T. J. COSTELLO.

ANNEALING FURNACE.

APPLICATION FILED MAY 28, 1913.

1,097,303.

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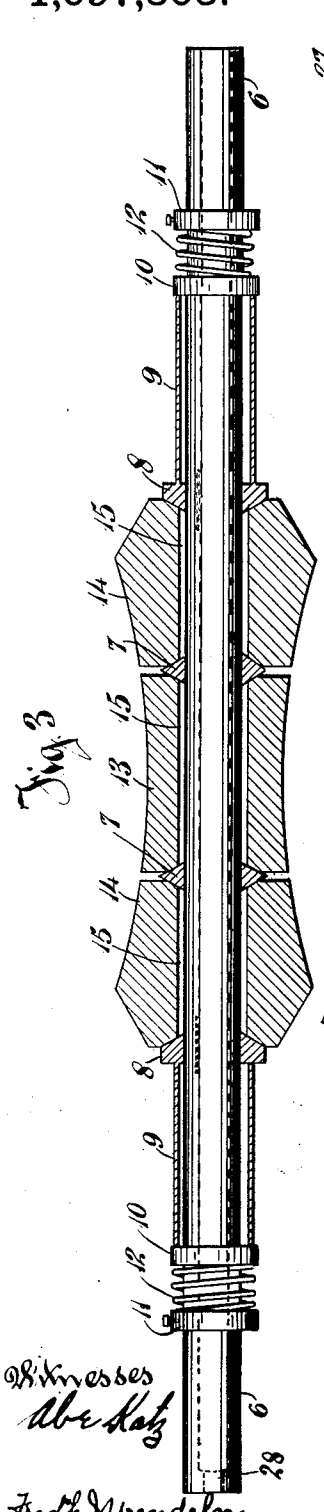


Fig. 3

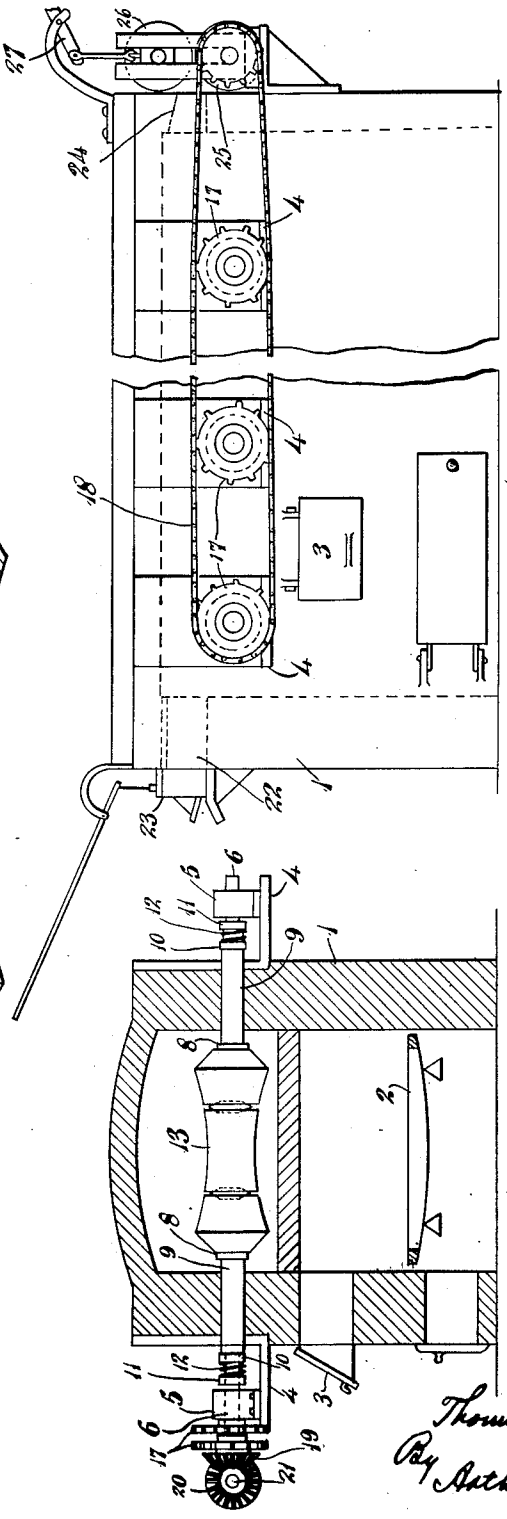


Fig. 2

Fig. 1

Witnesses

Abe Katz

Fredk. J. Wendelin.

