R. E. TALLEY.

HEAT TREATMENT.

APPLICATION FILED OCT. 4, 1919.

1,362,367.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 1.

FIG. 2.

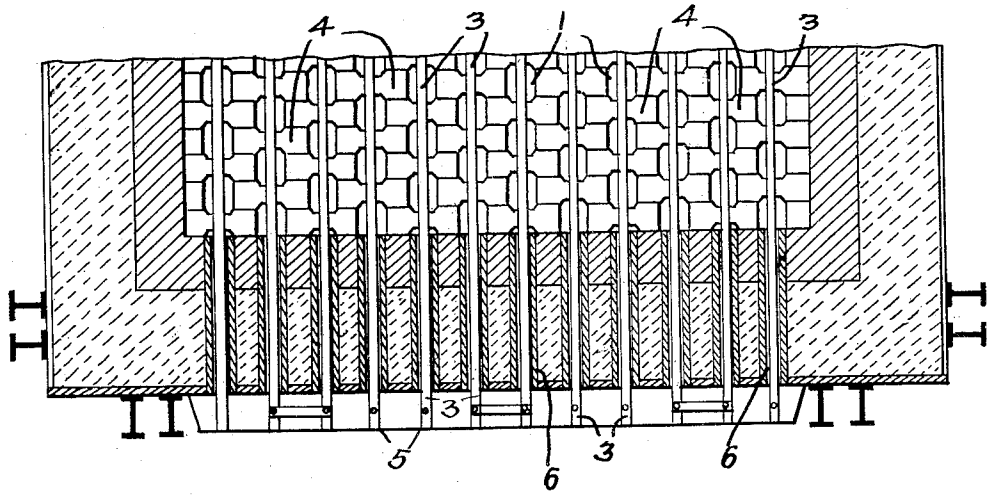
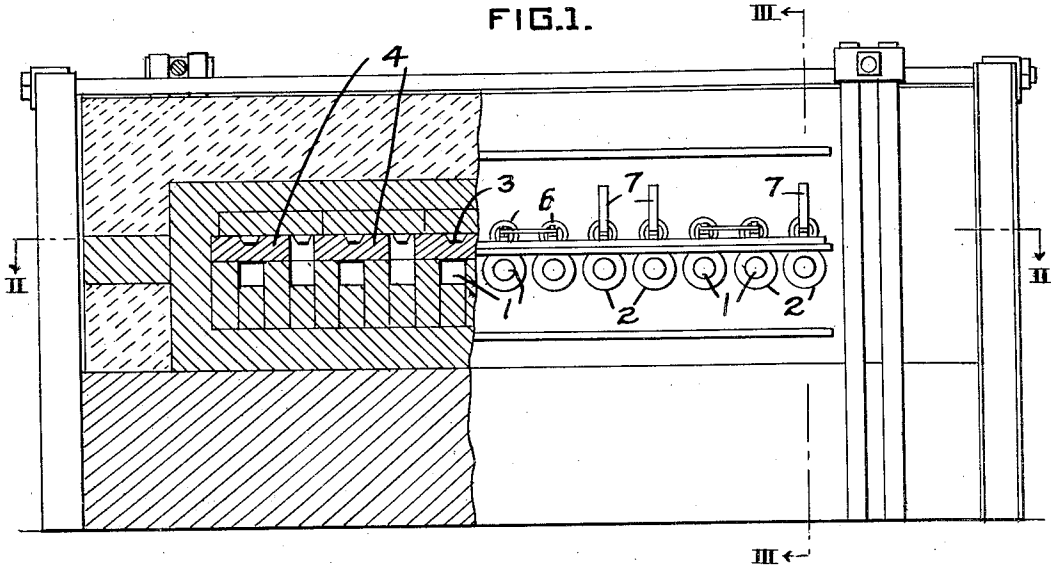


FIG. 1.



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4 SHEETS—SHEET 2.

FIG. 4.

