

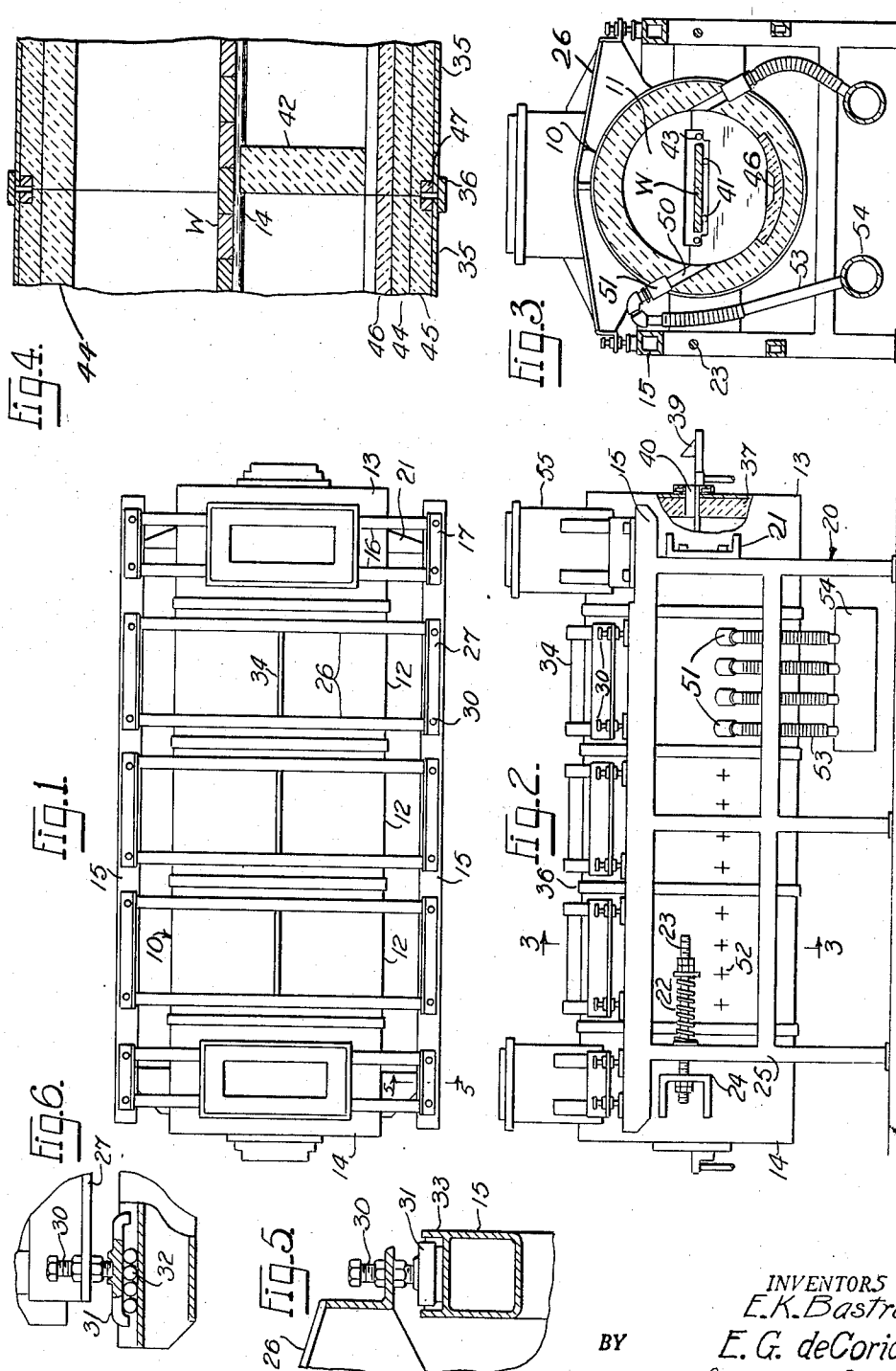
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FORGE FURNACE

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FORGE FURNACE

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This invention relates to a fuel heated forge furnace and has for its general object to provide a furnace whereof the wall enclosure which forms the furnace chamber shall be comprised of individually supported sections arranged end to end and supported in a manner to permit any particular section to be readily removed for replacement purposes. Other related objects will appear hereinafter. For a consideration of what we consider to be novel and our invention, attention is directed to the following specification and the claims appended thereto.

