

May 15, 1928.

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1,669,902

ANNEALING AND HEAT TREATING FURNACE

Filed May 26, 1926

2 Sheets-Sheet 1

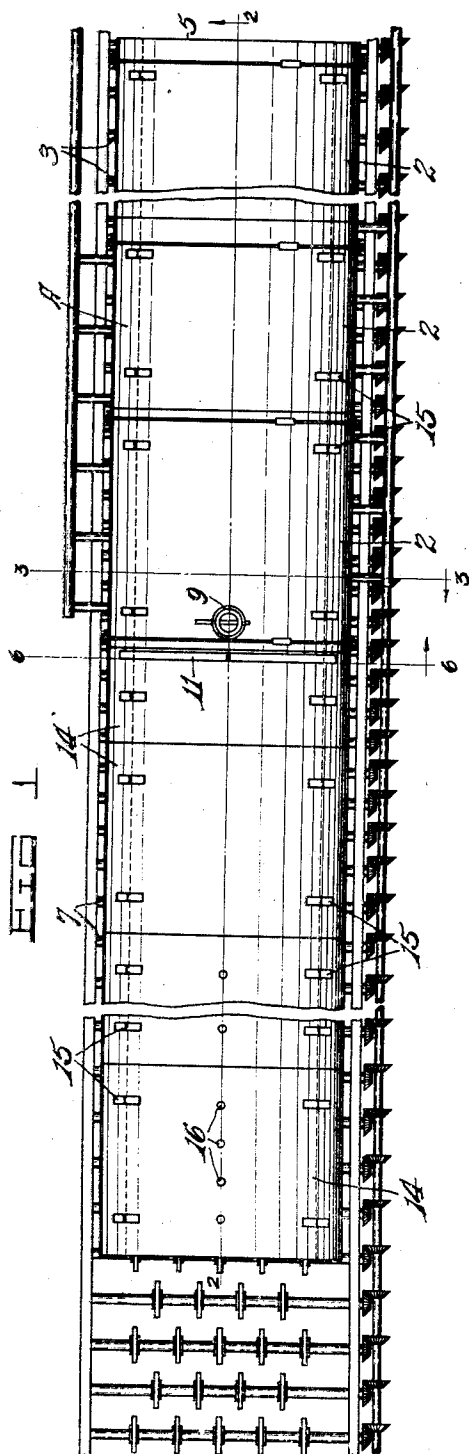
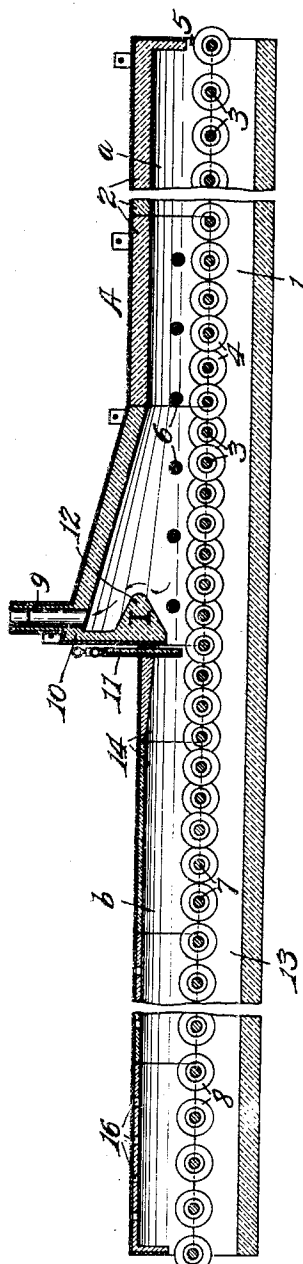