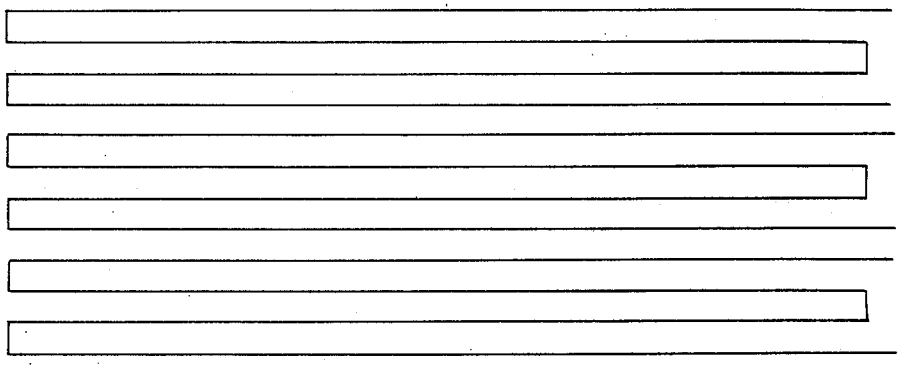
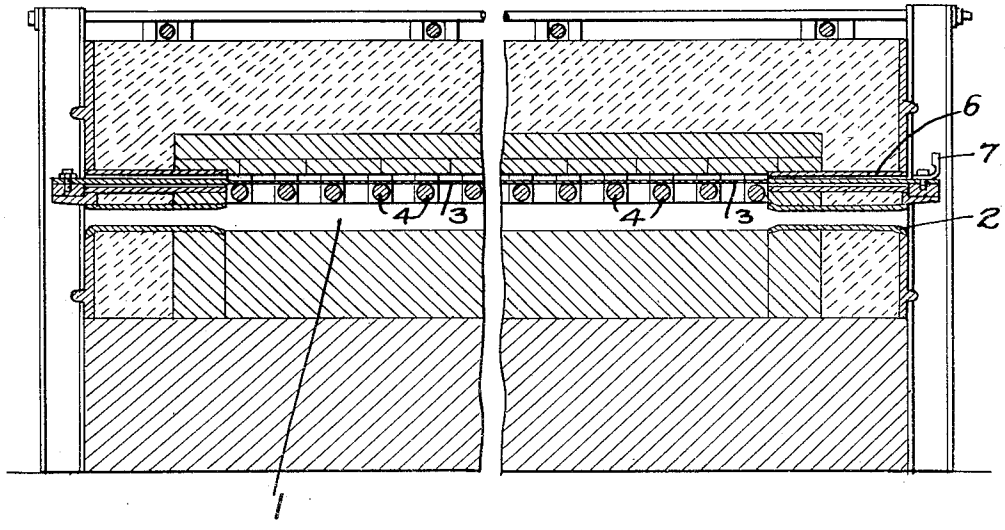


FIG. 3.



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4 SHEETS—SHEET 3.

FIG. 5.

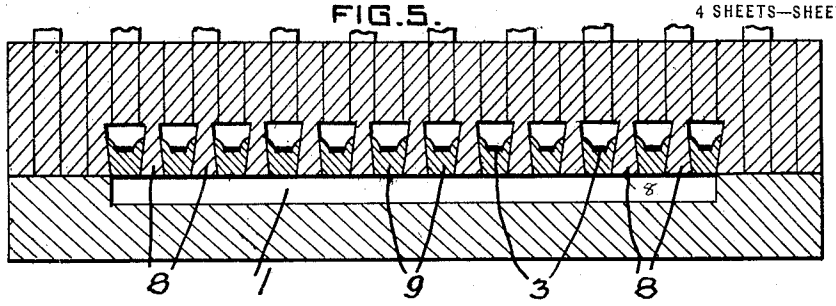


FIG. 5a.

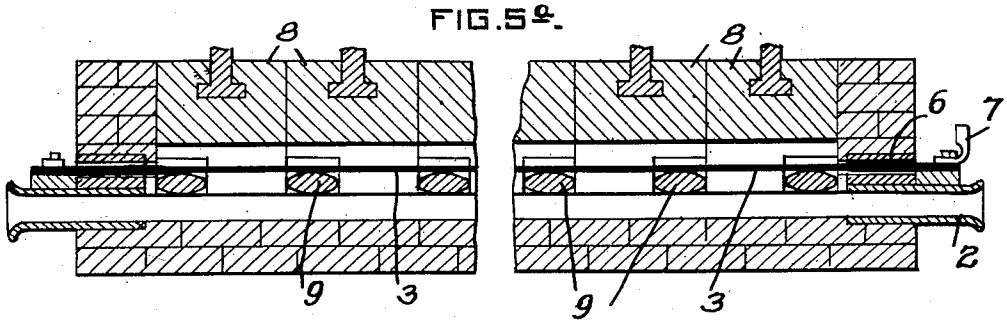


FIG. 6.

