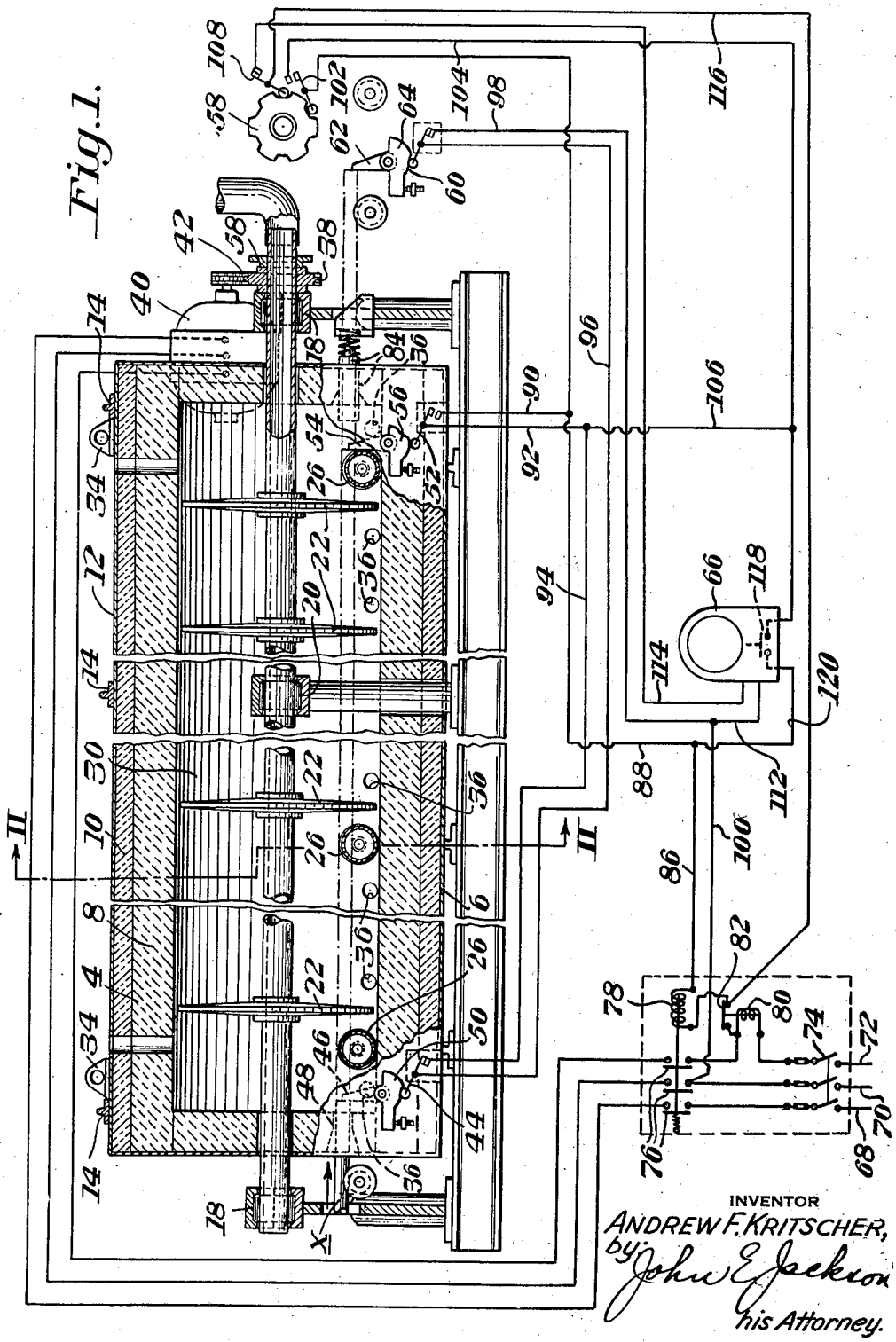
March 13, 1945. A. F. KRITSCHER 2,371,335

ROTARY HEATING FURNACE

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Fig. 1.

