April 7, 1931. F. T. COPE ET AL 1,799,957

APPARATUS FOR HEAT TREATMENT

Filed Oct. 2, 1928 2 Sheets-Sheet 1

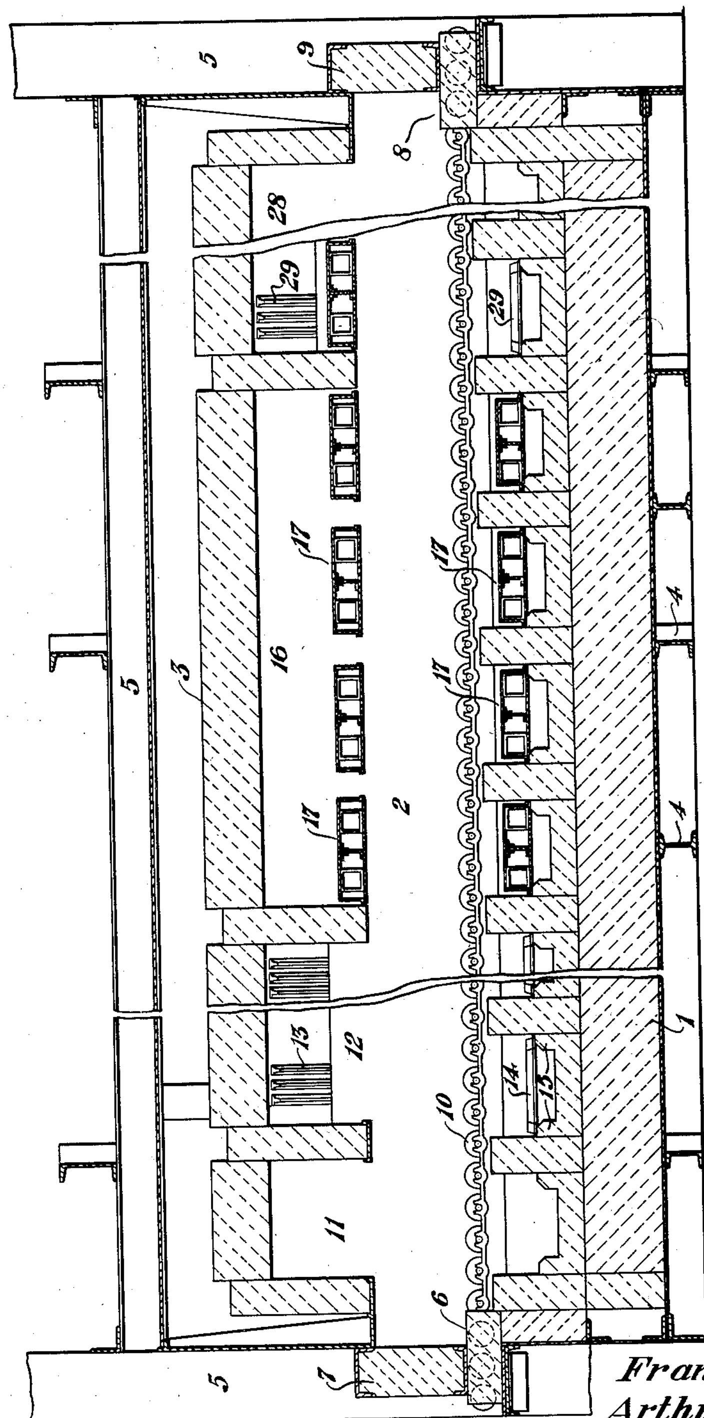

Fig. 1

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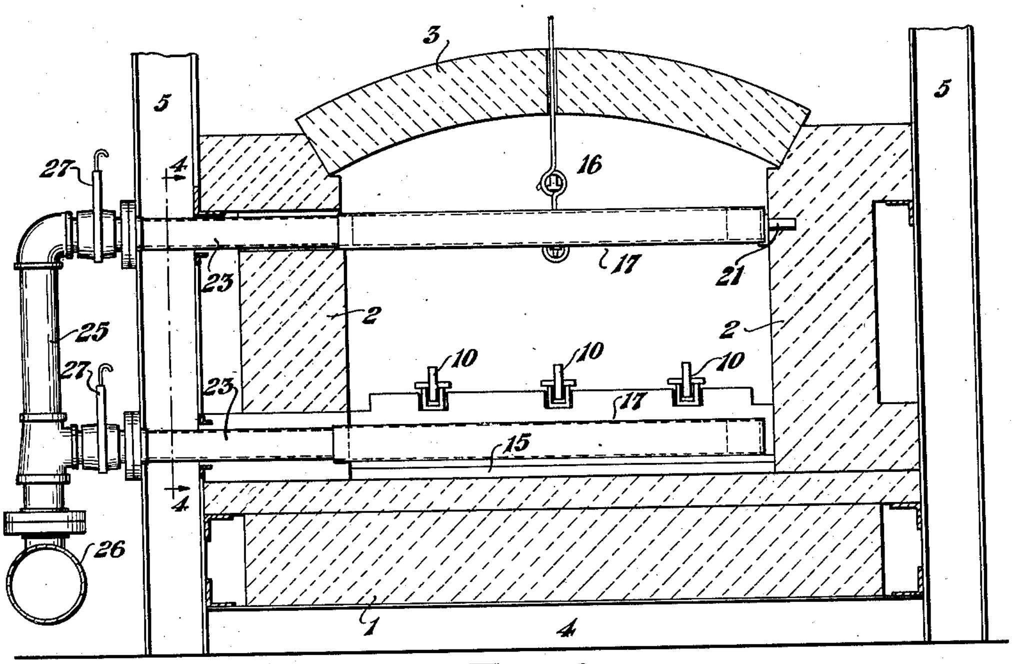