FIG 1



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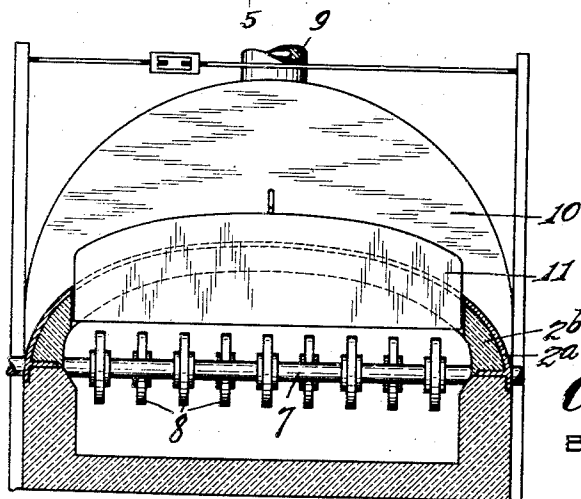
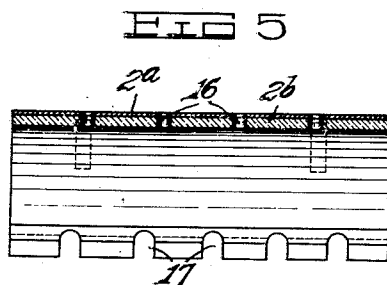
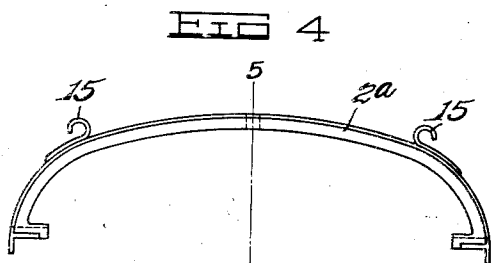
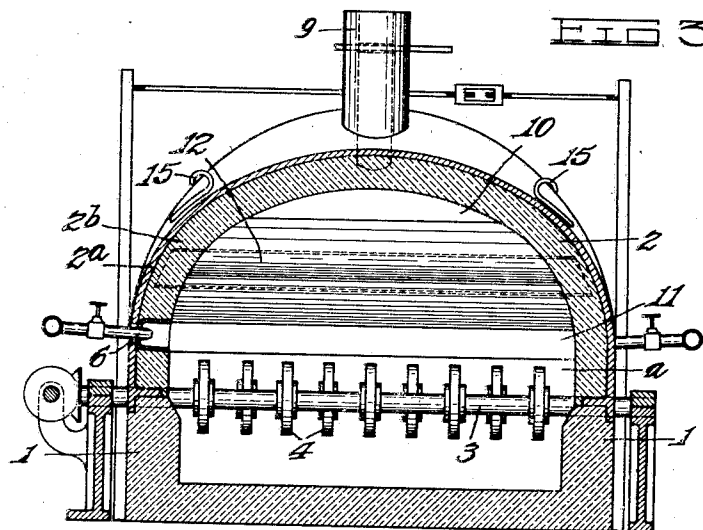


FIG 6

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UNITED STATES PATENT OFFICE.

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ANNEALING AND HEAT-TREATING FURNACE.

Application filed May 26, 1926. Serial No. 111,754.

This invention relates broadly to furnaces or annealing and heat treating metals, and more specifically to a furnace for normalizing, annealing, heat-treating and processing metal sheets, plates, slabs, bars and the like.

The primary object of the invention is to provide a continuous furnace of multiple type adapted to meet the various peculiar requirements involved in the treatment and processing of metals whereby the latter may be given practically any required character or quality obtainable through heat treatment. More specifically stated, it is designed that the furnace may be employed economically for effecting any and all of the annealing, normalizing and processing operations required to impart to the metal the characteristics which are desired and which are obtainable by or through heat treatment which operations have heretofore been effected only by the employment of numerous different forms or types of furnaces.

A further object is to provide a continuous furnace of the character referred to having certain improved features of constructions providing for regulation of the temperature and the rate of cooling required to produce any desired character of annealing and whereby a material economy in the time involved in the treatment of processing of the metal may be effected.