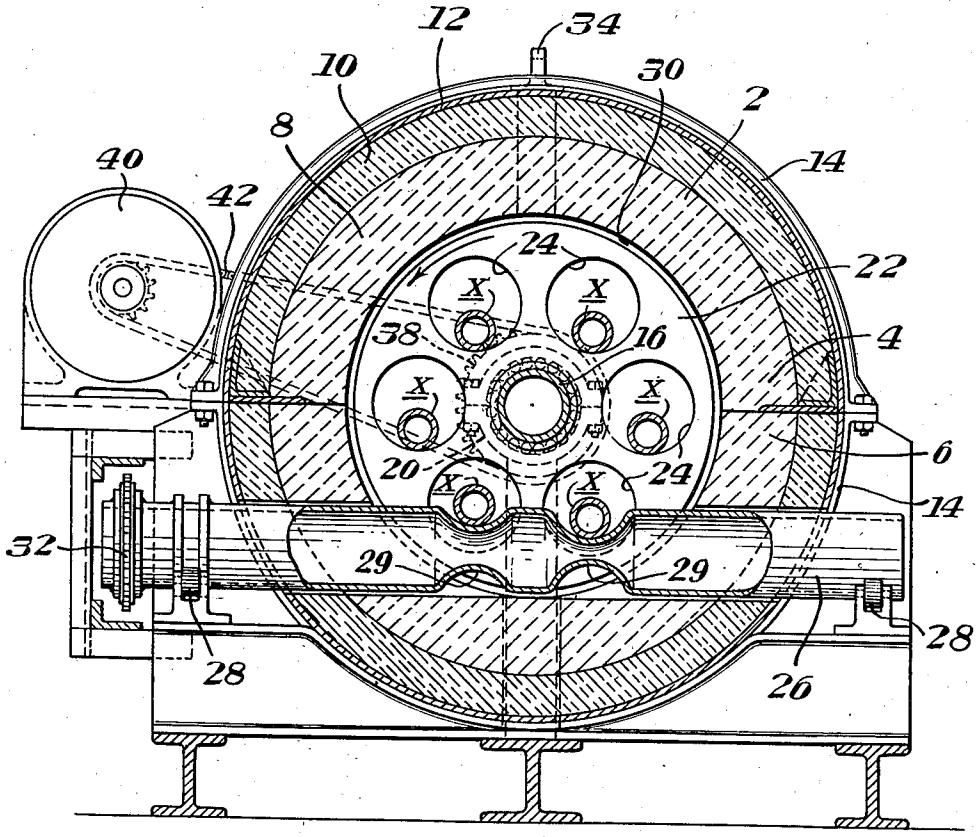


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Fig. 2.



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Fig. 3.