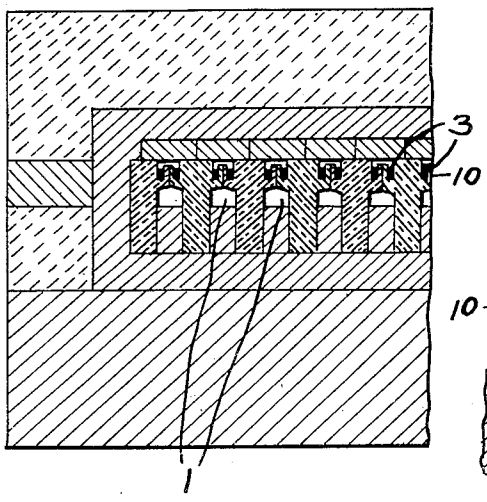
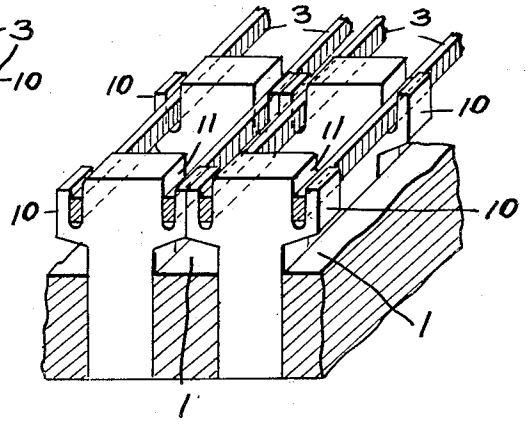


FIG. 7.



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1,362,367. Patented Dec. 14, 1920.

4 SHEETS—SHEET 4.

FIG. 8.

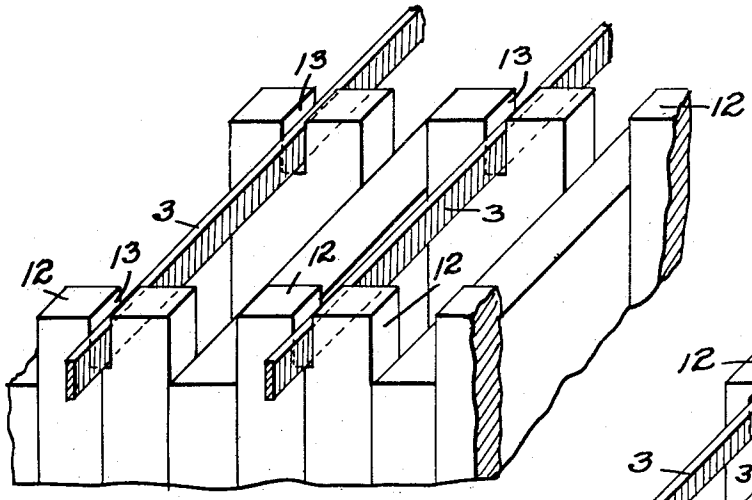


FIG. 9.

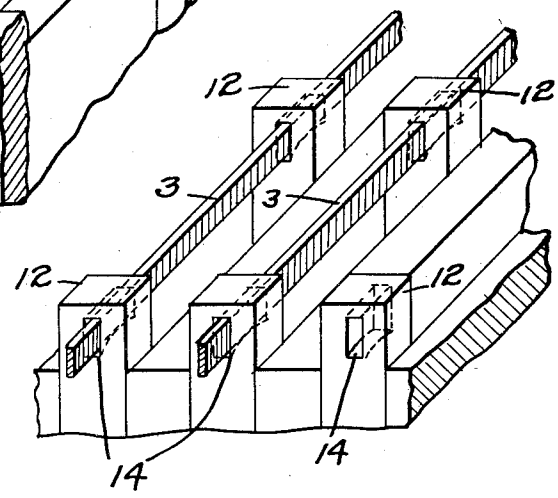
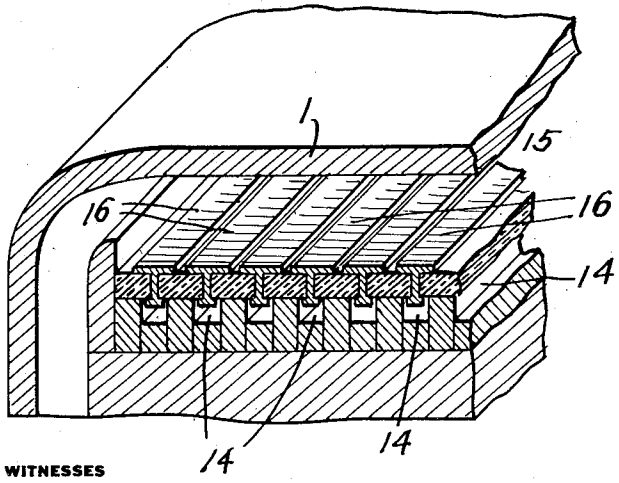


