

[54] **FURNACE FOR HEATING BARS, TUBES OR SIMILAR OBLONG ARTICLES**

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[57] **ABSTRACT**

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For preparing material that must be pressed or forged furnaces are used to heat said material. Said furnaces comprise a steel jacket in which a brickwork of refractory bricks is provided forming the so called furnace chamber. The articles to be heated are position in said furnace chamber into which burners for liquid or gaseous fuel discharge. An exhaust for combustion gases is provided and also supply means and discharge means for the articles to be heated. The furnace described comprises an elongated heating chamber, an exhaust passageway for combustion gases located alongside and extending lengthwise of the heating chamber and means for supplying elongated articles to be heated to the exhaust gas passageway to move transversely therethrough in contact with the hot gases and then into the heating chamber.

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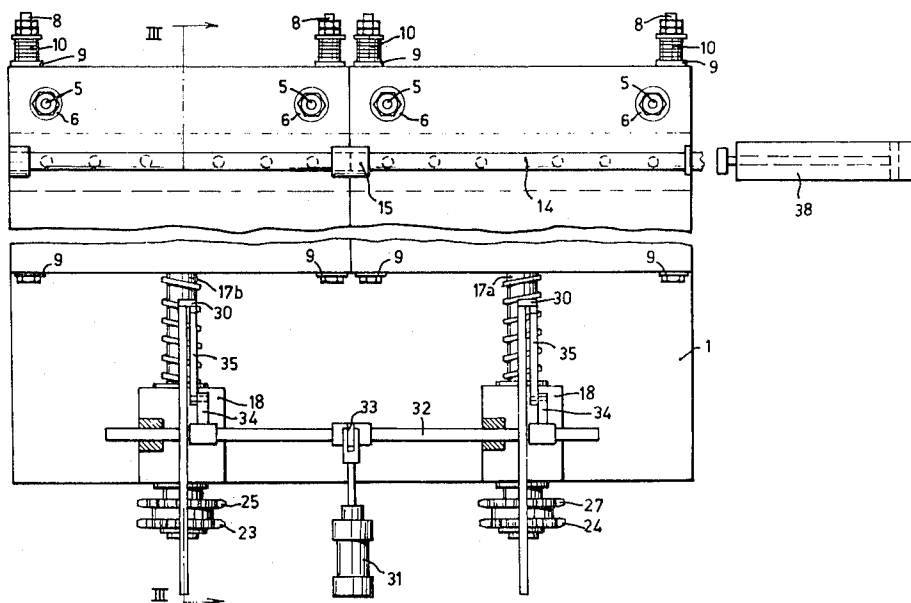
[58] Field of Search.....263/2, 4, 5, 6, 7