In the accompanying drawing forming part of this specification,

Fig. 1 is a plan view of a furnace embodying the present invention.

Fig. 2 is a side elevation of the furnace shown in Fig. 1.

Fig. 3 is a vertical transverse section on line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary vertical sectional view at the joint between abutting sections of which the furnace chamber is comprised.

Fig. 5 is an enlarged fragmentary cross section on line 5—5 of Fig. 1.

Fig. 6 is a side elevation of Fig. 1.

The wall structure 10 which forms the furnace chamber 11 is comprised of a plurality of intermediate sections 12 between front and rear end sections 13 and 14, respectively. The several sections 12, 13 and 14 have cylindrical tunnels and are independently supported on a support 15 comprising a pair of longitudinally extending rails or side beams 15 between which the sections are adapted to be disposed with their tunnels in axial alignment to define a continuous furnace chamber which is circular in vertical section. All of these several sections, except the front section 13, are free to move lengthwise with reference to the supporting beams or rails 15 as longitudinal thermal expansion of the wall structure 10 may require.

The front section 13 (which is the work entering end of the furnace chamber) is supported on the rails 15 by side arms 16 which extend from the upper portion of the section and which are joined at their outer ends by connecting plates 17 adapted to rest on and be bolted to said rails. The rails 15 constitute the top side of an elevated structure 20 between which a substantial portion of the wall structure 10 is disposed. Brackets 21 are bolted to the structure 20 to assist in anchoring said front section against longitudinal displacement on said rails.

Yieldable means are employed to maintain the

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wall structure 10 as a whole under sufficient longitudinal compression to maintain the several sections thereof in abutting relation. The means for this purpose will ordinarily comprise coil springs 22, one at either side of the furnace, tending to slide the rear end section 14 of the furnace chamber toward the front end section thereof by acting on horizontal pull rods 23 connected to side brackets 24 carried by said section 14. The rods conveniently extend through pillars 25 which comprise part of the elevated structure 20 and the springs are carried by their respective pull rods to abut said pillars.

The means for transmitting the load of the individual intermediate furnace chamber sections 12 to the supporting rails 15 comprises for each section a pair of arms 26 which extend over said rails from the upper portion of the section, the outer ends of the arms being joined by a connecting plate 27 on which a pair of vertically adjustable screws 30 are mounted for the purpose of leveling the section with reference to said rails and the adjacent sections so that all of the sections may be in axial alignment. These screws do not rest directly on the supporting rails but on caps 31 individual to said screws, the caps in turn resting on a plurality of antifriction rollers 32 supported directly on the rails 15 between side flanges 33 on the latter. A central longitudinal bracing member 34 extends between the supporting arms 26. The load of the rear section 14 is transmitted to the supporting rails 15 through antifriction bearings in the same manner as the intermediate sections 12.

The front and rear end sections 13 and 14 of the furnace chamber are each closed by an end wall 37 having a slot-type work passage 40. The work W to be heated is advanced through the furnace chamber on internally cooled skid rails 41, these rails being supported at longitudinal intervals atop transversely extending bridge walls 42. Other internally cooled tubes 43 may also be supported on said bridge walls alongside of the path of travel of the work pieces to serve as lateral guide rails for the work pieces. A reciprocating pusher 39 will ordinarily be employed to advance the work pieces along the skid rails.

Each of the intermediate sections 12 of the furnace chamber has a high temperature refractory lining 44 inside of an exterior metal shell or casing 35 with a layer of heat insulating material 45 therebetween. Because molten slag is formed when scale from work pieces contacts the very hot furnace walls, and this slag has a deleterious effect on the refractory lining 44, the bottom portion of the furnace chamber 11 where the slag

tends to collect is provided with a slag collecting trough or apron 46 of slag resisting refractory material. The underside of the bridge walls 42 is above this apron so that it will not prevent molten slag from passing thereunder.