Fig. 2

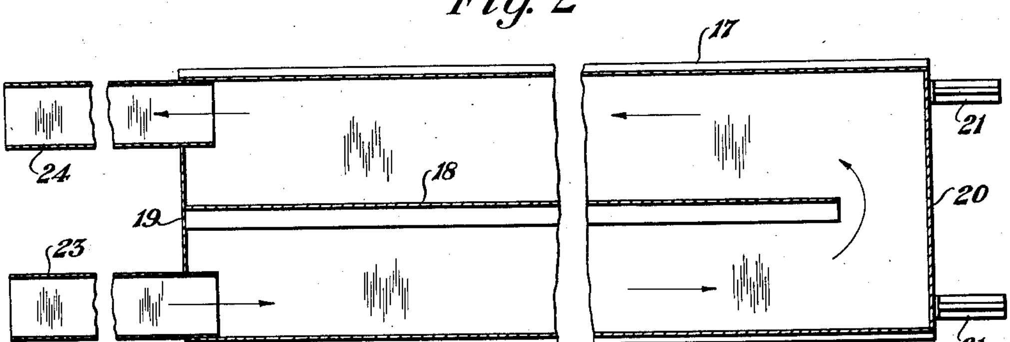

Fig. 3

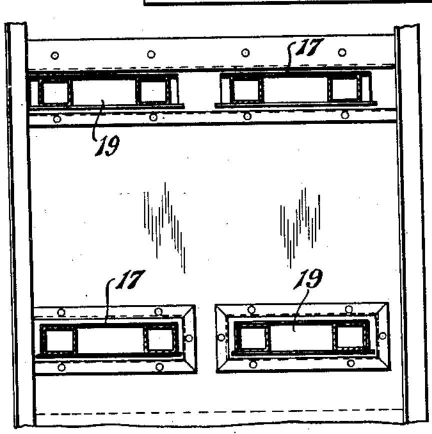

Fig. 4

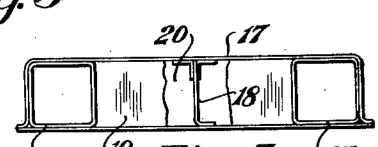

Fig. 5

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UNITED STATES PATENT OFFICE

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APPARATUS FOR HEAT TREATMENT

Application filed October 2, 1928. Serial No. 309,828.

The invention relates to apparatus for heat treatment of metals and the like and more particularly to a continuous type of furnace provided with a heating zone followed by a cooling zone in which are located ducts for the circulation of cold air or other cooling agent therethrough, a final zone being located beyond the cooling zone if desired and provided with heating means such as electrical resistors and cooling means such as additional ducts, which may be operated so as to produce the desired temperature cycle.

The object of the improvement is to provide a furnace or kiln of the continuous or tunnel type having roller or other conveyers for continuously or intermittently passing material to be treated through the furnace.

The tunnel may be provided with a heating zone near the entrance and which may be heated by electric resistors or the like, the central portion of the tunnel forming a cooling zone in which continuous ducts may be located back and forth through the tunnel above and below the train of material, if desired, a further zone being located beyond the cooling zone and provided with electric resistors or other heating means and cooling means such as additional ducts which may or may not be operated, depending upon the nature of the treatment, and the temperature cycle desired.

An embodiment of the invention is illustrated in the accompanying drawings, in which

Figure 1 is a longitudinal sectional view through the improved furnace;

Fig. 2, a transverse sectional view through the cooling zone of the furnace;

Fig. 3, an enlarged plan sectional view of one of the cooling ducts;

Fig. 4, a fragmentary side elevation of a portion of the cooling zone, taken substantially on the line 4—4, Fig. 2; and

Fig. 5, an enlarged end view, partly in section, of one of the cooling ducts.

Similar numerals refer to similar parts throughout the drawings.

The furnace may be of the continuous or tunnel type, the bottom 1, side walls 2 and roof 3 being formed of suitable refractory material mounted upon the structural beams 4 and reinforced as by the structural framework 5.

