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STRIP HEATING APPARATUS

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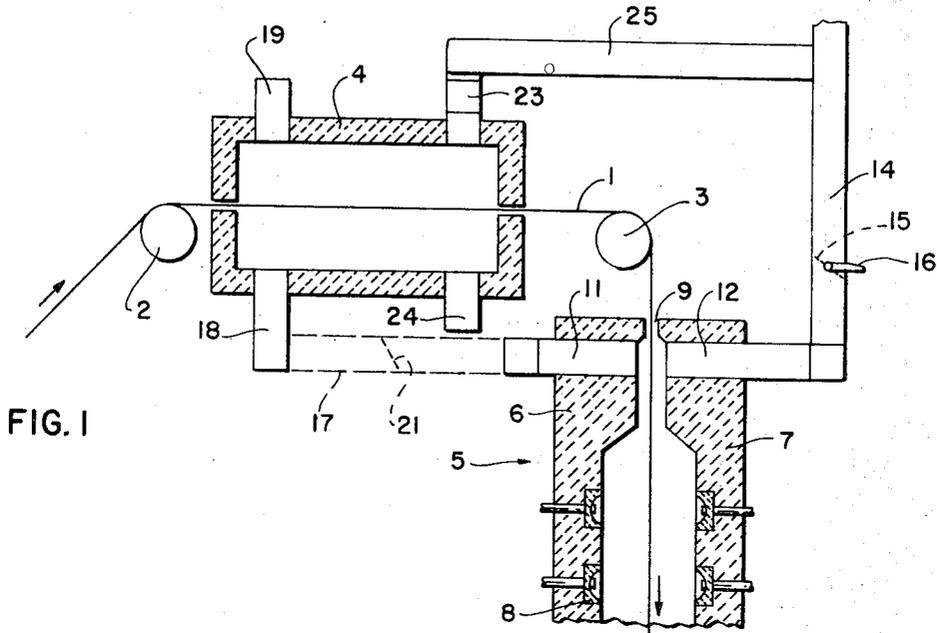


FIG. 1

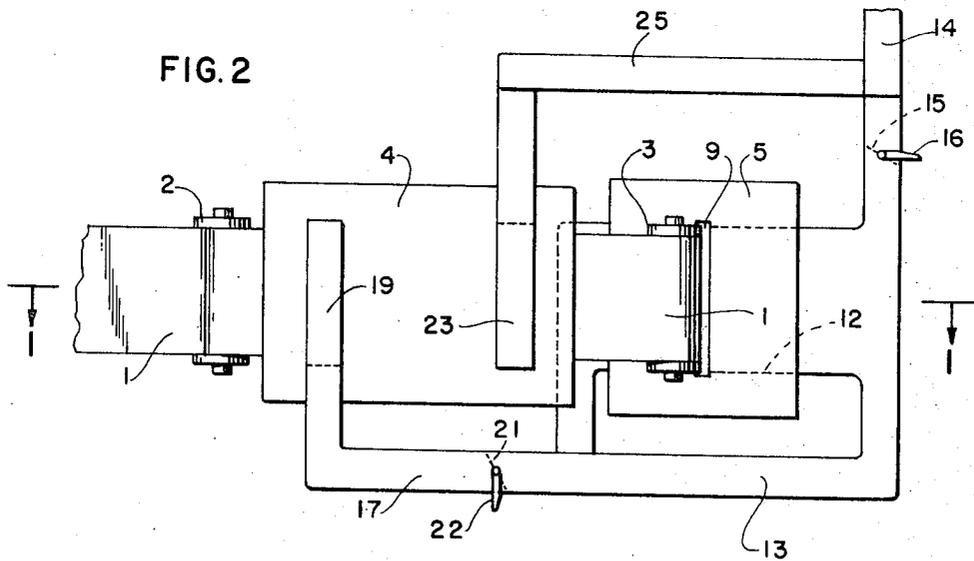


FIG. 2

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**STRIP HEATING APPARATUS**

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6 Claims

**ABSTRACT OF THE DISCLOSURE**

Strip metal heating apparatus in which there is provided a strip preheating chamber and a strip heating furnace with provisions for ducting products of combustion from the furnace either directly to an exhaust stack or through the preheating chamber to the exhaust stack in any desired volume.

**SUMMARY OF THE INVENTION**

The present invention relates to the heating of strip metal and more particularly to apparatus for the continuous heating of strip steel for annealing, heating for galvanizing, or other purposes.

In most direct fired strip heating furnaces the products of combustion are exhausted at the entrance of the furnace. With equipment of this type the range of operation of the furnace is determined by the turn-down range of the burners used to heat the furnace. It has been proposed to increase the efficiency of the furnaces by providing elongated passages leading to the furnace through which products of combustion may be directed in contact with the strip being heated. While such construction may well increase somewhat the thermal efficiency of the equipment, it has no effect on the flexibility of operation.

It is an object of the invention to provide apparatus for controlling the use of exhaust gases from a metal strip heating furnace to vary the preheat of the strip. It is a further object of the invention to provide apparatus for heating strip material and in which the products of combustion are used to increase the flexibility of the apparatus in its heating ability.

