face of its heating area on the material. The furnace also reduces the heat conserved by the constructional material used in the construction of the furnace. This heat reduction is achieved using sectional, and consecutively arranged thin-walled fireproof shells having in one embodiment a thickness between 25-60 mm. It should be understood that thicker shells may be used for larger furnaces within the scope of this invention. These inventive furnace shells reduce the heat consumed approximately 25 percent to that of conventional furnaces. A further feature of the invention is that the furnace shells are formed as half-shells, which are pivotably supported at their lower ends. This arrangement makes it possible to easily remove and replace these shells without complicated dismantling work. In their operational stage, the furnace shells are so arranged that they have an upper and a lower opening. The upper opening is fixed by

separated spacers. While the upper opening permits the exhaust gases to escape, the lower opening serves as a guide for the material-transporting device. The invention may also be realized in larger furnaces, because the shells may be multisectionally constructed.

In a preferred embodiment of the invention, the burners are distributed in at least four rows running axially throughout the total length of the furnace tunnel and are directed to the core of the materials to be heated. The lower rows of burners are located as close as possible to the material-carrying device and are directly obliquely and upwardly towards the material. Because of the inventive arrangement of the burners and the distribution of the total heating capacity to a plurality of burner rows, there is a more economical transfer of the available heat to be distributed to the upper surface of the material. The particular oblique angle of the burners with respect to the material makes it possible for the exhaust gases to be admitted evenly around the circumferential surface of the heated material. It is particularly important to note that both rows of the lower burners are located as close as possible to the material transport means, and in order to assist the exhaust of the gases escaping through the upper opening, the burners are positioned obliquely and upwardly with respect to the material to be heated.

The upper rows of burners are so arranged that the exhaust gases are admitted evenly over the remaining part of the upper surface of the material, even for materials with different cross sections such as rods, blocks, ingots, etc. For example, when round ingots are heated, the upper rows of burners are directed downwardly in an oblique direction. The distance of the burner nozzles with respect to each other in a given row is approximately between 80-120 mm. By using the furnace shells of the invention, the effective arrangement of the shells can be facilitated. To improve the temperature distribution across the cross section of the material, particularly with materials which are processed through metal tube extruding presses, it is necessary to arrange the burners in such a way that the heat transfer is adequate for all types of blocks, rods, ingots, and the like. Since the burners are disposed in a flexible arrangement due to the shell construction for the furnace, it is possible to adequately heat all types of materials.

A further feature of the invention is that the heating capacity of the upper row of burners may be reduced with respect to the lower row. It should be noted however that the heat supply for the burners may be in an adjustable or in a fixed arrangement. This arrangement makes it possible to adjust the heat supply in the part of the furnace which is separated from the lower part due to upward flow of the exhaust gases. In order to adjust the upper row of burners, it is suggested, in accordance with the subject invention, that the burner nozzles not be provided with separate feeder lines for the gas-oxygen mixture, as is common with the known furnaces, but that a plurality of burner nozzles be combined to a series of burners by means of connecting pipes and a main feeder line. An adjustable or a fixed throttle valve may be installed in the main feeder line for the upper burners. Because of this arrangement, the heat supply of the individual burners on the upper row may be adjusted and thereby influence the heat distribution across the cross section of the material to be heated. Another feature of the invention provides that the material transport device includes a cross section which closes the opening in the area between the individual tunnel shells. This, a further improvement of the temperature distribution across the cross section of the material is achieved, since the amount of false air, which exists between the tunnellike furnace wall and the conveyor means of the conveyor chains, is reduced. When relatively small materials are heated such as flat ingots for extruding presses, there is a danger that these ingots which are inserted edgewise, will tilt over during transport. In order to avoid such an accident, the inventive device provides guides on the upper part of the furnace to support the ingots at both sides thereof, or from one side so that the ingot may be slightly tilted towards its support. It is, therefore, an object according

to the present invention to provide an improved furnace for heat-treating materials such as ingots, blocks, rods and the like, prior to their deformation which is constructed for efficient operation and adaptable for all types of materials.

It is another object according to the present invention to provide an improved furnace for heat treating metals which is simple in design, easy to construct, and reliable and efficient in operation.

Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanying drawings which disclose the embodiments of the invention. It is to be understood, however, that the drawings are designed for the purpose of illustration only, and not as a definition of the limits of the invention.

In the drawings, wherein similar reference characters denote similar elements throughout the several views:

FIG. 1 is a cross-sectional view of the furnace, whereby the shells which form the furnace, the support for the shells, the exhaust opening, and the outer mantle of the furnace are shown in profile, and,

FIG. 2 is a longitudinal section of a portion of the furnace showing the transport chain including the carrying device for the material as well as the inner part of a furnace shell, and a side view of the adjacent section, with the outside mantle removed so as to show the upper and lower series of burners and the outside of the furnace shell.

Referring to FIGS. 1 and 2, material 1 to be heated is intermittently transported by means of carrying device 2, is mounted to a conveyor chain 3, and moved into a cylindrical furnace 5 formed by furnace shells 4. Furnace shells 4 are pivotably mounted in their lower end on carrying supports 6, and are maintained in position by spacers 7. Furnace shells 4 are also supported by radially arranged support posts 8. By removing spacers 7 and by slightly pivoting inwardly carrying supports 6 at their pivot point, furnace shells 4 may be easily removed without any further complicated dismantling of the furnace.

The heat introduction into the furnace is done by a series of burners consisting of upper and lower rows of premixture burners 9 and 10 respectively, together with burner nozzles 11 which extend through openings 12 of furnace shells 4 into furnace space 5. Adjustable throttle valves 14 are mounted in feeder lines 13 for adjusting the upper burners 9 with respect to the lower burners 10. As can be seen from FIG. 1, burners 9 and 10 are so arranged that during the heating of the two ingots 1' and 1 to be extruded by an extruding press, wherein the two ingots have a different cross section, a favorable usage of the upper face for a rotational-symmetric heat distribution across the ingots is effected.

The carrying device for material 1 in the range of the entrance into the furnace which are formed by the two furnace shells 4 are provided with a shaft having a right-angular cross section which closes the entrance opening of the furnace at

both sides thereof, the closure being limited in order to still take into consideration the heat extension of the furnace walls with respect to the shaft.

The exhaust gases leave furnace space 5 by the opening formed by the furnace shells 4 and spacers 7. The exhaust gases are ventilated off together with the fresh air by means of an exhaust ventilator and through exhaust vent 16. The outer mantle 17 serves simultaneously as a fresh air supply and heat exchanger.

As can be seen in FIG. 1, at one side of the furnace, the feedlines for the required dosage of fuel and the necessary regulatory equipment 18, as well as a means 19 for measuring the temperature of material 1 are provided.

While only a few embodiments of the present invention have been shown and described, it will be understood that many changes and modifications may be made thereunto without departing from the spirit and scope of the invention.

What is claimed is:

1. A furnace for heating materials, such as metal blocks, rods, ingots and the like, comprising:
 - a furnace tunnel through which the material to be heated is guided, said tunnel consisting of a plurality of consecutive, sectionally arranged semicylindrical fireproof shells having one of their ends pivotably mounted on said furnace so as to provide a linear elongated opening in the lower section of said furnace tunnel and having spacing members disposed between the other ends of said shells so as to provide linear elongated opening in the upper portion of said furnace tunnel, said shells also being provided with a plurality of openings disposed throughout the entire length of the furnace tunnel in at least four axially extending upper and lower rows in different angular spaced-apart relationships,
 - burner means, inserted in said openings, having their flame nozzles directed at the surface of the material to be heated; and
 - guiding means, for guiding the material to be heated through said furnace tunnel, including a plurality of supporting members having a substantially T-shaped cross section, coupled to a conveyor chain, which substantially close the lower opening provided in said furnace tunnel while said material is being conveyed through said furnace.
2. The furnace as recited in claim 1, wherein said burner means inserted in said lower rows in said shells are positioned substantially adjacent to said guiding means.
3. The furnace as recited in claim 1 wherein said fireproof shells have a thickness between 25-60 mm.
4. The furnace as recited in claim 1 wherein said upper row of burners include adjustable means for controlling the temperature distribution on a surface of the material.
5. The furnace as recited in claim 1 wherein said burner means comprise series burners connected to a collective feedline.

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