Dec. 20, 1938. C. B. HOAK 2,141,108

NORMALIZING FURNACE

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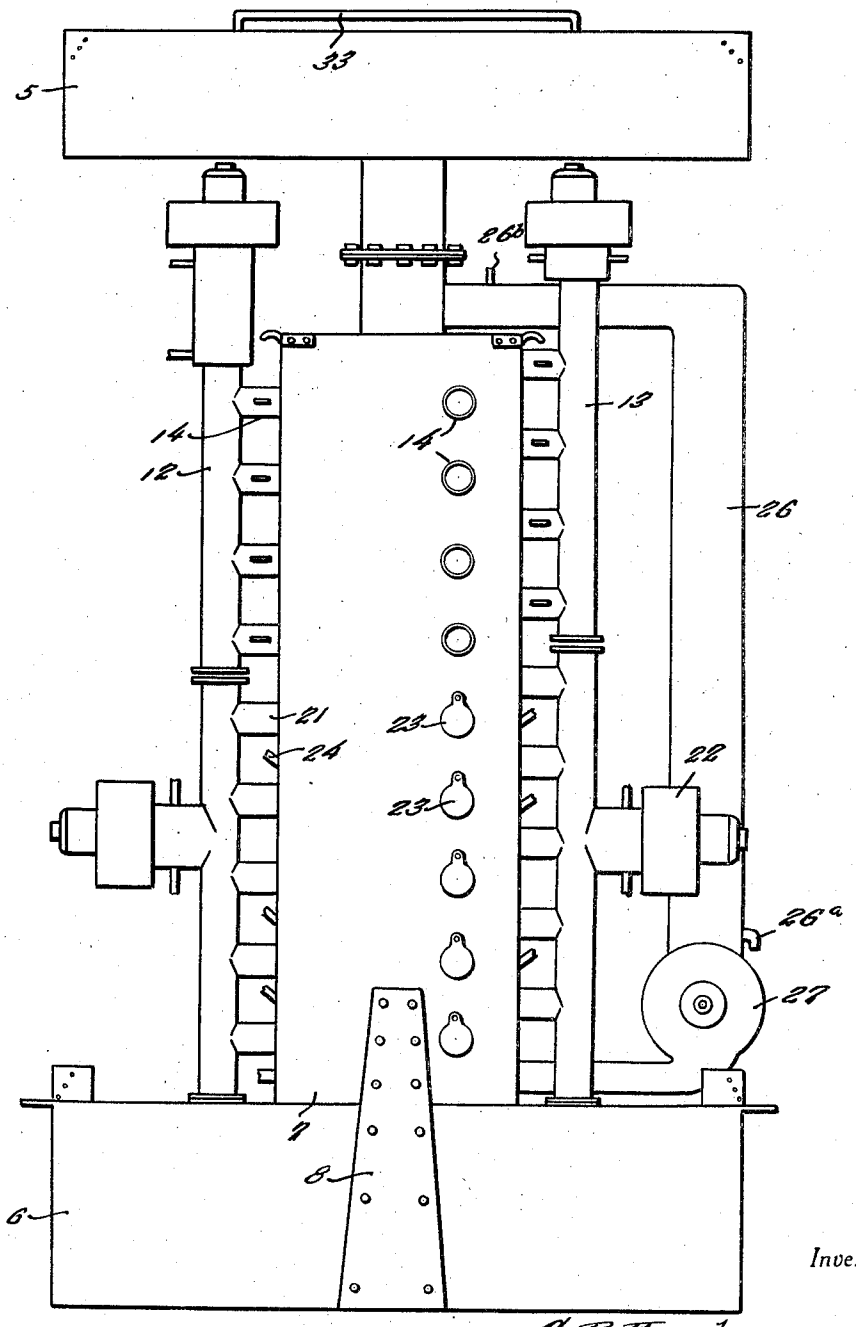


Fig. 1.