With these and other important objects in view, the invention resides in the features of construction, arrangement of parts and combinations of elements which will hereinafter be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan view of the invention;

Figure 2 is a longitudinal section on line 2—2, Fig. 1;

Figure 3 is an enlarged transverse section on line 3—3, Fig. 1;

Figure 4 is an end elevation of one of the removable arch sections of the furnace;

Figure 5 is a longitudinal section on line 5—5, Fig. 4; and—

Figure 6 is a transverse section of the invention, taken on line 6—6, Fig. 1.

Referring to said drawings, A designates generally a heating or normalizing furnace which comprises opposite side walls 1 of suitable height and a plurality of relatively abutting arch sections 2 which are superimposed upon said side walls. Suitably journaled upon and supported by said side walls

is a succession of suitably driven shafts 3 which carry conveyor disks 4 upon which sheets of metal, or packs of such sheets, are advanced through the furnace from the entrance end 5 of the latter. Fuel, as gas, for heating the chamber *a* may be supplied through suitably arranged burners 6.

Located in alinement with the normalizing chamber *a* of said furnace and communicating with the forward end of the latter is a chamber *b* through which the metal under treatment is advanced at any required rate of speed, and in which the rapidity of cooling is controlled or regulated to accord with the character of annealing, or heat treatment, required. Said chamber *b* has located therein a succession of transverse shafts 7 which carry conveyor disks 8 upon which the metal under treatment is advanced.

A damper controlled stack 9 is located over the forward end of the normalizing furnace adjacent to the position of the front end, or fire wall, 10, which latter has its lower end disposed a suitable distance above the path of travel of the metal borne by the conveyor disks. A fire door baffle 11 is adjustable vertically relative to said path of travel at or adjacent to the end wall 10 whereby the passage of heat from the normalizing chamber *a* to the cooling chamber *b* may be controlled. A suitable deflector 12 is formed on or adjacent to the fire wall 10 whereby heat and other products of combustion may be directed to the stack 9 and thus very largely prevented from finding its way to the cooling chamber.

The cooling chamber comprises side walls 13 upon which are carried the bearings for the conveyor shafts 7 and upon which is supported an arch composed of a plurality of complementary relatively abutting sections 14 of suitable size or sizes.

Each of the various arch sections 2 and 14 comprises a suitable metal frame structure, designated 2^a in Figs. 3 to 6, which carries in fixed relation thereto a lining 2^b of a suitable refractory material, and each of said sections has rigidly attached thereto carrying members, as hooks 15, to which the carrying chains of a lifting crane may readily be attached, as for bodily elevating or removing any selected section or sections.

The sectional arrangement or construction of the arch of the normalizing furnace has for one of its purposes to provide for expansion and contraction of the arch result-

ing from the widely varying temperatures maintained in the normalizing chamber without undue buckling or distortion and without derangement of either the conveyor or the driving mechanism, said sections being more or less free to move upon the side walls by which they are supported. Such freedom of movement is facilitated by the provision of bearing-receiving recesses 17 of relatively large capacity in the lower edge portions of the arch sections. Moreover, when the lining of any section requires renewal or repair, such section may be bodily removed and a spare section kept for the purpose may immediately be introduced in the place of the removed section without shutting down the furnace, thus obviating the long delays which have heretofore been necessitated in cases where repairs, even of a minor nature, were required, such delays being greatly prolonged by the usual requirement that the furnace be allowed to cool off completely before repairs could be undertaken.

The sectional construction of the arch of the cooling chamber is designed primarily to provide means for controlling the rate of cooling of the metal as it passes through said chamber. As is well understood in the art, the character and quality of the product is very materially controlled by regulation of the time of cooling following the heating to high temperatures. When rapid cooling to a predetermined temperature is desired, one or more selected sections 14 of the arch are elevated from their places by means of a crane to permit of the rapid escape of heat from the chamber *b* as required, following which they may be replaced. Obviously, a great variety of results may be arrived at by elevating or removing different sections of the arch from time to time and for different periods to vary the time and rate of cooling of the metal.

Vents 16 may be provided in some or all of the arch sections 14 for allowing the heat of the annealing chamber to escape gradually, as when gradual cooling of the metal is desirable.

In cases where the period of cooling of the product is to be prolonged, the fire door 11 is elevated to the extent required for admitting heat to the cooling chamber.

