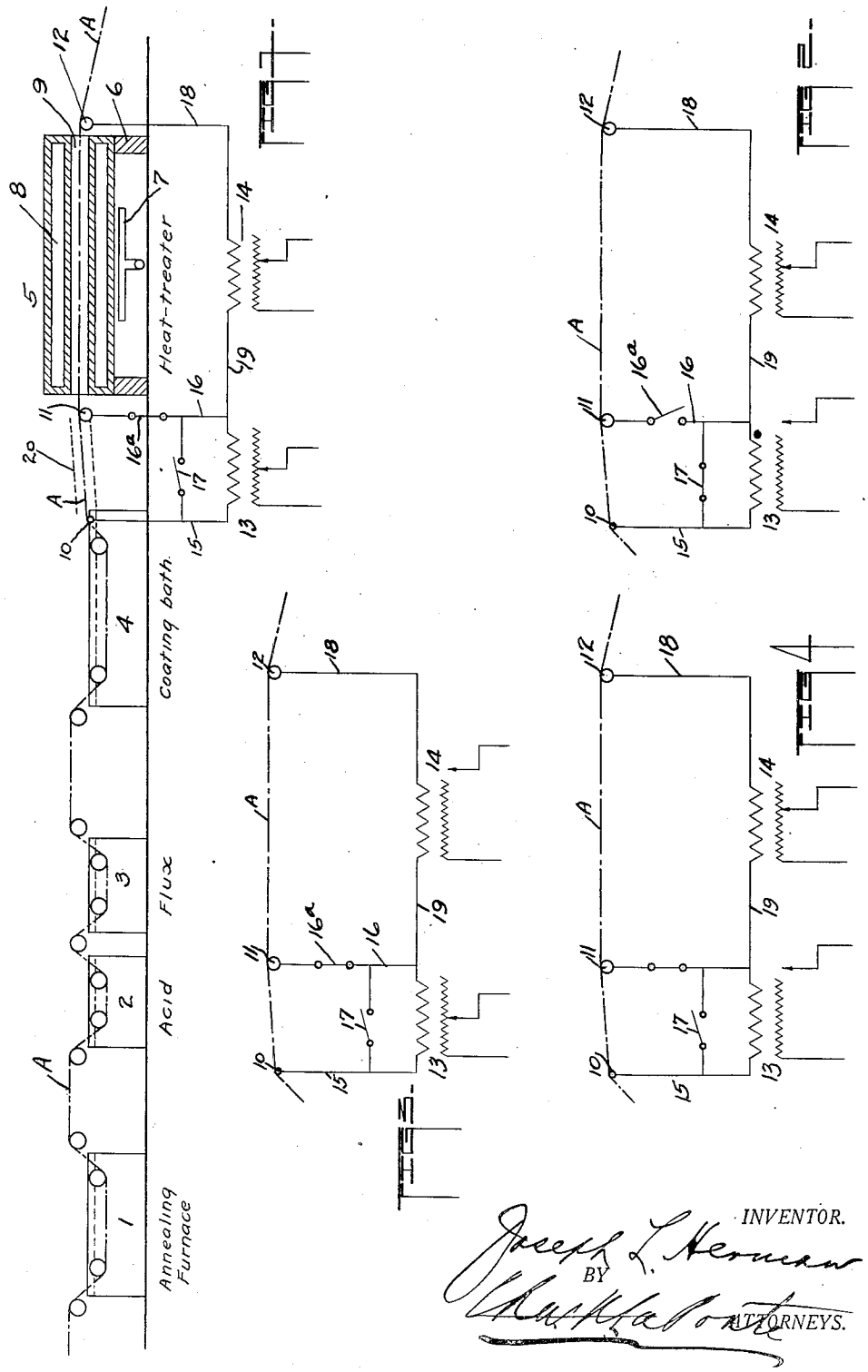
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J. L. HERMAN

APPARATUS FOR HEAT TREATING METAL COATED MATERIALS

Filed May 4, 1922



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UNITED STATES PATENT OFFICE.

JOSEPH L. HERMAN, OF PEORIA, ILLINOIS.

APPARATUS FOR HEAT TREATING METAL-COATED MATERIALS.

Application filed May 4, 1922. Serial No. 558,472.

To all whom it may concern:

Be it known that I, JOSEPH L. HERMAN, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented new and useful Improvements in Apparatus for Heat Treating Metal-Coated Materials, of which the following is a specification.