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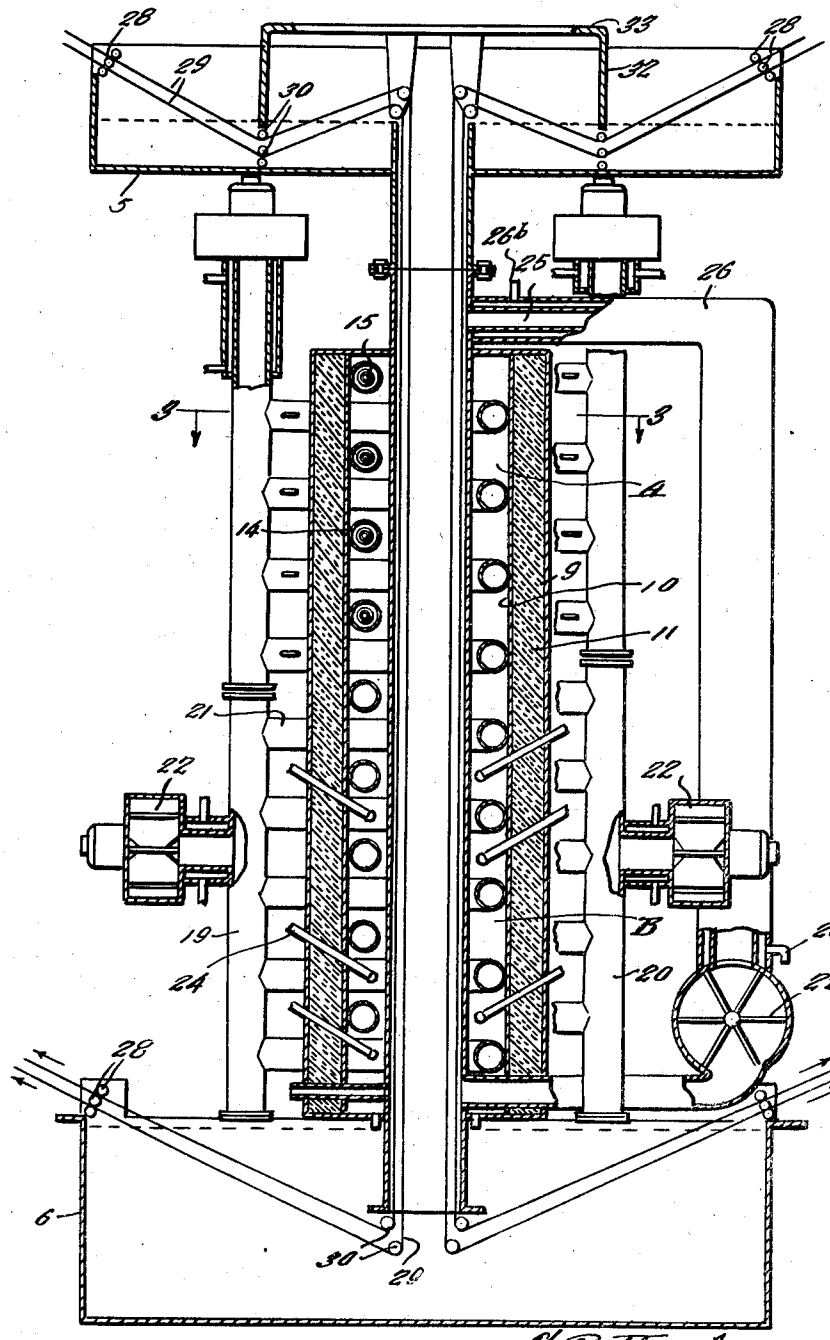


Fig. 2.