A charging opening 6 is formed at the entrance end of the furnace adapted to be normally closed as by the door 7 and a discharging opening 8 at the exit end thereof controlled as by the door 9. A suitable conveyer hearth, such as the roller hearth, indicated generally at 10, may be located entirely through the furnace from the charging to the discharging point.

The furnace may include a receiving hood 11, adjacent to the charging door, and communicating with the heating chamber or zone 12 which may be heated in any suitable manner, preferably by electric resistors 13 and 14 located against the roof and upon piers 15 beneath the roller hearth respectively. It should be understood that the receiving hood is not essential and may be dispensed with without changing the invention.

The cooling zone or chamber 16 communicates with the heating chamber and is provided with suitable means for rapid cooling of the material as it passes therethrough, from the heating zone. This cooling means may comprise ducts shown generally at 17 located above and below the roller hearth and so constructed that air or other cooling agent may be circulated through the ducts without entering the cooling chamber.

The cooling ducts may be of the return flow type, as illustrated in the accompanying drawings, and later described herein, or, if desired, they may consists of simple tubes through both walls of the furnace, the air supply being connected to one end of each duct, the opposite end thereof discharging to the atmosphere.

Each duct may be formed of sheet metal or the like and provided with a central longitudinal partition wall 18 extending from one end wall 19 to a point spaced from the opposite end wall 20. Legs 21 may be fixed to the end wall 20 for supporting the adjacent end of the duct upon the side wall 2.

Inlet and outlet pipes 23 and 24 respectively, communicate with the opposite ends of the duct, upon opposite sides of the partition wall 18. Thus a circulation of cold air or other cooling agent may be passed through each duct, in the direction of the arrow shown in Fig. 3, and discharged without entering the cooling chamber.

The pipes 23 and 24 extend through suitable openings in the adjacent side wall 2 of the cooling chamber, the pipes 24 preferably discharging into the atmosphere while the pipes 23 are connected to the branch pipes 25 communicating with a conduit 26 which may be connected with any suitable source of supply of air or other cooling agent under pressure. Valves 27 may be provided for independently controlling the admission of the cooling agent to each duct.

Beyond the cooling zone a final treatment zone 28 may be located through which the cooled material is passed before being discharged from the furnace. If desired, suitable heating means may be provided in this final zone such as the electric resistors 29 located above and below the path of the material and additional cooling ducts may be provided, which may or may not be operated, depending upon the nature of the treatment to be given the material, and the temperature cycle desired.

With such a construction it will be seen that a substantially reducing atmosphere may be maintained throughout the entire furnace, the material being heated by electric resistors and cooled by air or other cooling agent passing through ducts which are located within the cooling chamber but have no communication therewith.

It is also possible to better localize the cooling means if it is confined within ducts, since if it is admitted to the interior of the furnace it would have to flow out the ends, thereby disturbing the temperature gradient of the various zones.

We claim:

1. Heat treating apparatus including a cooling zone, a duct located in the cooling zone, inlet and outlet passages communicating with one end of the duct, a partition wall located through the duct between said passages and terminating at a point spaced from the opposite end of the duct, and means for passing a cooling agent through the inlet passage.

2. Heat treating apparatus including a heating chamber, heating means within the chamber, a cooling chamber communicating with the heating chamber, means for passing material to be treated through the heating chamber and cooling chamber, laterally extending cooling ducts located above and below the path of material within the cooling chamber and extending through the wall thereof, and means for circulating a cooling agent through the ducts.

3. Heat treating apparatus including walls forming a chamber having a heating zone, a cooling zone communicating with the heating zone, and a final treatment zone communicating with the cooling zone, heating means located within the chamber at the heating zone, a cooling duct located within the chamber through the cooling zone, means for circulating a cooling agent through the duct, heating means and transverse cooling ducts located within the chamber at the final treatment zone, means for controlling the heating means and cooling means in the final treatment zone, and means for continuously passing material to be heat treated through the heating zone, cooling zone, and final treatment zone.

4. Heat treating apparatus including walls forming a chamber having a heating zone, cooling zone, and a final treatment zone, heating means located within the chamber at the heating zone, a laterally extending cooling duct within the cooling zone and extending through the wall of the chamber, inlet and outlet passages in the duct communicating with one end of the duct, and means for passing a cooling agent through the inlet passage.

5. Heat treating apparatus including walls forming a chamber having a heating zone, cooling zone, and a final treatment zone, heating means located within the chamber at the heating zone, laterally extending cooling ducts located above and below the path of material within the cooling zone, inlet and outlet passages in each duct communicating with one end of the duct, and means for passing a cooling agent through the inlet passages.

6. Heat treating apparatus including walls forming a chamber having a heating zone, cooling zone, and a final treatment zone, heating means located within the chamber at the heating zone, a laterally extending duct located in the cooling zone, inlet and outlet passages communicating with one end of the duct, a partition wall located through the duct between said passages and terminating at a point spaced from the opposite end of the duct, and means for passing a cooling agent through the inlet passage.

In testimony that we claim the above, we have hereunto subscribed our names.

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