[56] **References Cited**

**13 Claims, 4 Drawing Figures**

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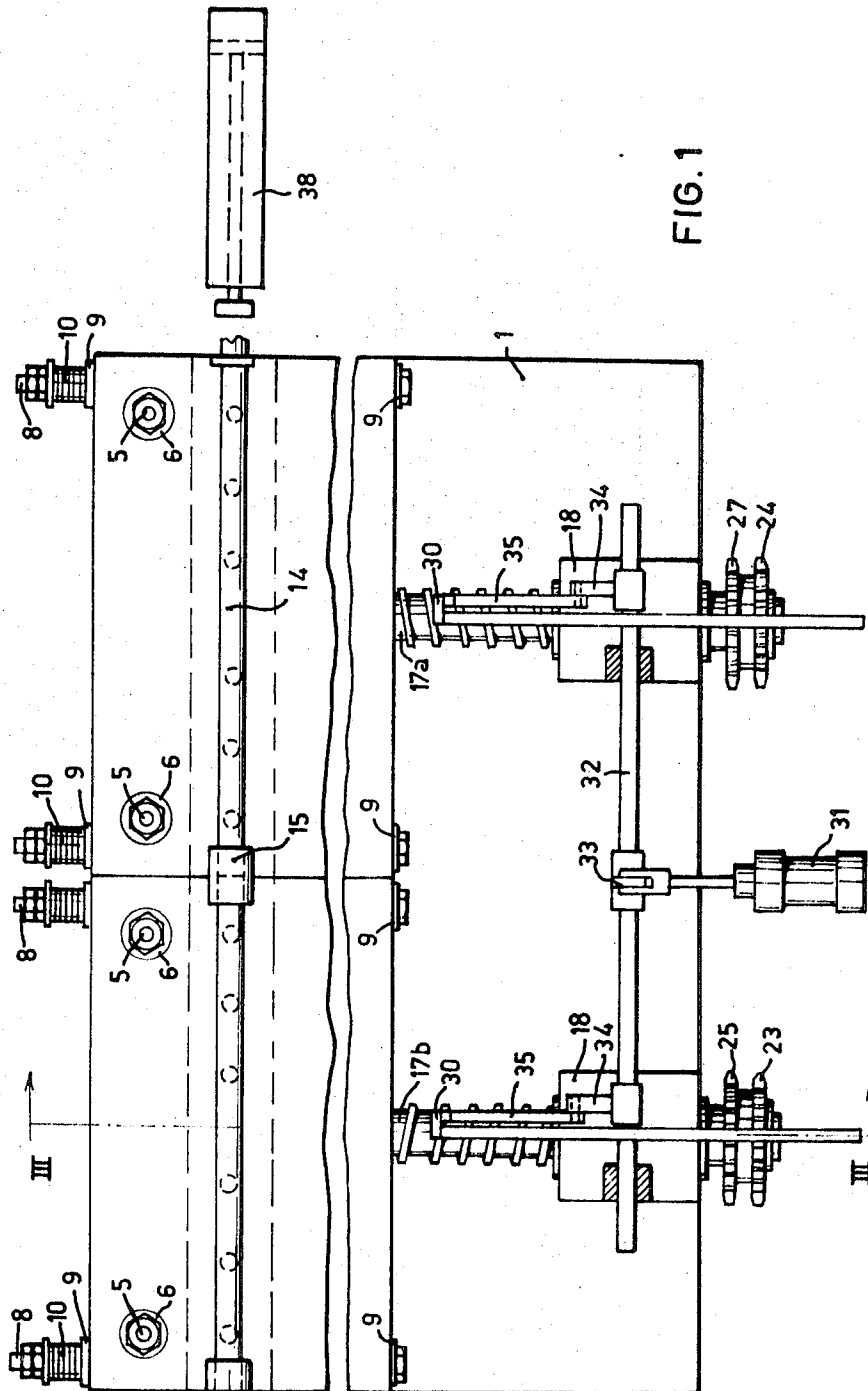


FIG. 1

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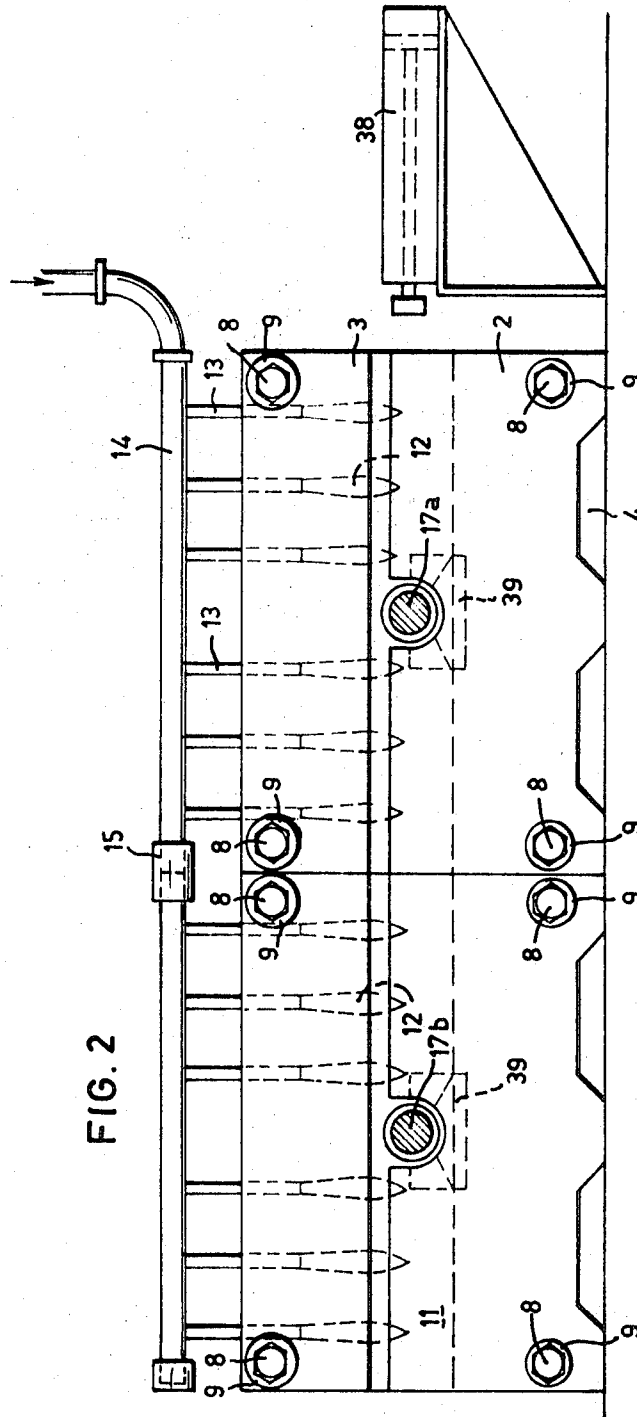


