April 25, 1933. G. S. PETERSON 1,906,092

CONVEYER FURNACE

Filed July 30, 1930

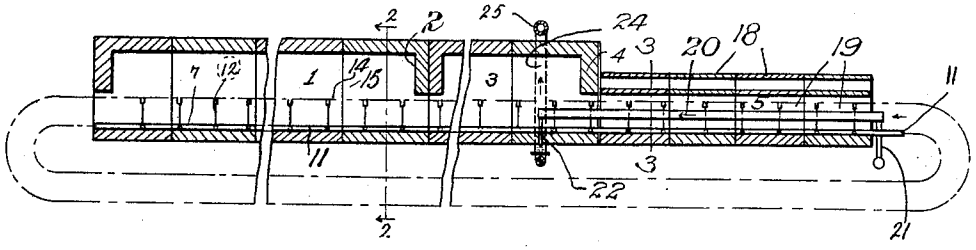



Fig. 1

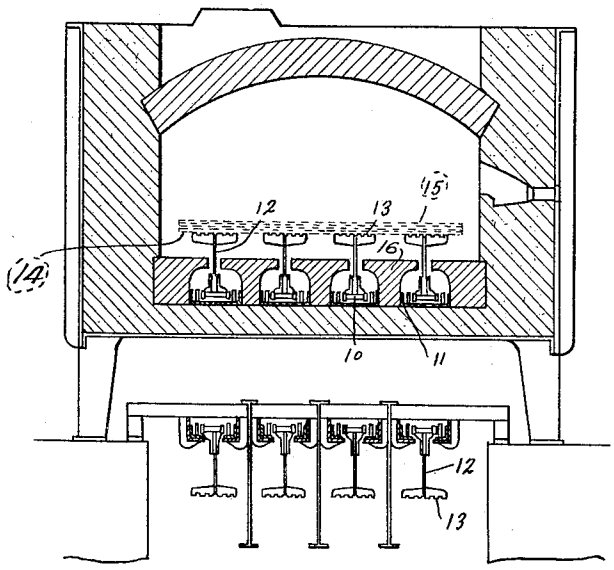



Fig. 2

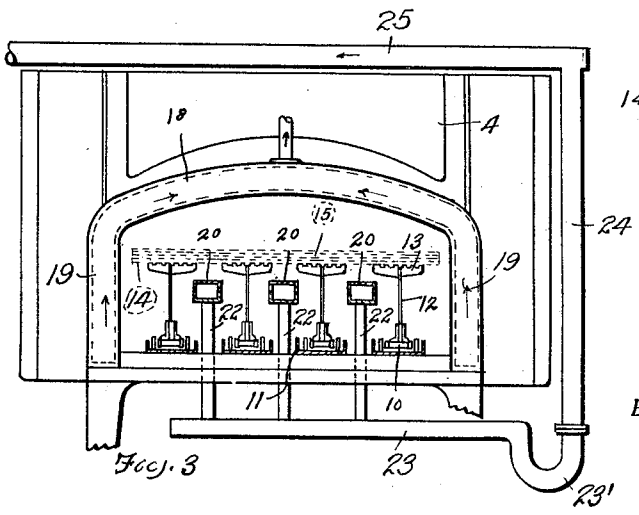



Fig. 3

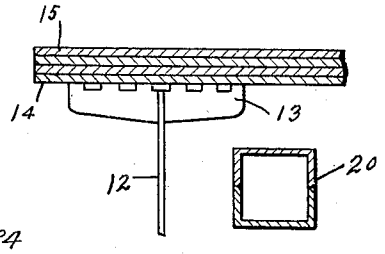



Fig. 4

INVENTOR.

Guy S. Peterson

BY

Fay Oberlin & Fay

ATTORNEYS.

Patented Apr. 25, 1933 1,906,092

# UNITED STATES PATENT OFFICE

GUY S. PETERSON, OF EAST CLEVELAND, OHIO, ASSIGNOR TO THE STRONG, CARLISLE & HAMMOND COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

## CONVEYER FURNACE

Application filed July 30, 1930. Serial No. 471,865.

This invention relates to conveyer furnaces, and more particularly to means for equalizing the cooling on both sides of horizontally disposed sheets of metal which are carried through conveyer furnaces in the process of normalizing and in similar operations.

The known practice in this respect comprises stacking sheets of metal on a conveyer, usually of the continuous chain type, and running these sheets through a heating chamber and one or more cooling chambers. It is known to have the roof arch of the cooling chamber water-cooled, but this alone gives undesirable results in that the sheets on the top of the stack are cooled more rapidly than those on the bottom and also in that the sheets are cooled more rapidly than the conveyer members which support them. This results in some inequality of treatment and is particularly objectionable as causing a spot on the lower side of the bottom sheet where the sheet has been in contact with the supporting element of the conveyer, this element usually being formed as a transversely disposed upright blade. Such spots on the sheet greatly diminish its value, particularly for automobile body work, inasmuch as they will show even through several coats of paint. The customary practice, therefore, has been to use the bottom sheet simply as a carrier, thus obtaining an even finish of all the upper sheets.

Such a practice is not economical, for the reason that this carrier sheet has to be conveyed back outside of the furnace to the loading point, a distance, frequently, of 100 feet or more, and furthermore these carrier sheets are destroyed by several passages through the furnace and therefore the old system entails considerable expense both for handling and for loss of material.

A preferred form of my invention for avoiding these difficulties is shown by the accompanying drawing and described below, although it is to be understood that this preferred embodiment is intended for interpretation by way of example and not by way of limitation, and that the principle of the invention may be embodied in other forms and applied to other situations.