The refractory lining of each intermediate section 12 is extended slightly beyond the ends of the exterior metal casing 35 to insure that the adjacent ends of the refractories rather than the ends of the metal casing about each other when the sections are in abutting relation thereby reducing to a minimum the likelihood of the ends of the metal casing becoming overheated by leakage of hot gases and molten slag at the joint between said sections. An internal metal ring 47 within each end of the casing serves to impart rigidity to the edge of the latter and to key it to the corresponding refractory section, with space between the adjacent rings and casings to allow for differential expansion, thus keeping the burner nozzles 51 substantially aligned with fuel inlet ports 50. A removable metal strap about adjacent ends of the metal shell 35 tends to hold said ends in alinement.

Heat is produced in the furnace chamber 11 by burning fully aerated fuel therein in contact with the inner cylindrical surface of the refractory lining 44 whereby the latter is rapidly heated to such elevated temperature that it constitutes a source of radiant heat for heating the work pieces in the chamber to forging temperature. The fuel is introduced into said chamber through a multiplicity of tangential inlet ports 50 formed in the refractory lining 44 of the intermediate furnace chamber sections 12. Aerated fuel under pressure is delivered to said ports by individual fuel supply nozzles 51 mounted on the outer metal shell 35 of the chamber sections 12. The aerated fuel is delivered to said nozzles 51 by supply conduits 53 which lead from supply manifolds 54. As best shown in Fig. 2, each of the intermediate sections 12 of the furnace chamber will have its own group of fuel supply nozzles 51 and its own fuel supply manifold for the same so that the supply of fuel to the several sections may be independently controlled. The crossed lines 52 indicate diagrammatically the fuel supply nozzles 50 for the other intermediate sections 12. The end sections 13 and 14 each has a stack 55 for exit of the combustion products from the furnace chamber 11.

The skid rails 41 and the lateral guide rails 43 associated therewith are so mounted that they may be readily withdrawn from the furnace chamber either for replacement purposes or preparatory to removing any particular furnace chamber section for replacement purposes. Such outside connections as must be severed before any particular section can be removed for replacement purposes are readily accessible. The gas supply manifolds 54 are anchored to the supporting structure 20; hence, the fuel delivery conduits 53 between the same and the discharge nozzles 50 comprise flexible tubing to compensate for longitudinal movement of the furnace chamber sections. The furnace has special utility in plants where space is at a premium and where a high temperature head must be maintained in the furnace chamber whereby to heat the work as rapidly as possible to reduce the formation of scale on the work to a minimum.

From the foregoing description it will now be seen that the present invention provides a fuel heated forge furnace that is well adapted for its intended purpose.

What is claimed is:

1. In a furnace for heating work to elevated temperature, in combination, structure defining a single elongate furnace chamber wherein the work is heated, a horizontally-elongate support whereon said structure is mounted, said structure being transversely split to divide the same into a plurality of sections including end sections and at least one intermediate section, said sections being individually removably mounted on said support to permit independent removal of said sections from said support for replacement or repair, said sections each comprising an external metal casing and a lining of refractory material therewithin, and means for releasably holding said sections in contacting relation.

2. In a furnace for heating work to elevated temperature, in combination, structure defining a single elongate furnace chamber wherein the work is heated, a horizontally-elongate support whereon said structure is mounted for thermal expansion and contraction, said structure being transversely split to divide the same into a plurality of sections, said sections being individually removably mounted on said support to permit independent removal of said sections for replacement or repair, said sections each comprising an external metal casing and a lining of refractory material therewithin, and means for maintaining said structure under longitudinal compression.

3. In a furnace for heating work to elevated temperature, in combination, structure defining a single elongate furnace chamber wherein the work is heated, a horizontally-elongate support whereon said structure is mounted, said structure being transversely split to divide the same into a plurality of sections including end sections and at least one intermediate section, said sections being individually removably mounted on said support to permit independent removal of said sections for replacement or repair, said sections each comprising a metal shell and a refractory lining within said shell, and said shells at the abutting ends of said sections terminating short of the refractory lining to insure that the adjacent ends of the refractory linings but not the metal shells shall be in abutting relation at the abutting ends of said sections.

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