March 10, 1931. S. P. AXELL 1,795,819

HEAT TREATING FURNACE

Filed May 21, 1929

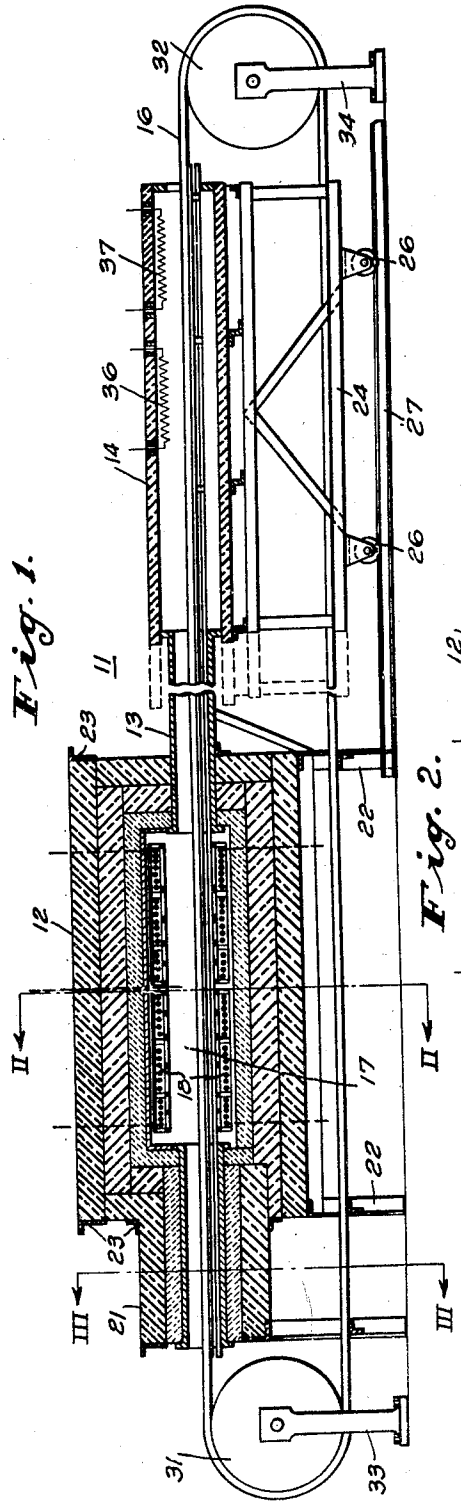


Fig. 1.

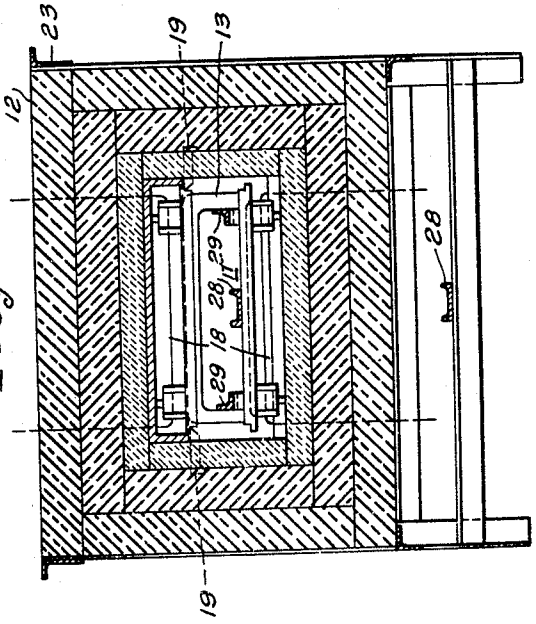


Fig. 2.

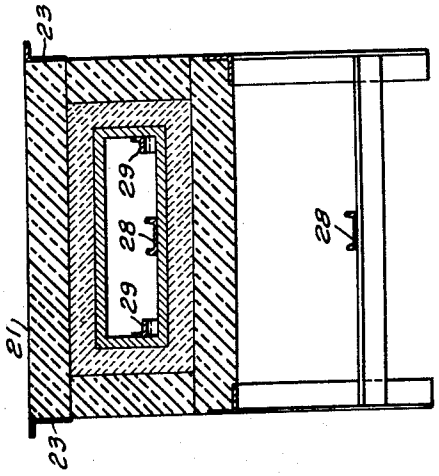


Fig. 3.

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UNITED STATES PATENT OFFICE

SVEN PAUL AXELL, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

HEAT-TREATING FURNACE

Application filed May 21, 1929. Serial No. 364,717.

