Aug. 16, 1927. 1,638,908

J. F. BAKER

FURNACE

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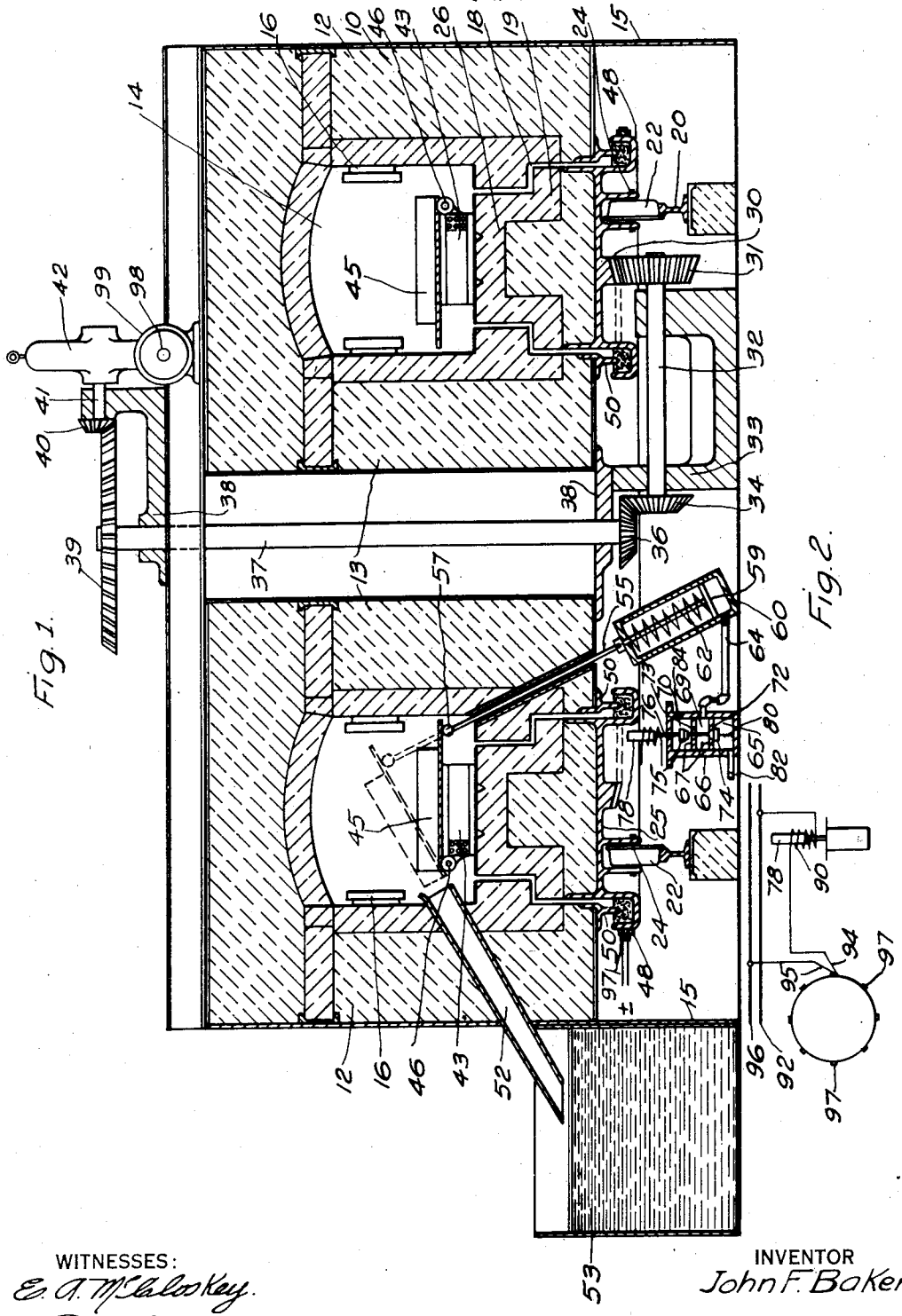


Fig. 1.

Fig. 2.

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FURNACE.

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My invention relates to a furnace and particularly to a rotary furnace having automatic discharge means.

An object of my invention is to provide in a furnace having a conveyer, an efficient means for periodically effecting the discharge of material from the conveyer.

Another object of my invention is to provide in a furnace having a rotary conveyer with a hearth-tray thereon, a pneumatically operated ram, controlled by the conveyer, for periodically tilting the hearth-tray to discharge heat-treated material therefrom.