FIG. 2

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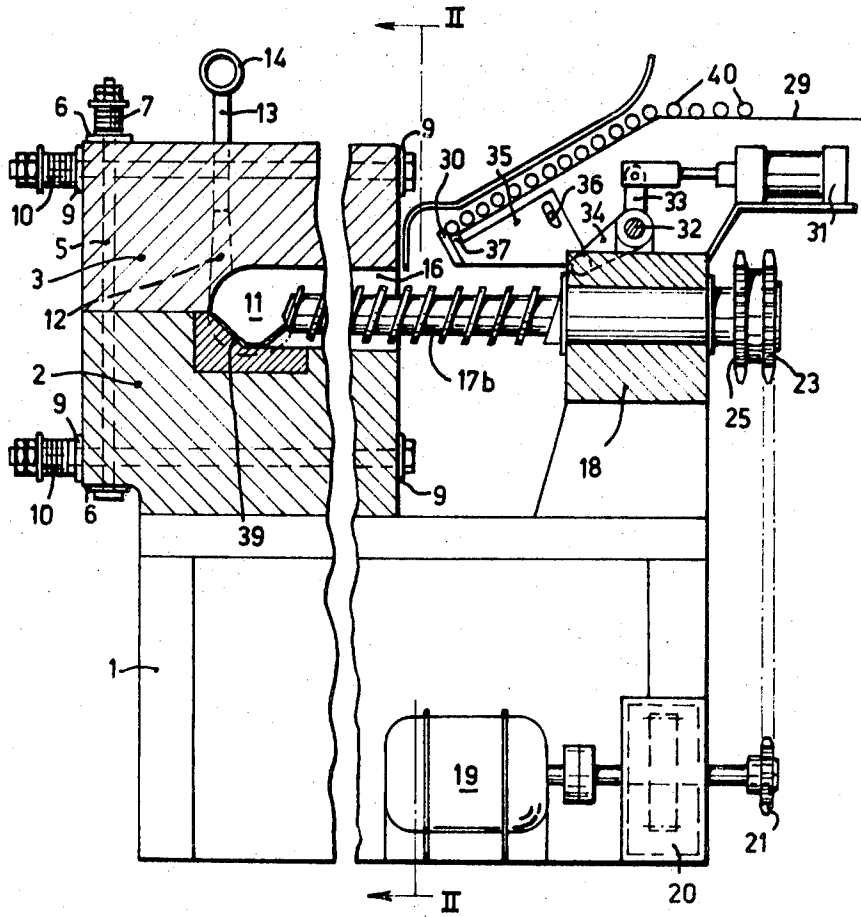