My invention relates to furnaces and more particularly to heat treating furnaces of the conveyor type.

An object of my invention is to provide a relatively simple and effective furnace structure including a plurality of portions to permit of obtaining a predetermined and adjustable cooling curve of a heated article.

Another object of my invention is to provide a plural-part furnace structure that shall embody an endless conveyor of substantially fixed extent of travel to move an article to be heat-treated, first through a heated member and then through a non-heat insulated cooling muffle to greatly reduce the temperature initially and then to obtain any desired temperature curve in a heat-insulated cooling chamber.

In practicing my invention, I provide a heated heat-insulating chamber, a non-heat-insulated cooling muffle permanently connected to the heated chamber structure at one end thereof and a heat-insulated cooling chamber, telescoping with the cooling muffle, the muffle and the two chambers being longitudinally coaxially aligned, in combination with a horizontal conveyor for moving an article through said chambers and muffle in predetermined sequence.

In the single sheet of drawings,

Figure 1 is a view, in vertical longitudinal section, through a furnace assembly embodying my invention,

Fig. 2 is a view, in vertical lateral section, through a heated chamber, taken on the line II—II of Fig. 1, and

Fig. 3 is a view, in vertical lateral section, taken on the line III—III of Fig. 1.

A furnace assembly or structure 11 includes a furnace 12, a cooling muffle 13, a cooling chamber 14 and an endless conveyor 16. The furnace 12 includes a plurality of side, bottom, top and end walls which may be made of a plurality of bricks or blocks of suitable high-temperature-resisting and heat-insulating refractory material to enclose a chamber 17.

Heating means for the chamber 17 are shown as including top and bottom electric-heating elements 18 which are illustrated schematically only as they may be of any suitable or desired type and may be located either as shown, adjacent to the top and the bottom of the chamber 17 or at the sides thereof, in accordance with the general shape of the articles to be heat treated.

It is to be understood that suitable provision is made for supporting the heating elements which, in the case of the upper heating elements 18, may include a plurality of lugs 19 fitted into the side walls and supporting the metallic and refractory supporting members of the heating elements. As any suitable or desired type of electric-heating element, or, in fact, any kind of heating means, may be employed, I do not deem it necessary to illustrate or describe the construction of the heating elements, the support thereof and the terminal construction in greater detail.

A preheating muffle 21 is provided at the entering end of the furnace 12 and comprises a plurality of side, top and bottom walls made of refractory heat-insulating and high-temperature-resisting materials, usually employed for such purposes. The chamber of the muffle 21 is coaxially and longitudinally aligned with the chamber 17 which, as shown, may be of any suitable length, and, in the particular embodiment shown in the drawings, is of substantially rectangular shape in lateral section.

Supporting means for the furnace 12 and the muffle 21 may comprise metal members 22, which may cooperate with other structural metal members 23, in a manner well known in the art, to cooperate with, and hold the walls of the furnace part 12 in proper operative positions relatively to, each other.

The cooling muffle 13 may be of substantially rectangular shape in lateral section and may be made of a single metal casting or, if desired, it may be made of sheet metal shaped to the desired dimensions and form. No heating insulation is used on this cooling muffle, one end of which extends into the leaving-end wall of the furnace 12 to be coaxially and longitudinally aligned with the chamber 17.

The heat-insulated cooling chamber 14, comprises side, top and bottom walls of a suitable heat-insulating refractory material, the walls being of a predetermined thickness, in accordance with the rate of cooling or the maintenance of a predetermined curve of temperature, as will be hereinafter more clearly set forth.

The walls of the cooling chamber 14 may be constructed and maintained in proper operative positions relatively to each other in any suitable or desired manner, and such metallic framework as may be necessary to hold the parts are to be included in my structure, even though that may not be specifically shown in the drawings. The structure of the cooling chamber is located on a truck 24 having a plurality of sets of wheels 26 which move on a pair of rails 27, thereby permitting adjustable location of the cooling chamber 14 relatively to the cooling muffle 13.

The outer end of the cooling muffle 13 interfits with the inner end of the cooling chamber 14 in order that any desired degree of overlap of the cooling muffle and of the cooling chamber may be obtained.

The conveyor 16 is illustrated schematically only and is to be considered as including or embodying an endless chain which may move in guide members 28 of substantially channel section, the plurality of trays which may be secured to the endless chain and be moved thereby being supported by tray-guides 29, each of angle-bar shape in lateral section, which are suitably secured to the respective chamber and muffle structures, in a manner well known in the art.