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NORMALIZING FURNACE

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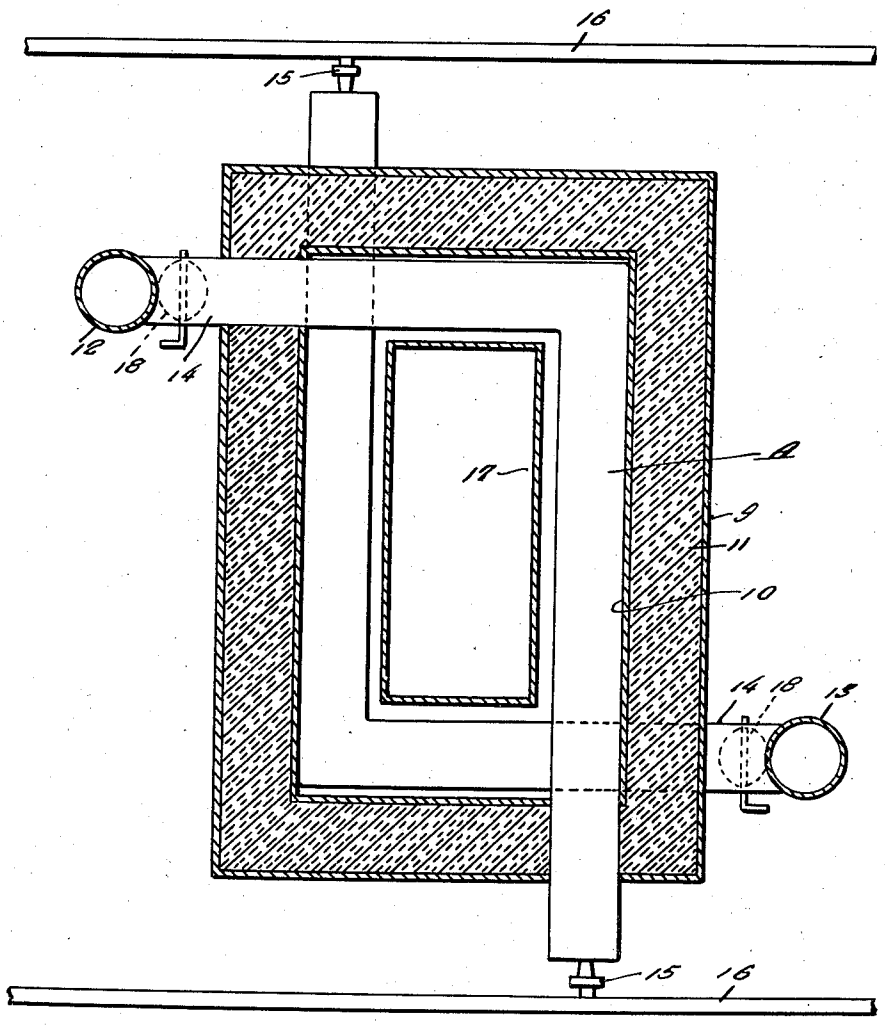


Fig. 3.

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Fig. 4.

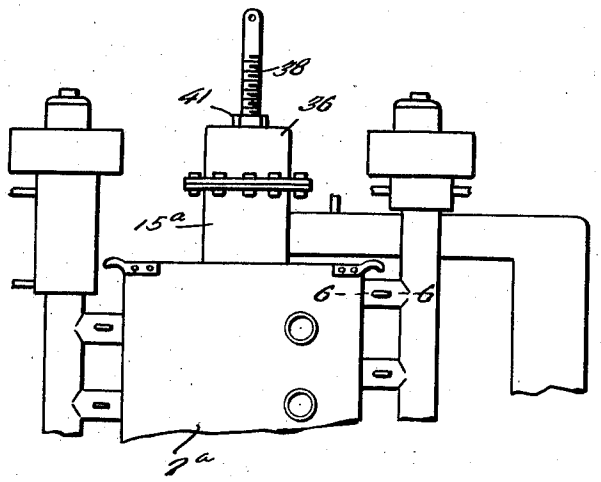


Fig. 5.