FIG. 3

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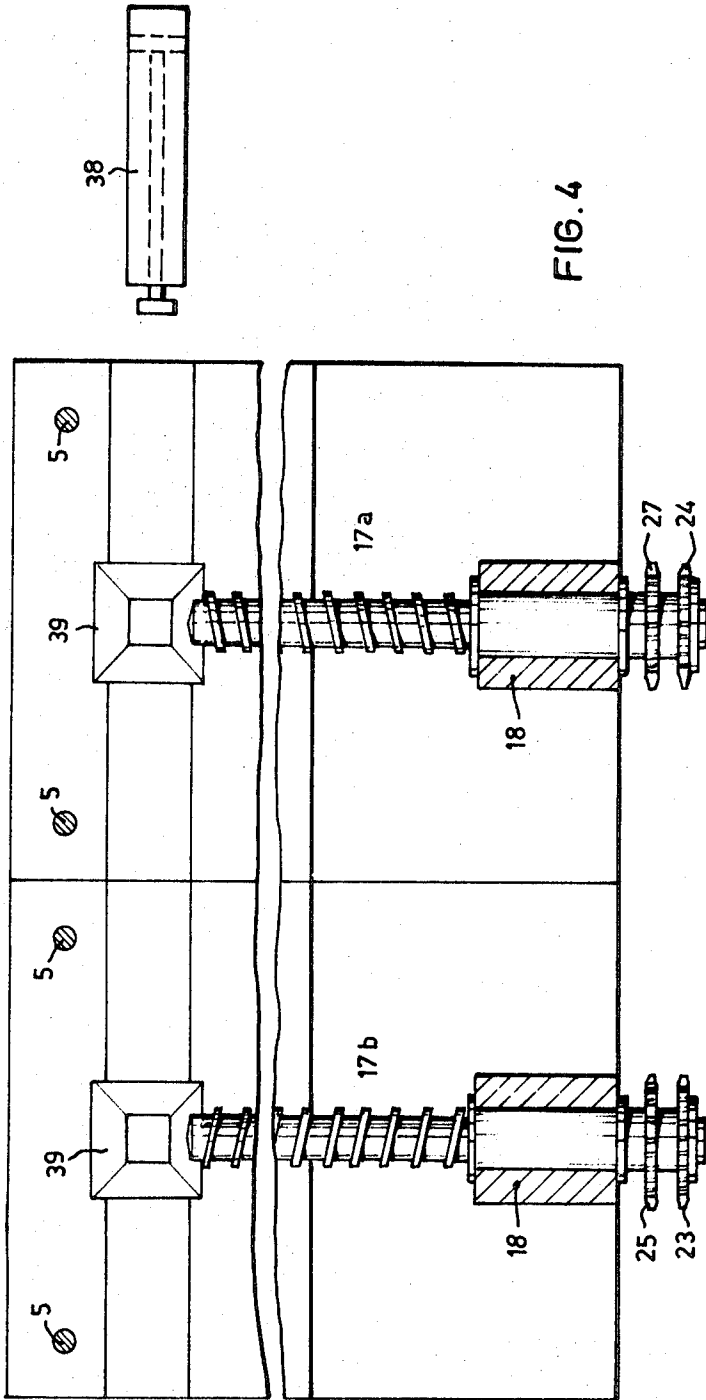


FIG. 4

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## FURNACE FOR HEATING BARS, TUBES OR SIMILAR OBLONG ARTICLES

The present invention relates to a furnace for heating bars, tubes or similar oblong articles, comprising a heating chamber having the length of the articles to be heated, burners for liquid or gaseous fuel discharging into said heating chamber, an exhaust for the combustion gases, a supply and a discharge means for the articles to be heated and the heated articles.

Such furnaces are known. They serve for preparing material that must be pressed or forged, and comprise a steel jacket in which a brickwork of refractory bricks is provided forming the so-called furnace chamber.

The articles to be heated are positioned in said furnace chamber into which the burners discharge. Said articles are lengthwise conveyed into said furnace chamber.

Generally the main disadvantage of said type of furnaces is that their efficiency is low due among other reasons to their unfavorable proportions.

The length of the furnace must be at least equal to the length of the longest article to be treated. The cross section of the furnace chamber, however, is relatively small, such that only a few articles can be heated into the chamber. It is useless to increase said cross section since the articles must not be heated too long otherwise they will burn and too much scale will be formed.

Therefore every now and then a cold article is brought into the furnace when a heated one is discharged in order to undergo a further treatment. As a result the cold articles are suddenly subjected to the high temperature of the furnace (approx. 1,100° C.), whereby it is possible that heat cracks are caused and that the article will become strongly warped. Also bringing a cold article into the furnace chamber the temperature in said chamber will drop several degrees.