This invention has reference to an apparatus for heat-treating metal coated materials having preferably an iron base, as for example galvanized wire, the apparatus being particularly designed for heat-treating materials immediately following the galvanizing operation and by continuous process.

The apparatus for heat-treating metal coated materials herein described and claimed, discloses one form of apparatus and modifications thereof for practicing the process of coating and treating materials having an iron base described and claimed in my application for patent bearing Serial Number 535,660.

The principal object of the invention is to provide an apparatus for heat-treating metal coated material during the process of coating the same and preferably immediately upon the material leaving the coating bath in which the material is immersed or thru which the material is moved. By such heat-treatment I obtain a coating which will be more resistant to atmospheric rusting and corroding conditions than is ordinary galvanized wire, and which will produce a heavier coated wire and one which can be used in wire fabricating machines without causing the coating to crack or flake off as is the case with heavily coated galvanized wire coated by ordinary processes.

The invention has for a further object to provide an apparatus for applying a heavier coating on wire with a shorter immersion in molten zinc than is the case with ordinary galvanized wire carrying heavier coating and the elimination of the usual wiping mechanism.

That the invention may be more fully understood reference is had to the accompanying drawings forming a part of the description illustrating a preferred embodiment of the invention, in which:—

Fig. 1 illustrates in a more or less diagrammatic way a continuous galvanizing unit for wire including the "annealing furnace," "acid" bath, "flux" bath, "coating" or galvanizing bath and "heat-treater;"

Figs. 2, 3 and 4 illustrate in a diagrammatic way associated electrical units employed in connection with the heat-treater, illustrating in modified forms different modes of applying heat directly to the coated materials preferably immediately upon the material leaving the coating bath.

Like characters of reference denote corresponding parts thruout the figures.

No claim is made to the "annealing furnace," the "acid" bath, the "flux" bath, or the "coating" or galvanized bath, separately as individual units, or collectively in combination with each other, as these elements are well known in the art. The invention lies in the heat-treater and in the combination of the heat-treater with the elements constituting the galvanizing unit.

For convenience the "annealing furnace" is designated 1, the "acid" bath 2, the "flux" bath 3 and the "coating" or galvanizing bath 4, and in Fig. 1 a wire designated A is shown moving continuously thru the "annealing furnace," "acid" bath, "flux" bath and "coating" bath, being guided in the usual manner and subjected to the action of the several elements referred to in the manner common to the ordinary galvanizing practice.

The heat-treater as a complete unit is designated 5 and includes as I shall point out a suitable furnace for heat-treating the coated material immediately after it leaves the coating bath, and also a means associated with the furnace for applying electrical heat directly to the coated material. The furnace designated 6 may be of a suitable size, and as adjacent to the coating or galvanizing bath as practice will demand, said furnace being heated by an oil burner 7 or in some other approved or desirable manner and has associated therewith a lead bath 8 in which a tube 9 is preferably submerged, the lead serving to maintain an even temperature in the tube thru which the wire A is passed. In the operation of the apparatus it is the purpose of the heat-treater to heat the wire in such a manner as will provide the superior coating which I have fully described in my pending application bearing Serial Number 535,660. Upon the wire A leaving the coating bath at an approximate temperature of 950 degrees F., and before the coating has an opportunity to completely set it is subjected to a heat-treatment in the tube 9 whereby the coated wire is subjected to a heat of approximately 1250