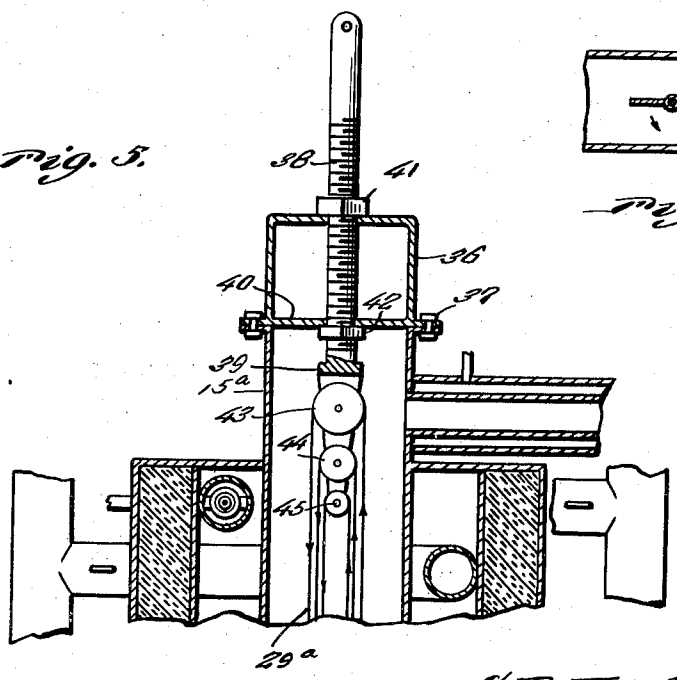


Fig. 6.

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NORMALIZING FURNACE

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Fig. 7.

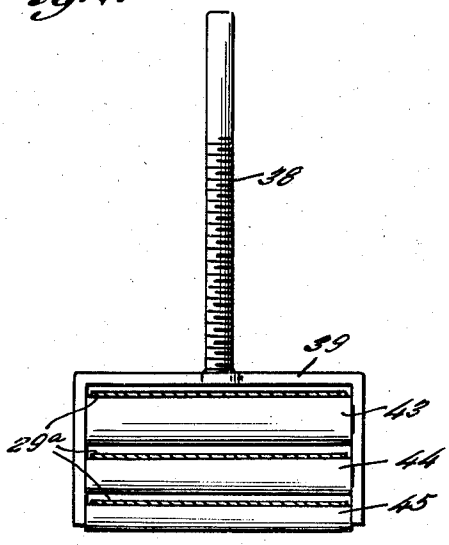
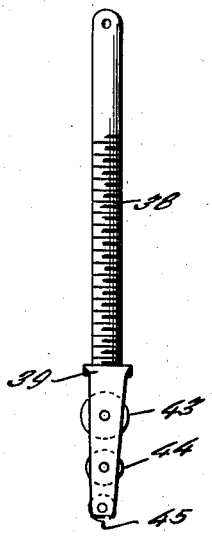


Fig. 8.



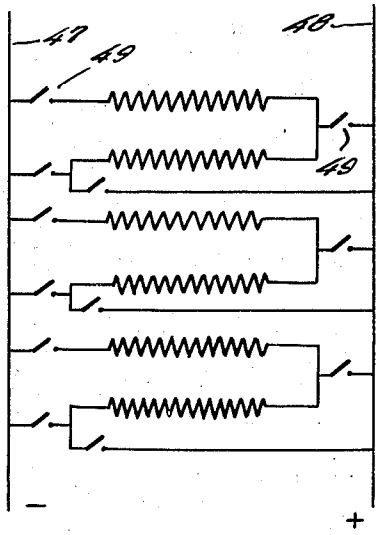


Fig. 9.