Obviously, the rate of cooling may additionally be controlled by regulation of the speed at which the conveyor disks are driven.

Manifestly, any form of heating element or fuel, as gas, powdered coal, oil, tar and the like may be employed.

What is claimed is—

1. A continuous annealing furnace comprising a heating chamber and a cooling chamber arranged in alined relation and separated by a fire wall, said wall having a passage in its lower portion providing com-

munication between said chambers, continuous means for conveying material through said chambers, a damper-controlled stack leading from the forward end of the heating chamber, means for deflecting products of combustion away from said passage and towards said stack, a shiftable fire-door for controlling the admission of heat through said passage, and means embodied in the cooling chamber whereby the rate of cooling of material passing through said chamber may be controlled.

2. A continuous annealing furnace comprising a heating chamber and a cooling chamber arranged in alined relation and separated by a fire wall, said wall having a passage in its lower portion providing communication between said chambers, continuous means for conveying material through said chambers, a damper-controlled stack leading from the forward end of the heating chamber, means for deflecting products of combustion away from said passage and towards said stack, a shiftable fire-door whereby the admission of heat through said passage is controlled, said cooling chamber embodying an arch-like top having sections which are removable for facilitating heat dissipation.

3. A continuous annealing furnace comprising a heating chamber and a cooling chamber arranged in alined relation and separated by a fire wall, said wall having a passage in its lower portion providing communication between said chambers, continuous means for conveying material through said chambers, a damper-controlled stack leading from the forward end of the heating chamber, means for deflecting products of combustion away from said passage and towards said stack, a shiftable fire-door whereby the admission of heat through said passage is controlled, said cooling chamber including a top having sections thereof bodily removable for facilitating heat dissipation.

4. A continuous annealing furnace comprising a heating chamber and a cooling chamber arranged in alined relation and separated by a fire wall, said wall having a passage in its lower portion providing communication between said chambers, continuous means for conveying material through said chambers, a damper-controlled stack leading from the forward end of the heating chamber, means for deflecting products of combustion away from said passage and towards said stack, a shiftable fire-door whereby the admission of heat through said passage is controlled, said cooling chamber including a top having sections thereof bodily removable for facilitating heat dissipation, and said annealing chamber having a sectional arch mounted upon its side walls, the arch sections being shiftable in

relation both to each other and to said walls, said sections also being separately removable.

5 5. A continuous annealing furnace comprising a heating chamber and a cooling chamber arranged in alined relation and separated by a fire wall, said wall having a passage in its lower portion providing communication between said chambers, continuous means for conveying material
10 through said chambers, a damper-controlled stack leading from the forward end of the heating chamber, means for deflecting products of combustions away from said passage and towards said stacks, a shiftable fire-
15 door whereby the admission of heat through said passage is controlled, said heating chamber having an arch formed of complementary bodily elevatable and removable sections.

20 6. A continuous annealing furnace of the character described, comprising a heating chamber and a cooling chamber arranged in alined relation, a fire wall extending downwardly between said chambers to separate
25 same and having an opening therein to provide a passage between the chambers, a stack arranged in the heating chamber, means in the stack for controlling the egress of heat and products of combustion

from the heating chamber, a movable door 30 adjacent to the fire wall, for varying and controlling the passage of heat and products of combustion between the chambers, and means in the chambers for continually advancing material therethrough to be
35 treated, said means being disposed below and spaced from said door to permit a predetermined amount of heat and products of combustion and the material to be treated to continually pass from the heating cham- 40 ber to the cooling chamber.

7. A continuous annealing furnace of the character described, including a heating chamber and a cooling chamber arranged in alined relation, a movable door between said 45 chambers for controlling the passage of heat and the products of combustion between the same, and means for advancing material to be treated through said chambers, said means being disposed spaced from said door 50 whereby a predetermined amount of heat and products of combustion and the material to be treated may be continuously passed from the heating chamber to the cooling chamber. 55

In testimony whereof, I affix my signature.

ARTHUR T. KATHNER.