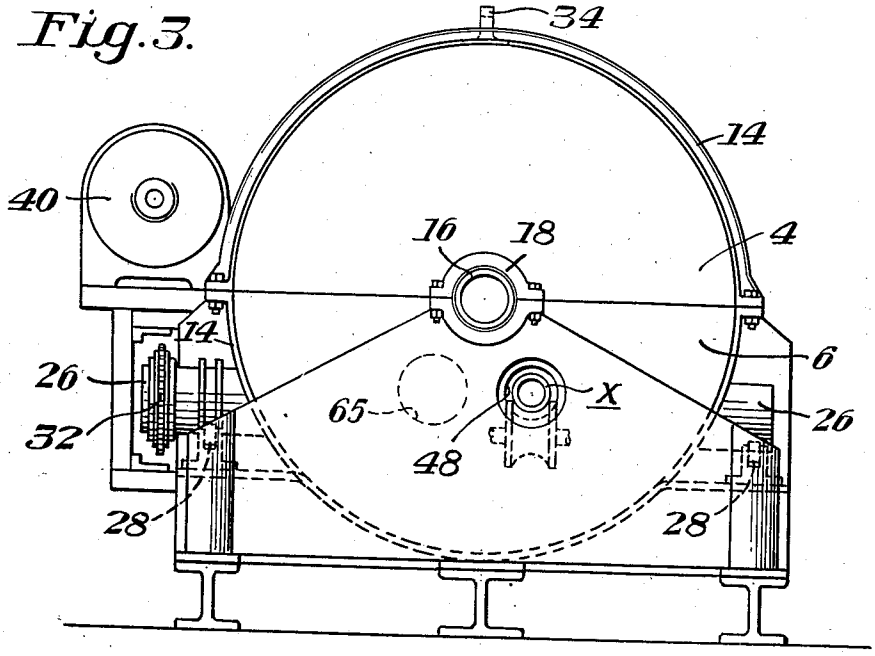
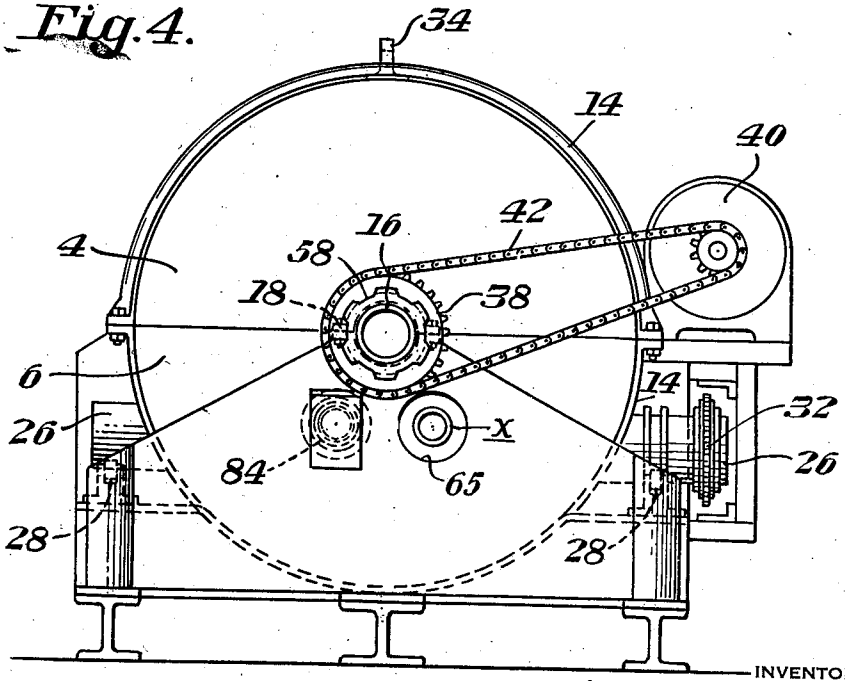


Fig. 4.



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ROTARY HEATING FURNACE

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Application November 30, 1943, Serial No. 512,373

12 Claims. (Cl. 263—7)

This invention relates to rotary heating furnaces for tubes, bars, and similar elongated articles which are commonly heated by passing them through continuous heating furnaces where they rest on bars during their passage therethrough. The fuel economy of the furnace is low and the length of the furnace is often not sufficiently great to allow the tube to become evenly heated throughout. As the tube rolls on the bars, those portions of the tube in contact with the bars do not become sufficiently heated with the result that there are black spots at those points. In many instances the combustion volume of the furnace is insufficient and the tubes besides being spotted and unevenly heated have scale formed thereon. In the case of tubes which are being heated prior to rolling in a sinking mill, the uneven heating and scaled condition of the tube causes excessive wear on the sinking mill rolls. It is necessary to use water cooled conveying rollers for moving the bar through the furnace and these also lower the efficiency of the furnace. To obtain satisfactory results in this type of a furnace, the furnace would have to be excessively long, this requiring a large floor area which is not always available. As the article passes through the furnace it comes in contact with soft particles of refractory which are rolled into the surface of the article.

It is an object of this invention to provide a furnace in which the tube is evenly heated by causing it to rotate or turn in its passage through the furnace.

Another object is to provide a furnace wherein the tube cannot contact the refractory.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a longitudinal cross-section of the furnace which shows schematically the wiring diagram for operating the furnace;

Figure 2 is a cross-sectional view on the line II—II of Figure 1;

Figure 3 is an end view showing the inlet side of the furnace; and

Figure 4 is an end view of the outlet side of the furnace.