The greatest disadvantage of such furnaces, however, is that the exhaust gases have a temperature that is at least as high as the temperature of the furnace, mostly, however, much higher, so that the loss of heat is very high. Said losses could be diminished by the use of heat-recuperators, so that a small amount of the exhaust heat is recovered by heating the combustion air therewith. This, however, increases the costs of the plant considerably.

It is known that the best process to heat a material to a high temperature is supply the heat in the lower temperature range by means of convection and in the higher temperature range by means of radiation. However, the two furnaces must be arranged behind each other, i.e., a convector furnace and a radiation furnace through which the articles to be heated, such as bars, are conveyed.

This system, however, has the disadvantage that an extremely long structure is needed. If the diameter of the article is 40 mm. such a structure would have a length of approximately 30 meters and a complicated device would be necessary to convey said article through said structure. Furthermore the thermal efficiency would be low because of the great length of the furnace.

The object of the present invention is to provide a furnace in which the above-mentioned disadvantages are eliminated.

In the furnace according to the present invention the discharge means for the exhaust gases is provided sideways and lengthwise to the heating chamber and is carried out as a slot or passageway through which the supply of the oblong articles takes place transversely to their length, such that the preheating of the articles takes place by convection and the proper heating by radiation.

In an embodiment of the furnace according to the invention the heating chamber has such a cross section, e.g., a circular cross section, that one oblong article can be heated at a time.

For a preferred embodiment of the furnace according to the invention the bottom of the heating chamber is provided with sliding blocks or the like for supporting the articles to be pushed lengthwise through and from the heating chamber.

In order to increase the efficiency the burners extend tangentially into the heating chamber.

In a preferred embodiment of the furnace according to the invention rotatable endless screws are provided for supplying the oblong articles to the heating chamber, said screws extending transversely into the gas exhaust slot.

According to the invention said rotatable screws are internally air cooled.

According to another aspect of the invention the furnace is composed of sections of refractory material positioned lengthwise adjacent to each other.

In the furnace according to the invention each section consists of two superimposed elements, each containing a portion of the heating chamber.

An embodiment of the furnace for heating bars according to the invention is shown by way of example.

FIG. 1 shows a plan view of two adjacent furnace sections.

FIG. 2 shows a cross section of two adjacent furnace sections along the line II—II in FIG. 3, the supply device for the bars being omitted.

FIG. 3 shows a cross section along the line III—III in FIG. 1.

FIG. 4 shows a longitudinal section of two furnace sections.

Dependent on the length of the bars to be heated the furnace is composed of a number of sections having a predetermined length, said sections being adjacent to each other and base 1. Each section consists of a bottom-frame 2 and an upper frame 3, the bottom-frame being provided at its bottom with recesses 4 such that said sections easily can be moved e.g., by means of lifting machine.

The bottom-frame and the upper frame 2 and 3 are pulled together with pretension by draw bars 5, the pretensioning forces being transferred onto the bottom and upper frame by means of plates 6.

In order to compensate the expansion that is created by heating the furnace and to maintain said pretension as constant as possible dish springs 7 are provided.

The upper frame and the bottom-frame are made of cast or rammed refractory concrete, however, said frame could be made of burned refractory ceramic material. Both frames are pretensioned by means of draw bars 8 and pressing plates 9, dished springs 10 being provided in order to keep the pretensioning forces as constant as possible.

The furnace has a hollow interior 11, forming the heating chamber.

A number of burners 12 discharge tangentially into said chamber, said burners being mounted in the upper frame 3. Said burners are interconnected with a main fuel conduit 14 through lines 13, said main fuel conduit 14 extending over the whole length of the furnace, but being detachable by means of couplings 15 between adjacent furnace sections.

By means of the tangentially positioned burners it is possible to give a high velocity to the gases in the furnace which, therefore, will burn very quickly and create a high temperature. The circular heating chamber 11 will obtain the desired temperature very quickly and will be heated very uniformly.

The exhaust gases leave the heating chamber 11 through the slot 16 in which the bars to be supplied are kept and which extends transversely over the whole length of the furnace. Since said slot 16 only has a relatively small width the exhaust gases will have a vortex motion such that they will wash the bars and transfers their heat to them, said bars being conveyed to the heating chamber 11 in a well preheated condition. Since the exhaust from the furnace gases in their way to the exhaust encounter bars in a colder state, the temperature of said gases will decrease in a steady way and at the time they leave the furnace their temperature will be a fraction only of the temperature they had when leaving the heating chamber and entering the slot.