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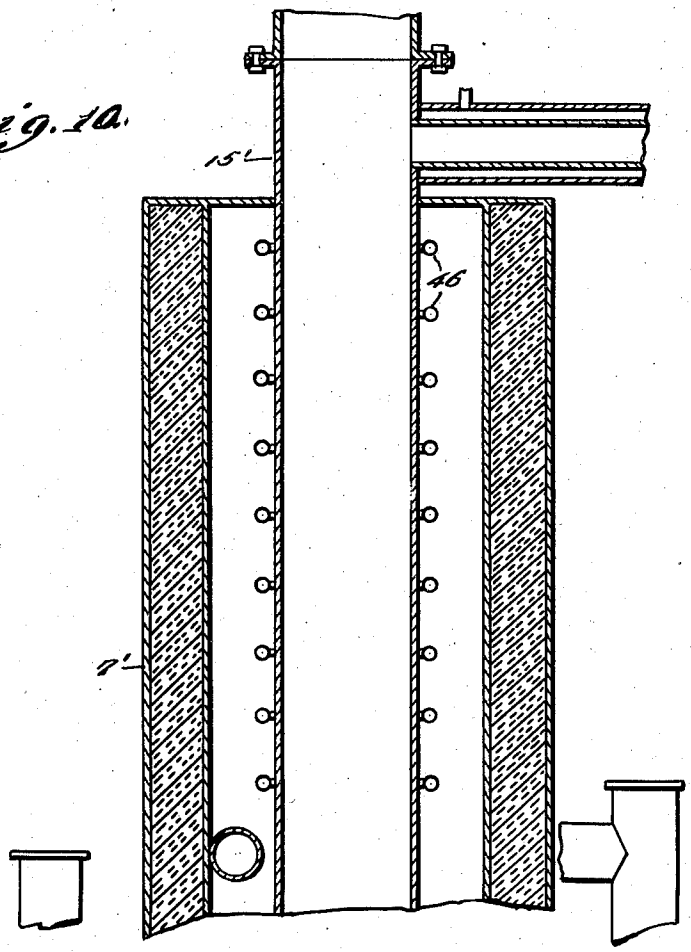
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Dec. 20, 1938. C. B. HOAK 2,141,108

NORMALIZING FURNACE

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Fig. 1a.



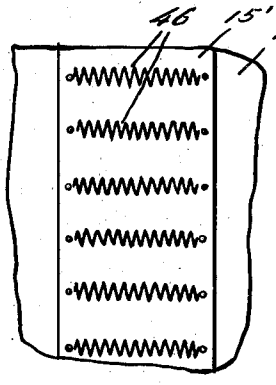


Fig. 1b.

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UNITED STATES PATENT OFFICE

2,141,108

NORMALIZING FURNACE

Clarence B. Hoak, Steubenville, Ohio

Application December 9, 1937, Serial No. 179,003

2 Claims. (Cl. 266—3)

The present invention relates to new and useful improvements in apparatus for treating elongated material such as strip steel, wire, etc., the same being an improvement on my U. S. Patent No. 2,104,518.

The principal object of the present invention is to provide a furnace of the character stated wherein material can be treated in an efficient manner to prevent scaling.

Another important object of the invention is to provide a furnace of the character stated wherein application of high and low temperatures can be executed in a definitely regulated manner.

Still another important object of the invention is to provide a furnace in which strip metal can be treated efficiently and wherein an inert gas is employed in the sealed passageway through which the strip material passes.

These and various other important objects and advantages of the invention will become apparent to the reader of the following specification.

In the drawings:

Figure 1 represents a side elevational view of the apparatus.

Figure 2 is a view partly in side elevation and partly in vertical section.

Figure 3 is a horizontal sectional view taken substantially on the line 3—3 of Figure 2.

Figure 4 is a fragmentary side elevational view of a modified form of the apparatus.

Figure 5 is a fragmentary vertical sectional view through the structure shown in Figure 4.

Figure 6 is a fragmentary detailed sectional view showing one of the butterfly valves.