FIG. 10.



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UNITED STATES PATENT OFFICE.

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HEAT TREATMENT.

1,362,367. Specification of Letters Patent. Patented Dec. 14, 1920.

Application filed October 4, 1919. Serial No. 328,359.

To all whom it may concern:

Be it known that I, RANDAL E. TALLEY, residing at Irwin, in the county of Westmoreland and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Heat Treatment, of which improvements the following is a specification.

The invention described herein relates to the annealing or heat treatment of metal articles having small transverse sections, such as wire rods, strips or sheets, and has for its object the subjection of such articles while moving continuously through a heating chamber to heat radiated from the heating elements, extending parallel with the direction of movement of the article and also to heat reflected from the walls of such chamber, and at the same time protecting the article from oxidation and the action of injurious gases. The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a view partly in elevation and partly in section of a form of furnace embodying improvements described herein; Fig. 2 is a sectional plan view on a plane indicated by the line II—II, Fig. 1; Fig. 3 is a vertical section on a plane indicated by the line III—III, Fig. 1; Fig. 4 shows a desirable wiring arrangement for three phase supply; Fig. 5 is a sectional view illustrating a modification of the manner of supporting the heating element; Fig. 5ª is a sectional elevation of the construction shown in Fig. 5, the plane of section being at right angles to that of Fig. 5; Fig. 6 is a perspective section showing a modification of the means of supporting the heating element; Fig. 7 is a partial section showing the assembly of this method of support; Figs. 8 and 9 are perspective views illustrating further modifications, and Fig. 10 is a view partly in perspective and partly in section showing the manner of introducing heat generated by combustion of fuel into the tunnels.

In the practice of the invention the furnace is provided with a plurality of tunnels or passages 1 through which the articles to be treated are continuously passed. These passages or tunnels are formed in the hearth of the furnace by a suitable arrangement of fire brick except at the end portions which are preferably formed of tubes 2 of fire clay, metal or other suitable material. Provision is made for heating the tunnels by the arrangement of heating elements partially or wholly within the tunnels, said elements being of such a character and so heated that no injurious gases are formed in or can enter the tunnels. In the construction shown in Figs. 1 to 4 inclusive, provision is made for heating the tunnels electrically and resistance elements 3 consisting of ribbons or strips preferably formed of nickel chromium alloy are supported in the upper portions of the tunnels out of the path of movements of the articles through the tunnels. These ribbons are so supported that the articles passing through the tunnels are subjected to heat from a large proportion of the surfaces of the ribbons. In the construction shown in Figs. 1 to 3, the ribbons are supported by refractory blocks 4 of electrically non-conducting material. These blocks have their ends supported by the side walls of the tunnels and are spaced a suitable distance apart dependent on the rigidity of the ribbon when heated. In order that the articles may be directly subjected to the radial heat from large proportions of the surfaces of the ribbons, the portions of the supporting blocks intermediate their ends are reduced in transverse dimensions, as shown in Figs. 1, 2 and 3.

The terminals 5 of the ribbons extend out through tubes 6 formed of nonconducting material and their outer ends are suitably connected to supply conductors 7 and to each other. While the connections are shown for three-phase alternating current it is obvious that any commercial electrical supply either alternating or direct current can be employed with equally good results.