Inventor

Thomas J. Costello,

By Arthur V. Evans

Attorney

UNITED STATES PATENT OFFICE.

THOMAS J. COSTELLO, OF MIDDLETOWN, OHIO.

ANNEALING-FURNACE.

1,097,303. Specification of Letters Patent. Patented May 19, 1914.

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To all whom it may concern:

Be it known that I, THOMAS J. COSTELLO, a citizen of the United States, and a resident of Middletown, county of Butler, and State of Ohio, have invented a new and useful Improvement in Annealing-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to annealing furnaces of the continuous type in which means are provided for carrying the sheets or plates through in a continuous heating process.

The object of my invention is to provide in such a furnace simple and efficacious means for carrying the sheets or plates through the furnace.

A further object of my invention is to provide means for automatically removing the sheets or plates from the furnace after the process has been completed.

In the drawings: Figure 1 is a cross section of an annealing furnace constructed in accordance with my invention; Fig. 2 is a side elevation of the same, part being broken away in the middle; Fig. 3 is a longitudinal section of one of the carrying rollers.

The numeral 1 designates a furnace of any desired construction, the same being of suitable length, however, to provide for the continuous annealing process. Said furnace is provided with a grate 2, and door 3 giving access to the fire chamber. Supported by brackets 4 on the outside of the furnace, are journal boxes 5 in which the shafts 6 of the carrying rollers are journaled. These shafts are hollow, as clearly shown in Fig. 3 to provide passage for a cooling liquid. The hearth of my new annealing furnace is composed of the carrying rollers, said rollers being constructed as follows. The shafts 6 are provided with collars 7; said collars are of metal or other suitable material, and the same fit tightly around the shafts. The two faces of the collars 7 are beveled, as shown in Fig. 3, for the purpose hereinafter set forth. On each of the shafts 6 are also collars 8; these collars are constructed of the same material as collars 7, and they are slidably keyed on the shafts. Each of the collars 8 is provided with one beveled face. Attached to each collar 8, or formed integrally therewith, is a sleeve 9 which carries a collar 10 at its free end. Between the sleeves 9 on each shaft and the shaft there is an insulating space. Secured to the shaft, by means of set screws, beyond the collars 10, are rings 11. Between the collars 10 and rings 11 are compression springs 12. The shafts 6 extend transversely through the furnace, the sleeves 9 passing through the walls thereof. The collars 8 and 10, the former being keyed to the shaft, revolve therewith, but the same are adapted to slide thereon under pressure.

Each of the carrying rollers composing the hearth has a middle section 13 and end sections 14 constructed of any suitable refractory material as chrome clay. These sections have openings of slightly greater diameter than the diameter of the shaft 6, and said openings are beveled or reamed, so that the sections may rest firmly on the beveled faces of the collars 7 and 8. The fitting of the sections to the collars is such as to leave a space between the ends of the middle section and the adjacent ends of the sections 14, for the purpose hereinafter set forth. The difference in diameter between the shaft and the openings in the roller sections, leaves air spaces 15 for insulation between the shaft and roller. The sections are so shaped that when placed in position they will form a concaved roller, as illustrated in Figs. 1 and 3.

On one end of each of the shafts 6 is a sprocket wheel 17, and a sprocket chain 18 is provided to drive all the shafts uniformly. For the purpose of power, a bevel gear 19 is provided on the end of one of the shafts, the same intermeshing with a similar gear 20 on the power shaft 21.

The front end of the furnace is provided with an opening 22 for the insertion of the sheets or plates to be annealed. A drop shutter 23 of the ordinary type is provided normally to close said opening. At the rear end of the furnace is an opening 24,

and outside of the furnace at the mouth of said opening is a pair of ejecting rollers 25 and 26. These are large, heavy rollers, and they receive power from the sprocket chain 18, being geared, however, to run at a greater speed than the carrying rollers. The upper roller 26 is mounted so that it may be lifted in its bearings by means of the lever 27 for the purpose hereinafter specified.