In practicing the invention there is provided a direct fired strip heating furnace, preferably, vertically positioned, through which strip is directed after passing over a plurality of guide rolls. A chamber is located around the strip between a pair of guide rolls and a duct is provided to direct exhaust gases from the furnace to the chamber. An additional duct is provided through which exhaust gases can be discharged directly to the atmosphere, and dampers are provided in the ducts to direct all or part of the exhaust gases through each duct. Thus, the amount of preheat, if any, that is imparted to the strip can be varied at will.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a view partly in section of the apparatus taken on line 1—1 of FIG. 2; and

FIG. 2 is a plan view of the apparatus.

**DETAILED DESCRIPTION**

Referring to the drawings, there is shown a strip of metal 1 which is guided through a path by guide rolls 2 and 3. These rolls guide the strip through the preheat chamber 4 and a direct fired furnace 5 which is prefer-

ably of the type disclosed in U.S. Pat. No. 2,869,846. Such a furnace includes panels 6 and 7 on opposite sides of the strip, each of which has in it a plurality of rows of burners 8 which fire directly into the furnace chamber to heat the strip from opposite sides by radiation and by convection from the products of combustion. The products of combustion pass upwardly toward a relatively narrow entrance or inlet slot 9 where they are withdrawn through passages 11 and 12 respectively to a connecting duct 13 which is connected with an exhaust duct 14. Duct 14 has in it a damper 15 operated by a handle 16 to control the flow of gases from the furnace.

The duct 13 is connected with another duct 17 which leads to entrances 18 and 19 at the bottom and top, respectively, of preheat chamber 4 adjacent to the entrance end thereof. Duct 17 has in it a damper 21 which is operated by a handle 22 to vary the amount of products of combustion that can flow to the preheat chamber. The products of combustion are exhausted from the preheat chamber through a pair of ducts 23 and 24 which are joined by a duct 25 leading to the main exhaust duct 14 downstream of damper 15.

In the operation of the apparatus the hot products of combustion flowing from furnace 5 can be exhausted directly to the duct 14 and a stack by closing damper 21 and opening damper 15. It is noted that damper 15 can be adjusted to vary the back pressure in the furnace. If it is desired to preheat the strip prior to the time that it enters the furnace, damper 15 will be closed and damper 21 will be opened so that the products of combustion will be directed through preheat chamber 4 before being exhausted through ducts 25 and 14.

The amount of preheat that is imparted to the strip in chamber 4 will depend upon the adjustment of dampers 21 and 15. These can be regulated, preferably manually so that full preheat or partial preheat of the strip can be obtained prior to the time it enters into furnace 5 for the final heating. The amount of preheat imparted to strip 1 for a given setting of burners 8 will depend upon the type of heating that is being done, whether annealing or heating for galvanizing, for example; the weight of the strip 1 and its speed. Normally, when the preheating chamber is being used, the strip will not be heated in this chamber above a temperature at which it will oxidize while passing from the preheat chamber over roll 3 of the furnace.

It is noted that the hot products of combustion introduced into chamber 4 are introduced adjacent to the entrance end of this chamber. When this is done the products of combustion at their highest temperature will impinge upon opposite surfaces of the strip to vaporize any oil that may be on the surfaces of the strip, thereby cleaning the strip prior to the time it is heated. This vaporization of oil will reduce the fumes that would otherwise be produced if the oil were burned in the furnace proper.

It is preferred to introduce the preheating products of combustion into the entrance end of chamber 4, as described above, since in most cases the strip will have oil on its surface and the strip will be preheated whether it is oily or clean. It will be apparent, however, that if the strip has been cleaned before it is supplied to the furnace adequate preheating could be obtained if the combustion gases were introduced at the exit end of chamber 4.

It is also noted that a housing can be built around the strip between the exit of the preheat chamber and the entrance of the furnace, if desired. This would save the heat that would normally be lost during the passage of the strip between these two points, which loss however is rather slight.

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While in accordance with the provisions of the statutes I have illustrated and described the best form of embodiment of my invention now known to me. It will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. Apparatus for preheating and heating strip material comprising means to direct the strip through a path, means forming a chamber having an entrance and an exit surrounding the strip at a first location along said path, a furnace to heat the strip surrounding the strip at a second location also said path, said furnace being provided with burners producing hot products of combustion, manifold means located adjacent to the point where the strip enters said furnace to withdraw the products of combustion, an exhaust duct connected to said manifold means, a second duct connected to said manifold means, said second duct discharging into said chamber, a third duct connecting the interior of said chamber to said exhaust duct, and damper means in said ducts operative to

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direct products of combustion to said exhaust duct or to said second duct.

2. The combination of claim 1 in which said second duct discharges into said chamber on opposite sides of the strip adjacent to the entrance of said chamber.

3. The combination of claim 1 in which said damper means includes a first damper in said exhaust duct and a second damper in said second duct, and means to adjust said dampers individually.

4. The combination of claim 3 in which said second duct is connected with said chamber at a location adjacent to the entrance of said chamber.

5. The combination of claim 1 in which said second duct is connected with said chamber at a location adjacent to the entrance of said chamber.

6. The combination of claim 5 in which said third duct connects with said chamber adjacent to the exit thereof.

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