degrees F. which completely smooths and improves the coating in the manner and for the purpose very clearly stated in my pending application bearing Serial Number 535,660. By the use of the element just described the wire is heated by radiation from the surface of the tube thru which it is passing. It is well known that in heating by radiation it is important that the material to be heated is close to the source of heat, as the heat radiated from one body to another under black-body temperature conditions is as the fourth power of the distance separating the two bodies; consequently the tube 9 should be as small in diameter as is practical to use as compared with the wire passing thru it. I have found however, in practical experience that it is rather difficult to so regulate the tension of the wire in the tube when a very small tube is used, so as to prevent the wire from striking at different points in the tube in which case spots are formed in the coating which do not always test out as well as the rest of the coating. I can completely obviate this however, by use of larger diameter tubes, but in this case, as I have explained the radiation space is much greater and consequently a longer tube is necessary in order to transfer the same degree of heat to the wire as would be imparted from a small tube. For these reasons I employ in connection with the furnace an electric means for bringing the wire up to the correct heat-treating temperature. In practice a large tube, except for the length required, is suitable. To obviate the additional length of the tube required, I provide an auxiliary heating device, preferably an electrical means including contacts over which the wires pass, said contacts being connected to a transformer or transformers for controlling the direction of the current thru said contacts. In the preferred arrangement of the auxiliary heating means there are provided contacts 10, 11 and 12 connected by suitable wiring with transformers 13 and 14. The contact 10 is preferably of the sliding type and may be used as indicated in Fig. 1 as a drip-bar at the outlet end of the coating or galvanizing bath 4. The contact 11 is also preferably of the sliding type and is preferably located at the entrance of the tube 9 of the furnace. The contact 12 is preferably of a roller type as at this point the coating may be more or less in a plastic state and is less injured by a rolling contact than it would be by a sliding contact. The contact 10 is shown connected by a wire 15 with the transformer 13; the contact 11 is connected with the transformer 13 by a wire 16 in which is a switch control 16^a, and the two wires 15 and 16 are connected by a switch control wire 17. The contact 12 is connected by a wire 18 with a transformer 14 and the two transformers are connected by a wire 19. The circuits between the several contacts and the transformers are only complete when a wire A is in contact therewith. As will be understood the transformers are suitably wired to allow varying amounts of current to pass thru the wire A by means of regulating switches, not shown, and which are well understood.

In Fig. 1 the switch 16^a is closed and the switch 17 is open and as shown the current will flow from contacts 10 to 11 and from 11 to 12 and then alternately from 12 to 11 and 11 to 10 applying the electric energy for heating the wire alternately between these points, the two transformers being in use. By the use of the two transformers I am enabled to get the result shown in Fig. 1 and also the modified results shown in Figs. 2, 3 and 4.

In Fig. 2 the transformer 13 is not in use, the switch 16^a is open and the switch 17 has been moved to complete the circuit between the wires 15 and 16, wherein the electric energy is supplied only thru the transformer 14. In this figure the current flows alternately thru contacts 10 to 12 and 12 to 10 as will be understood.

In Fig. 3 the transformer 14 is not in use and therefore the current flows alternately from contacts 10 to 11 and 11 to 10.

In Fig. 4 the transformer 13 is not in use, the switch 17 is open and therefore the current will flow alternately from contact 11 to 12 and from 12 to 11. By the foregoing arrangement it will be seen that heat may be applied by electrical energy directly to the coated wire A between the contact points 10 and 11 just prior to the wire entering the furnace; or directly to the wire between contact points 10 and 12, simultaneously with the heat-treatment of the wire within the furnace, or between the contact points 11 and 12 within the furnace without preheating before the wire enters the furnace.

As previously stated it is preferable to use a large tube in the heat-treater and I therefore associate with such a structure an auxiliary electrical heating means, by means of which the heat-treating temperature may be quickly reached without having recourse to the longer tube.

In Fig. 1 I have shown in dotted lines an enclosure 20 located between the contact points 10 and 11 thru which the wire A, may travel, if it is desired to have such a closure.

What I claim is:—

1. An apparatus for heat-treating metal coated materials before the coating has set, comprising an open ended single heat-treating unit arranged to heat-treat the material by radiation, and other means for applying heat directly to the material.

2. An apparatus for heat-treating metal

coated materials before the coating has set, comprising an open ended single heat-treating unit arranged to heat-treat the material by radiation, and electrical means for applying heat directly to the material.

3. An apparatus for heat-treating metal coated materials, comprising a heater including means for applying heat to the material by radiation, and electrical means for applying heat directly to the material preceding the action of the heater.

4. An apparatus for heat-treating metal coated materials before the coating has set, comprising an open ended single heat-treating unit arranged to heat-treat the material by radiation, and means for electrically applying heat directly to said material coincidentally with the application of the heat-treating by radiation, said electrical means arranged for imparting electric energy to the material alternately from opposite ends of the heat-treater.

5. An apparatus for heat-treating continuously moving metal coated materials having an iron base before the coating has set, comprising an open ended single heat-treating unit arranged to heat-treat the material by radiation, electrical contacts at opposite ends of the heater with which the material engages, a transformer, and electrical conductors connecting said contacts with said transformer.

JOSEPH L. HERMAN.