Figure 7 is a side elevational view of the roller mount employed in the form of the invention shown in Figure 5.

Figure 8 is an edge elevational view of the roller mount shown in Figure 7.

Figure 9 is a diagrammatic view disclosing the electrical connections between the heating elements employed in the form of the invention shown in Figure 10.

Figure 10 represents a fragmentary vertical sectional view through another modified form of the invention.

Figure 11 is a fragmentary side elevational view of the drum showing a modified heating means for the drum.

Referring to the drawings wherein like numerals designate like parts, it can be seen in Figure 1 that the machine consists of the upper and lower sealing tanks 5—6. Rising from the top of the lower sealing tank is the jacket wall structure generally referred to by numeral 7, this being secured in place by suitable means 8. This wall structure 7 is made up of the outer shell 9, the inner shell 10 and heat insulating material 11 interposed between these walls.

The upper portion of the interior of the wall structure 7 is to be known as the heating zone A, while the lower interior portion is known as the cooling zone B.

The wall structure 7 is preferably square in cross section and at opposite sides of the heating zone portion of the shell are the manifolds 12—13. Extending from each of these manifolds 12—13 is a series of vertically spaced longitudinal L-shaped pipes 14, those of one series alternating with those of the other, said pipes extending into the shell along one side thereof and outwardly through another side and along the side wall at right angles to the above mentioned wall to terminate with a burner 15 projecting into the same from the fuel line 16. As is shown in Figure 3, these fuel lines 16—16 extend along opposite sides of the wall structure, while the manifolds 12—13 extend vertically along the remaining two sides of the wall structure. As is shown in Figure 3, the pipes 14 extend across each other to define a vertical clearance through the wall structure, through which the drum 17 of rectangular cross section extends. This drum 17 extends upwardly and downwardly through the closed upper and lower ends of the wall structure and terminate within the sealing tanks 5—6.

Each of the pipes 14 has a butterfly valve 18 therein adjacent its corresponding manifold 12—13 whereby the amount of hot air passing through the pipes 14 can be regulated.

The aforementioned hot air pipes 14 are located of course within the heating zone A, while the manifolds 19—20 are located opposite the cooling zone B and are likewise provided with L-shaped pipes 21 which extend into the wall structure 7 in the same manner as the pipes 14 to afford a clearance for the drum 17.

A blower 22 is provided for each of the manifolds 19—20 for supplying cold air to the pipes 21. The outlet ends of the pipes 21 are provided with pivotal closure plates 23 whereby the passage of cold air through these pipes 21 can be regulated.

Tubes 24 extend into the lower portion of the wall, that is, into the zone B for spraying water into the cooling zone portion of the drum 17.

A tube extends from the upper portion of the drum 17, that is, above the wall 7, downwardly at the outside of the wall to again communicate with the drum 17 below the cooling zone B. This

tube 25 is provided with the water jacket 26 having the inlet 26a and the outlet 26b so that fluid of the desired temperature can be supplied to the said jacket. In the lower portion of this tube 25 is the suction fan or pump 27.

Inert gas is circulated through the tube 25 and drum 17 by means of the pump 27.

It can now be seen that the tanks 5—6 are substantially filled with water or some other suitable liquid and that the upper portion of the drum 17 extends into this liquid while the lower end depends into the liquid of the tank 6. The ends of these tanks are equipped with rollers 28 between which the strips of material 29 to be treated are trained. Other rollers 30 can be provided between the ends of the tank and the drum 17, as well as at the upper and lower ends of the drum over which the strips 29 can pass and be spaced in their transit through the drum from each other.

As the lower end of the drum is thus sealed off by the liquid in the tank 6 and as the upper end of the drum is sealed off by reason of the immersed disposition of the side walls 32 of the shed-like structure 33 in the liquid of the tank 5, the gas in the conduit 25 must move in a closed circuit and none of the same is consequently lost.