Drums 31 and 32 are provided, one at each end of the furnace structure hereinbefore described, pedestals 33 and 34 being provided therefor and being fixedly secured to a suitable foundation.

Any desired type of motor means may be provided to cause continuous movement of the endless conveyor and, as any suitable or desired type of such device may be employed, I have not shown it in detail.

The furnace assembly illustrated in the drawings is particularly adapted for the heat treatment of relatively flat objects. These objects may be manually or automatically moved upon the trays of the endless conveyor at the entering end of the furnace 12 and, particularly just outside of the preheating muffle 21, and will be moved, at a predetermined speed, through the chamber 17 to be heated to a predetermined temperature therein. It is desired to greatly reduce this temperature immediately after the articles leave the chamber 17 and this is effected in the non-heat-insulated cooling muffle 13 which, as hereinbefore set forth, may be of any suitable length and the wall of which may be of any suitable thickness.

After a relatively large drop in temperature has been effected during the movement of an article through the muffle 13, it is desired either that the articles be maintained at or near this lower temperature or that a predetermined rate of cooling be effected in the cooling chamber 14. In order to be able to maintain the temperature of the articles at a predetermined value, or to obtain a predetermined cooling curve thereof, the cooling chamber 14 may be provided with heating elements, indicated schematically at 36 and 37 and indicated also as being supported from and near the roof of the cooling chamber. A plurality of electric-heating elements may be provided to be energized from a suitable source of supply of electric energy and controlled by means (not shown) in order to obtain a predetermined curve of temperature of the articles.

It is obvious that, if the non-heat-insulated cooling muffle 13 be made relatively long, and if the wall thereof be made relatively thin, a relatively large drop of temperature of the articles being moved therethrough will be obtained. If it is desired to decrease this reduction in temperature, it can be done by moving the cooling chamber 14 and the truck structure 24 closer to the heated furnace 12 the muffle 13 interfitting and telescoping with the cooling chamber 14.

The device embodying my invention thus provides a composite or plural-part furnace structure embodying an endless conveyor of substantially fixed extent of travel and longitudinally aligned muffle and chamber parts, one of which is longitudinally adjustable relatively to the other to permit of obtaining any predetermined cooling curve in accordance with the work to be done in the heat treating furnace.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. In a heat treating furnace, the combination with a heated chamber and a conveyor for moving articles to be heat treated therethrough, of a two-part cooling chamber aligned with the heated chamber, one of said parts being longitudinally adjustable relatively to the other part.

2. In a heat treating furnace, the combination with a heated chamber and a conveyor for moving articles to be heat treated therethrough, of a two-part cooling chamber aligned with the heated chamber and embodying a heat-insulated cooling chamber adjustably spaced from the heated chamber and a non-heat-insulated cooling muffle located between the two chambers.

3. In a heat treating furnace having a

heated chamber and a conveyor for moving articles to be heat treated therethrough, means for obtaining a predetermined and adjustable rate of cooling of articles heated in said chamber, said means including a cooling chamber comprising two parts having relatively longitudinal adjustability coaxially aligned with the heated chamber and with each other, one of said parts telescoping within the other.

4. In a heat treating furnace having a heated chamber and a conveyor for moving articles to be heat treated therethrough, means for obtaining a predetermined and adjustable rate of cooling of articles heated in said chamber, said means including a cooling chamber having two parts coaxially aligned with the heated chamber and with each other, one of said parts being non-heat insulated and the other part being heat insulated, the non-heat insulated part connecting the heated chamber with the heat-insulated chamber and means for effecting longitudinal adjustment of the heat-insulated part relatively to the non-heat-insulated part to vary the overlap thereof.

5. In a heat treating furnace having a heated chamber and an endless conveyor of substantially fixed extent of travel, means for greatly reducing the temperature of a heated article initially and then maintaining the article at a predetermined curve of temperature for a predetermined time, said means including a non-heat-insulated cooling muffle permanently connected to the heated chamber at one end thereof, a cooling chamber aligned longitudinally with the muffle and the heated chamber and telescoping with the cooling muffle, the conveyor traversing the heated chamber, the cooling muffle and the cooling chamber in sequence and means for varying the amount of overlap of the cooling muffle and the cooling chamber.

In testimony whereof, I have hereunto subscribed my name this 9 day of May, 1929.

SVEN PAUL AXELL.