The alternative method of supporting the resistors shown in Fig. 5 is especially applicable where the tunnels must be of considerable width to accommodate strips or sheets of metal. The roof of the furnace may be of any suitable flat suspended arch

construction, for example, the Dietrich arch. To provide recesses to accommodate the heating elements, certain of the tiles or bricks, as 8, project down into the tunnel. The sides of the projecting portions of the tiles are so constructed as to engage and hold as against downward movement blocks 9 adapted to serve as electrically insulating supports for the resistors. While engagement between the tiles and the bearing blocks may be effected in many ways, it is preferred to so incline the adjoining faces of adjacent tiles as to form longitudinal recesses having downwardly converging walls forming a dovetail slot. The bearing blocks have their opposite sides oppositely inclined so as to wedge in between the faces of adjoining tiles. These bearing blocks are slid into the ends of the recesses or grooves formed by the projecting portions of the tiles and can be pushed along the same to proper position.

In the construction shown in Figs. 6 and 7, the walls forming the sides of the tunnels are provided with laterally projecting lugs 10 in which are formed slots 11 adapted to support the resistor ribbons on edge or approximately parallel with the sides of the tunnels.

In lieu of separating adjacent tunnels by continuous side walls, they may be separated by a multiplicity of piers or abutments 12, which are provided with slots 13 as shown in Fig. 8, or with openings 14 as shown in Fig. 9, adapted to support the ribbons on edge. It is characteristic of the construction shown in Figs. 6 to 9 that each tunnel will receive the heat radiated from a plurality of resistors. And further, by supporting the ribbons so that their faces are parallel with the sides of the tunnels, the wire being treated will receive direct radiation from the largest possible amount of resistor surfaces.

In lieu of heating the tunnels electrically as hereinbefore described, they may be heated by the combustion of any suitable fuel, whether solid or fluid, and transmitting the heat so generated to the tunnels by a heat conducting element. This method of heating the tunnels can be carried out in many ways, such for example as that shown in Fig. 10. As therein shown, the furnace is provided with tunnels 14 formed in the hearth of the furnace, substantially in the manner shown in Figs. 1, 2 and 3, and above these tunnels is arranged a combustion chamber 15 the shape and construction of which will depend on the character of the fuel employed. The heat generated in the combustion chamber is conducted to the tunnels by heat conducting elements 16 having a melting point higher than the temperature required and extending from the combustion chamber into the tunnels. In the construction shown the heat conducting elements are formed by metal strips embedded in the hearth and of such a width that portions will project down into the tunnels while the opposite edge will extend in such manner into the combustion chamber that it may be highly heated.

It will be understood that under the term "means for heating" includes in the one form the electric generator and in the other form the combustion chamber in which the products of combustion are brought into contact with the metal strips.

I claim herein as my invention:

1. As a means for the continuous heat treatment of articles having one of their cross sectional dimensions relatively small comprising a bed or mass of masonry provided with a plurality of tunnels or passages through which the articles to be treated may be fed continuously and heating elements arranged within the tunnels and adapted to be raised to a high temperature without the formation of injurious gases within the tunnels and means exterior of the tunnels for raising the temperature of the heating elements.

2. A means for the continuous heat treatment of articles having one of their cross sectional dimensions relatively small comprising a bed or mass of masonry provided with a plurality of tunnels or passages through which the articles to be treated may be continuously fed, heating elements extending along said tunnels substantially parallel with the axes of the tunnels and means exterior of the tunnels for raising the temperature of the heating elements.

3. A means for the continuous heat treatment of wires or sheets, comprising a bed or mass of masonry provided with a plurality of tunnels or passages through which the articles to be treated may be continuously fed, a heating element formed of a material capable of being raised to a high temperature without the generation of injurious gases, so supported in the tunnels that the wire or sheet will be acted on directly by heat radiated from the heating element and means exterior of the tunnels for raising the temperature of the heating elements.

4. A means for the continuous heat treatment of wire or sheets comprising a tunnel or passage through which the articles may be fed continuously, a metal strip arranged within the tunnel in suitable proximity to the path of movement of the wire or sheet through the tunnel, and means exterior of the tunnel for raising the temperature of the metal strip.

5. A means for continuous heat treatment of wire or sheets comprising a tunnel or passage through which the articles may be

fed continuously, a metal strip arranged within the tunnel in suitable proximity to the path of movement of the wire or sheet through the tunnel and means for raising the temperature of the metal strip.

6. The method herein described of heat treating wire or sheets which consists in moving the wire or sheet along an electrically heated strip and in such relation thereto that the wire or sheet will be subjected to heat radiated from the strip.

In testimony whereof I have hereunto set my hand.

RANDAL E. TALLEY.