Referring more particularly to the drawings, the reference numeral 2 indicates the walls of the furnace. As best shown in Figure 2, the walls consist of top and bottom sections 4 and 6. Each section has a circular refractory lining 8 surrounding which is a circular insulating layer 10 on the outside of which is a metal casing 12. The walls are bound together by means of hoops 14 which encircle the casing 12 at spaced intervals. A hollow spindle shaft 16 extends longitudinally through the furnace and is supported by means of bearings 18 outside the furnace. If necessary, additional bearings 20 may be provided within the furnace. Welded or otherwise fastened to the shaft 16 is a plurality of turrets 22, each of which is provided with a plurality of angularly spaced openings 24 for receiving the tube or other article to be heated. A plurality of driven rollers 26 pass through the furnace and are supported on cradle bearings 28 outside the furnace, the rollers being provided with grooves 29 for feeding the tube to and from the heating chamber 30. These rollers may be driven by any suitable means and, as shown, are rotated by means of a chain meshing with the sprocket 32. Brackets 34 attached to the casing 12 provide means for lifting the top section 4 of the furnace from the lower section 6. Burner tunnels 36 are provided along the length of the furnace for supplying heat thereto. Combustion air is provided to the burners by means of a blower (not shown), the suction end of which is connected to the shaft 16. In this manner, the combustion air is preheated and the efficiency of the furnace increased. The inside contour gives swirling circulation of the gases and provides ideal radiation and reradiation. It will be understood that all metallic parts within the furnace are made from a suitable heat resistant alloy. The shaft 16 is provided with a sprocket wheel 38 located outside of the furnace and which is rotated by a motor 40 through the chain 42.

A normally closed switch 44 has a trigger 46 in line with the furnace opening 48 through which the tube enters. The cam 50 of the switch is located outside of the furnace. At the other end of the furnace in line with the switch 44 is a normally open switch 52 having a trigger 54 in line with the entering tube X and a cam 56 located outside the furnace. A limit switch cam 58 is mounted on the turret shaft for movement therewith. A normally closed switch 60, having a trigger 62 and a cam 64, is located outside the furnace with its trigger in line with the outgoing tube which leaves the furnace through an opening 65 that is offset with respect to the opening 48. A time switch 66 is also provided in the control circuit for a purpose which will appear later. Power is provided to the motor 40 from the power lines 68, 70 and 72, through the power circuit which is provided with a line switch 74 and magnetic contactors 76, the coil 78 of which is controlled by the control circuit. In case of over-

load, an overload relay 80 will open the contactor 82, thus preventing damage.

The operation of the furnace and control circuit therefor is as follows:

With the furnace in operation, heat is provided thereto through the burner tunnels 36, the amount of heat being controlled in accordance with the temperature desired in the furnace. When it is desired to feed a tube X to the furnace, the rollers 26 are caused to rotate feeding the tube into the furnace. As the tube X enters the furnace, it depresses the trigger 46 of switch 44, causing it to open, this preventing the closing of the power circuit in any manner. As the tube travels into the furnace, it is received by the openings 24 of the turrets 22 and as it continues its travel on the rollers 26, it strikes the trigger 54 of the switch 52, causing it to close. The tube continues its movement until it strikes the spring bumper 84, which brings it to rest with the trigger 54 depressed and the trigger 46 back in its normal position. This completes the circuit to the coil 78 of the magnetic contactors 76 through lines 72, closed switch 74, coil 80, contactor 82, coil 78, lines 86, 88 and 90, closed switch 52, lines 92 and 94, closed switch 44, line 96, closed switch 60, lines 98 and 100 to line 70. Energization of coil 78 causes the contactors 76 to close, thus providing power to the motor 40 and causing the turrets 22 to rotate. Rotation of the turrets causes rotation of the limit switch cam 58, this closing the switch 102 which maintains the circuit to the coil 78 when the tube X permits the switch 52 to open as it raises from the trigger 54. The circuit is maintained through lines 86, 88, switch 102, lines 104, 106, 94, closed switch 44, line 96, closed switch 60 and lines 98 and 100. When the turret has rotated through the angular distance between two of the tubes which it carries, switch 102 opens, deenergizing coil 78 and opening magnetic contactor 76, thus stopping motor 40. At the same time, switch 108 is closed, starting the time switch 66. The circuit to the time switch 66 is completed through lines 100, 112, 114, closed switch 108, and line 116. When the turret reaches this position a heated tube is brought into contact with the rotating conveyer rollers which remove it from the right hand side of the furnace as seen in Figure 1. As it passes through the end of the furnace, it contacts trigger 62 of the switch 60, causing it to open. This switch is in series with switch 44 and, in its open position, prevents the turret from rotating until the tube has passed the switch. Normally another tube X enters the furnace after the heated tube passes the switch 60 and the cycle is repeated. If for any reason, another tube does not enter the furnace, the time switch 66 will, at the end of a predetermined time, close switch 118. This closes the control circuit to the coil 78, through lines 86, 120, closed switch 118, lines 104, 106, 94, closed switch 44, line 96, closed switch 60, lines 98 and 100. Closing of the control circuit starts the motor 40, causing the turret to rotate as before and brings another hot tube to the conveyer rolls. When the switch 108 is opened by rotation of the limit switch cam 58, the time switch 66 automatically sets to zero. The control circuit is then ready to be actuated by another tube entering the furnace or to be closed by the time switch 66 in case no tube is fed to the furnace.

As the turret rotates, the low point of each opening 24 is changing and gravity causes the tube to roll to the lowest point. Thus the tube has no one permanent or repeated point of contact while it is supported by the turrets and uniform heating results. The tubes are so supported in the turrets that they cannot pick up soft pieces of refractory.

While one embodiment of the invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, each of said turrets having a plurality of angularly spaced openings therein, the opening in one turret being aligned with the openings in the other turrets, each group of aligned openings forming a support for one of the articles to be heated, means for feeding the articles axially to and from the heating chamber, and means for rotating said shaft.

2. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, means for feeding the articles to and from the heating chamber, means for rotating said shaft, and means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets.

3. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, and means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings.

4. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, and means actuated by an article leaving the furnace for preventing operation of said second named means until the article has passed from the furnace.

5. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article enter-

ing the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, and a timer for actuating said second named means after a predetermined time interval, said last named means also starting said timer in operation.

6. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, a timer for actuating said second named means after a predetermined time interval, said last named means also starting said timer in operation, and means actuated by an article leaving the furnace for preventing operation of said second named means until the article has passed from the furnace, said timer being set at zero by rotation of said turret.

7. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, and means for rotating said shaft.

8. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, means for rotating said shaft, and means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets.

9. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, and means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings.

10. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, and means actuated by an article leaving the furnace for preventing operation of said second named means until the article has passed from the furnace.

11. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, and a timer for actuating said second named means after a predetermined time interval, said last named means also starting said timer in operation.

12. A heating furnace for elongated articles comprising a heating chamber, a horizontal shaft extending longitudinally through said chamber, a plurality of turrets mounted on said shaft, said turrets having a plurality of angularly spaced openings therein for supporting the articles to be heated, an opening in the furnace for admitting articles to the furnace, a second opening for permitting discharging of articles from the furnace, said openings in the furnace being spaced apart the same angular distance as the openings in the turrets, means for feeding the articles to and from the heating chamber, means for rotating said shaft, means actuated by the article entering the heating furnace for actuating said second named means to start rotation of said turrets, means for stopping rotation of said turrets after they have rotated the angular distance between two adjacent openings, a timer for actuating said second named means after a predetermined time interval, said last named means also starting said timer in operation, and means actuated by an article leaving the furnace for preventing operation of said second named means until the article has passed from the furnace, said timer being set at zero by rotation of said turret.

ANDREW F. KRITSCHER.