It can be seen that while the heat in the tubes 14 can be regulated by adjusting the burners 15, the air passing through the tubes 21 is regulated by the dampers 23 (see Figure 1).

A slightly modified form of the invention is shown in Figures 4 and 5 wherein the wall structure is denoted by reference character 7a. In this form of the invention the lower sealing tank 6 is employed, but the upper sealing tank 5 is eliminated, as the strips of material 29a to be treated are brought in through the lower portion of the apparatus and trained upwardly through the conduit 15a and then back down the conduit or drum and out again through the bottom of the apparatus.

In this connection, a cap-like structure 36 is bolted as at 37 to the upper end of the drum 15a and has the screw shank 38 of the yoke 39 disposed therethrough. A bridge member 40 is interposed between the upper end of the drum 15a and the screw 38 is disposed through the top of the cap 36 and this bridge member 40. Cam nuts 41—42 are engaged against the top of the cap 36 and the bridge piece 40 to prevent vertical adjustment of the screw member 38.

Rollers 43—44 and 45 of different sizes are rotatably mounted in the yoke 39, these being of different sizes so that the strips 29a to be treated can pass over these rollers and be maintained in spaced relation from each other, that is, in their transit through the drum 15a.

Instead of heat tubes 21 as shown in Figure 2, the apparatus can be provided at the heating zone A with electrical heating elements 46 at the outer side of the drum 15' (see Figure 10). These heating elements may be arranged in any manner desired, but are preferably arranged in parallel relation to the supply line 47—48 with switches 49 employed between the ends of these heating elements and the sides of the line 47—48 so that as many of these heating elements can be cut in or out of heating zone A as may be desired from time to time to regulate the temperature of the zone A.

In regard to the use of the inert gas, it is to be understood that the inert gas acts as a good conductor of the high and low temperatures afforded by the heating means and cooling means surrounding the drum 17. In this manner the correct temperatures are transmitted directly from the temperature creating source to the strips being treated.

The walls of the drum 17 should also be of good heat conductive material.

By varying the heat in the individual tubes 14, the heat of the inert gas can be varied along the entire length of the drum in the heating zone A.

Should steam be substituted for the inert gas, the strips of material being treated will turn a bluish color, this being known as "steam bluing."

While the foregoing specification sets forth the invention in specific terms, it is to be understood that numerous changes in the shape, size and materials may be resorted to without departing from the spirit and scope of the invention as claimed hereinafter.

Having described the invention, what is claimed as new is:

1. A combination furnace for bright-annealing or steam bluing strip material comprising a vertically disposed elongated muffle of heat conducting material open at both ends and through which said material is fed, means at each end of said muffle to seal said ends, a closed jacket surrounding said muffle intermediate said ends thereof and forming a continuous chamber around the same, means to optionally circulate inert gas or steam through the jacketed part of said muffle including a conduit passing from said muffle adjacent the opposite ends of the jacket, temperature varying means for said chamber dividing the same into upper and lower heating and cooling zones, respectively, and pipes extending through said jacket into the cooling zone of said chamber for the introduction of water thereinto.

2. A combination furnace for bright-annealing or steam bluing strip material comprising a vertically disposed elongated muffle of heat conducting material open at both ends and through which said material is fed, means at each end of said muffle to seal said ends, a closed jacket surrounding said muffle intermediate said ends thereof and forming a continuous chamber around the same, means to optionally circulate inert gas or steam through the jacketed part of said muffle including a conduit branching from said muffle adjacent opposite ends of the jacket, and temperature varying means for said chamber dividing the same into upper and lower heating and cooling zones, respectively, and including a pair of vertically disposed conduits on opposite sides of said jacket, respectively, a series of horizontal right angled pipes extending from each conduit in vertically spaced relation into and out of said chamber, the pipes of one series alternating with those of the other, means at the outer ends of said pipes for introducing heat to the same, and dampers in said pipes.

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