The bars are supplied through the slot 16 by means of rotatable screws 17a, b which are internally air cooled and are rotatable in bearings 18. Said screws 17a, b one of which being provided in each section, are mounted in such a way that one or two rotating clockwise are positioned adjacent to one or two rotating anticlockwise which prevents that the bars are shifted lengthwise.

The screws receive a continuous rotation by means of an electromotor 19 through a transmission 20. In order to provide a clockwise and anticlockwise rotation of the screws 17a, 17b, the shafts of transmission 20 are provided with sprockets, the shown 21 of which drives the sprocket 23 on the clockwise rotating screw 17b and the invisible sprocket 22 drives the sprocket 24 on the anticlockwise rotating screw 17a.

The sprockets 25 and 27 drive the screws of other sections, if any, of the furnace.

The bars to be supplied are received by the screws 17a and 17b through a pneumatically driven supply mechanism. For that purpose the bars 40 are supported by supporting means 29 (vide FIG. 3), said means being provided with upturned edges 30. If a bar must be supplied to the screws the air cylinder 31 receives an impulse so that the piston rod 26 of said cylinder will move inwardly and the shaft 32 will be rotated clockwise by means of the arm 33 fixed to said shaft 32. Thereby the lever 34 which is also attached to the shaft 32 will rotate upwardly and will cause the plate 35 linked to the lever 34 and guided by the pin 36 to raise such that the cam 37 attached to the plate 35 will push a bar over the upturned ridge 30 of the supports 29 said bar being placed onto the screws and guided into the furnace.

In order to push the heated bars from the heating chamber 11 another air cylinder 38 is provided. Said air cylinder 38 pushes at the right time a bar out of the heating chamber 11 in a machine for a further treatment. Since the heated bar performs a sliding movement in the heating chamber 11 sliding blocks 39 are provided in said chamber in order to prevent damaging of the bars, said blocks being interchangeable in an easy way.

I claim:

1. A furnace for heating bars, tubes and similar elongated articles, comprising a heating chamber for heating said articles, said chamber having the length of the articles to be heated, fuel burners for discharging hot combustion gases into said heating chamber, an exhaust passageway for conducting the combustion gases from the heating chamber, means for supplying the articles to be heated into the heating chamber, and means for discharging the heated articles from the heating chamber, wherein the exhaust passageway for the combustion

gases is located alongside and extends lengthwise of the elongated heating chamber, and wherein the means for supplying the articles to be heated to the heating chamber includes means for delivering them into the exhaust gas passageway to move transversely therethrough in contact with hot gases flowing therethrough and then into the heating chamber.

2. A furnace according to claim 1, wherein the bottom of the heating chamber is provided with slide blocks supporting the heated article in the heating chamber and while being pushed lengthwise out of the chamber.

3. A furnace according to claim 1, wherein the burners are set to discharge tangentially into the heating chamber.

4. A furnace according to claim 1, wherein the means for supplying the elongated articles to the heating chamber through the gas exhaust passageway comprise rotatable screws extending transversely to the gas exhaust passageway.

5. A furnace according to claim 4, wherein the rotatable screws are internally air cooled and extend through the exhaust gas passageway to the heating chamber.

6. A furnace according to claim 4, including means for rotating adjacent screws alternately clockwise and anticlockwise.

7. A furnace according to claim 1, comprised of lengthwise-positioned sections of refractory material.

8. A furnace according to claim 7, wherein each section is comprised of two superimposed elements, each containing a portion of the heating chamber.

9. A furnace according to claim 8, wherein the two elements are pulled against each other by means of draw bars.

10. A furnace according to claim 8, wherein said draw bars cooperate with springs bearing on said furnace elements.

11. A furnace according to claim 7, wherein the sections are laterally pulled against each other by draw bars.

12. A furnace according to claim 11, wherein said draw bars carry and cooperate with springs bearing on said furnace sections.

13. A furnace according to claim 1, wherein the means for supplying the articles to the heating chamber include means for delivering the articles one at a time to the means for delivering them into and through the exhaust gas passageway to the heating chamber.

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