For the purpose of maintaining a pressure of the cooling liquid in the shafts 6, one end of each shaft has a reduced opening, as shown at 28.

The operation of my invention is as follows: The sheets, or plates, are inserted through the opening 22 at the front of the furnace, one end being placed upon the first of the carrying rollers. The rollers being concaved; the sheet when it becomes flexible after heating, will conform itself to the concavity of the rollers, the middle section thereof being lower than the edges. The sheet will thus be longitudinally rigid throughout its passage over the hearth as will be readily understood, and it will pass from roller to roller, until the last carrying roller, the process being completed, inserts the end of the sheet between the ejecting rollers 25 and 26; these rollers, running at a greater speed than the carrying rollers, will immediately take up the sheet and eject it from the furnace. Should the rollers 25 and 26 for any reason become clogged, the latter may be raised by means of the lever 27 to remedy the difficulty. These rollers also re-flatten the sheets. The construction of the carrying rollers as above described is especially adapted to provide for accurate and efficient operation during the exigencies of use. The rollers being constructed of refractory material, that is material which refracts, or turns back, the heat instead of absorbing the same, the sheets or plates pass through a zone of relatively intense heat, the temperature of this zone being continuously renewed by the revolutions of the rollers, the portions cooled by contact with the sheets being continuously replaced by uncooled portions. The expansion of the rollers when heated will be taken care of by the compression of the tension springs 12, the collars 8 and 10 sliding to the degree necessary upon the shaft. Such expansion is also provided for by the construction of the rollers in sections and the leaving of spaces between the adjacent ends of the sections. Radial expansion coupled with longitudinal expansion of the roller sections is also permitted by reason of the beveling of the faces of the collars 7 and 8. By these means uniform operation of the carrying rollers is obtained, as well as security against the cracking or breaking of the rollers, and a zone of intense heat is maintained through which the sheets or plates pass in the annealing process.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In an annealing furnace, the combination with the furnace of a hearth composed of a series of concave carrying rollers, said rollers being made in sections and being adapted to carry sheets or plates through said furnace during the annealing process, means normally to maintain said sections at a distance from each other, and means to revolve said rollers in a uniform direction.

2. In an annealing furnace, the combination with the furnace of a hearth composed of a series of concave carrying rollers, said rollers being made in sections and being adapted to carry sheets or plates through said furnace during the annealing process, means to revolve said rollers in a uniform direction, and ejecting rollers, said ejecting rollers being adapted to move said sheets or plates at a greater rate of speed than said carrying rollers.

3. A carrying roller for an annealing furnace comprising a shaft mounted in said furnace, collars mounted on said shaft, and a series of roller sections mounted between said collars, the bearing surfaces of said collars and said roller sections being correlatively beveled, and the intermediate collars being adapted normally to maintain said roller sections at a distance from each other.

4. A carrying roller for an annealing furnace comprising a shaft mounted in said furnace, collars mounted on said shaft, a series of roller sections mounted between said collars, the bearing surfaces of said collars and said roller sections being correlatively beveled, and an insulating space between said sections and said shaft.

5. A carrying roller for an annealing furnace comprising a shaft mounted in said furnace, collars mounted on said shaft, the end collars being slidable thereon, a series of roller sections mounted between said collars, the intermediate collars being adapted normally to maintain said roller sections at a distance from each other, and means whereby said slidable collars are maintained under compression in proper position with reference to said roller sections.

6. A carrying roller for an annealing furnace comprising a shaft mounted in said furnace, collars mounted on said shaft, the end collars being slidable thereon, a series of roller sections mounted between said collars, an insulating space between said sections and said shaft, and means whereby said slidable collars are maintained under compression in proper position with reference to said roller sections.

7. A carrying roller for an annealing furnace comprising a shaft mounted in said furnace, collars mounted on said shaft, the end collars being slidable thereon, a series of roller sections mounted between said collars, the bearing surfaces of said collars and said roller sections being correlatively beveled, and means whereby said slidable collars are maintained under compression in proper position with reference to said roller sections.

In testimony whereof, I have hereunto set my hand this 20 day of May, 1913.

THOMAS J. COSTELLO.

Witnesses:
ARTHUR H. EWALD,
FRED'K J. WENDELN.