In the accompanying drawing:

Fig. 1 is a longitudinal vertical central section through a furnace embodying my invention; Fig. 2 is a transverse section through the heating chamber on the line 2—2 of Fig. 1; Fig. 3 is a transverse section through the second cooling chamber on the line 3—3 of Fig. 1, also showing in elevation certain elements to the left of the line 3—3; and Fig. 4 is an enlarged detail on the plane of Fig. 3.

Referring to the drawing, Fig. 1 shows a typical furnace to which my invention is adapted, this furnace consisting of a heating chamber 1, separated by an arch 2 from a cooling chamber 3 which is in turn separated by an arch 4 from a second cooling chamber 5.

A conveyer, generally indicated by the reference chacater 7, moves successively through the heating and cooling chambers throughout the length of the furnace, as usual in the art.

Referrng now particularly to Fig. 2, it will be seen that the preferred form of conveyer comprises a plurality of parallel chains 10 running on trackways 11, carrying upright members, such as 12, at intervals. These upright members have transversely disposed blades 13 at the top, on which the sheets 14, 15, Fig. 3, are carried. It is the usual practice to separate the tracks 11 and protect the chains 10 from exposure to the full heat of the heating chamber by means of blocks, such as 16, of refractory material. Nevertheless, the chains become considerably heated, and of course, the blades 13 reach approximately the maximum temperature which is acquired by the sheets 14, 15, inasmuch as these blades 13 are above the protecting elements 16.

Referring now particularly to Fig. 3, and also to section 5 of Fig. 1, it is customary after passing the sheets through the first cooling chamber 3, to subject them to more rapid cooling in a second cooling chamber 5 having a water-cooled roof 18 and sides 19.

It will be apparent from Fig. 2 that in such an arrangement the blades 13, and particularly those on the inner chains, are shielded from the cooling effect of the water arch by the pile of sheets. This gives rise to the various disadvantages set forth above.

In my invention I run a series of water

channels 20 through the chamber 5 and in some instances part way into the first cooling chamber 3, between the various rows of uprights 12 and blades 13 so as to cool the blades 13 and the lower sheets from below at approximately the same rate as they are cooled from above. Inasmuch as the cooling area possible below by means of the channels 20 is less than that of the cooling arch 18, it is desirable to begin the bottom water cooling at an earlier point in the travel of the conveyer than the top water cooling, and for that reason the channels 20 are extended into the chamber 3. The top water cooling begins when the conveyer passes under the arch 4 into the chamber 5.

To render the cooling gradual, the water intake 21 of the channels 20 is at the discharge end of the furnace, thus giving a water flow contrary to the direction of travel of the sheets. The outlet 22 of each of the channels is connected on each line by a manifold 23 to the short leg 23′ of a J-tube having its longer length 24 passing up outside the walls of the furnace and entering a manifold 25 disposed across the top of the furnace, from which manifold the water may either go to a cooling system or to waste as the case may be. The long riser 24 and the manifold 25 insure that the channels 20 will always be completely full of water.

The length and the cross-sectional area of the various channels 20 are intended to be so designed as to cause the cooling above and below the sheets to be uniform so that there will be no difference in temperature between the blades 13 and the sheets supported thereon. Thus, spotting of the sheets will be avoided and the bottom sheets 14, as well as the others, can be carried forward into production.

It will be understood that the invention is susceptible of embodiment in other forms and of application to other purposes for which its characteristics may be suitable, and that it is not limited to the use of water circulation, but that any suitable means for cooling below and above at equal rates fall within its scope.

What I claim is:

1. In a conveyer furnace, in combination, a heating chamber, a cooling chamber, a second cooling chamber, a chain type conveyer comprising a plurality of parallel chains carrying upstanding work supports adapted to run through said chambers in the order named, and channels disposed longitudinally of said conveyer at a level between the top and bottom elements of the chains thereof in said cooling chambers for circulating a cooling medium adjacent the conveyer and beneath the work thereon, said channels extending part of the length of said first cooling chamber and said channels extending the full length of said second cooling chamber.

2. In a conveyer furnace, in combination, a heating chamber, a cooling chamber, a second cooling chamber, a chain type conveyer comprising a plurality of parallel chains carrying upstanding work supports adapted to run through said chambers in the order named, and channels disposed longitudinally of said conveyer at a level between the top and bottom elements of the chains thereof in said cooling chambers for circulating a cooling medium adjacent the conveyer and beneath the work thereon, said channels extending part of the length of said first cooling chamber and said channels extending the full length of said second cooling chamber, said second chamber also having cooling means in the roof thereof.

3. In a normalizing furnace of the type which includes a heating zone, two successive cooling zones, and a chain type conveyer carrying work holders elevated above the chains, for carrying horizontally disposed plate packs through said furnace, channels for cooling fluid parallel to the chains of the conveyer, above the running means of said conveyer and below the work holding means thereof, said channels extending through the last cooling zone and into but not through the first cooling zone.

4. In a normalizing furnace including a conveyer adapted to carry horizontally disposed plate packs, cooling means toward the discharge end of said furnace, said means being disposed both above and below the work, said cooling means below the work beginning at an earlier point in the run of the conveyer than the cooling means above the work.

5. In a normalizing furnace through which work is adapted to be carried by a conveyer of the chain type having upstanding work supports, cooling means adjacent said supports below the work, other cooling means above the work, said lower cooling means being effective for a longer distance than said upper cooling means.

Signed by me this 25th day of July, 1930.

GUY S. PETERSON.