Other objects of my invention will be apparent from the disclosure.

In practicing my invention according to the present disclosure, I provide, in a furnace, a conveyer having tiltable hearth-trays thereon and pneumatically operated means, controlled by the movement of the conveyer, for periodically tilting the trays to discharge heat-treated material therefrom.

The structure of the furnace, including the conveyer and the hearth-trays, is somewhat similar to the structure of the furnace disclosed in my copending application, Serial Number 117,937, filed Jan. 23, 1926. In the present form of my invention, however, the conveyer is designed to operate continuously instead of intermittently, although, of course, by providing a control means similar to that shown in the above-mentioned application, the conveyer disclosed in the present application may also be operated intermittently.

In the drawing, which shows, by way of illustration, an embodiment of my invention, Figure 1 is a vertical sectional view of a rotary furnace, with my pneumatically operated tilting means operatively connected thereto, and

Fig. 2 is a diagram of the electric control means.

Referring to the drawing for a more complete description of my invention, a furnace 10 is provided with outer walls 12 and inner walls of refractory insulating material 13, the furnace being preferably of annular form and having an annular chamber 14 therein. Suitable supports 15 are provided.

Means for heating the furnace are provided. As a convenient form of such means, electric-resistor members 16 may be positioned in the chamber 14, and suitably secured to the walls thereof. These resistor members are electrically connected to a source of energy (not shown).

An annular passage-way or run-way 18 is provided in the bottom of the furnace. A rotary annular hearth or conveyer 19 is positioned in said annular passage-way and is rotatably mounted on a track 20 by means of wheels 22 that are rotatably mounted on lugs 24, the lugs 24 being connected with the metallic base member 25 of the conveyer 19. The conveyer 19 has a suitable insulating portion 26 that is mounted on the base member 25.

Suitable means for driving the conveyer are provided and comprise a rack 30 that may be integral with the base member 25, a gear wheel 31 meshing therewith and mounted on a shaft 32 that is rotatably mounted on a bearing member 33.

At the opposite end of the shaft 32, a bevel gear-wheel 34 is rigidly secured to the shaft and meshes with a bevel gear-wheel 36 that is rigidly secured to a vertical shaft 37. This vertical shaft is rotatably mounted in suitable bearing members 38.

A bevel gear-wheel 39 is rigidly secured to the upper end of the vertical shaft and meshes with a bevel gear-wheel 40 that is rigidly secured to the shaft 41 of a worm gear speed-reduction unit 42. Shaft 98 connects this speed-reduction unit to a motor 99 and the motor is, of course, conneced to a suitable source of energy.

A plurality of hearth-supports 43 are secured to the insulating portion 26 of the conveyer 19. Each of these hearth-supports has a hearth-tray 45 so connected thereto, by a pivotal joint 46, as to permit tilting of the hearth about the joint.

Means are provided to hermetically seal the spaces between the conveyer 19 and the walls of the run-way 18. Such means may consist of annular channel members 48 that are secured to the base member 25 at their edges and are adapted to contain sand or other sealing material. A pair of concentric flange members 50 are secured to the bottom of the furnace and extend into the sand in the corresponding channel members.

A discharge outlet 52 for the furnace is provided and preferably extends beneath the surface of the oil or other quenching medium in the quench tank 53. This outlet is adapted to receive heat-treated material that

is periodically discharged from the hearth-trays in a manner hereinafter described.

Means are provided to tilt the trays periodically and successively for the purpose of discharging material therefrom into the discharge outlet. In the present embodiment of my invention, such means comprise a ram or piston-rod 55 that preferably has a roller bearing 57 at its upper end for engaging a hearth-tray 45 at its inner or non-pivoted end. The piston-rod 55 has a piston 59 secured to its lower end that is slidably positioned in a cylinder 60. The piston-rod is maintained in a normally retracted position by the spring 62. An air-conduit 64 has one end connected to the lower end of the cylinder 60 and the other end connected to the middle chamber 69 of an air-valve housing 66. The air-valve housing has a pair of partitions 67 for dividing the house into three chambers, consisting of the chamber 65, chamber 69 and chamber 70.

The partitions 67 have valve-seats 72 and 73 therein that are adapted to receive valves 74 and 75, respectively. The valves 74 and 75 are rigidly secured to a valve-rod 76 that has an electro-magnet or core member 78 secured to the top thereof. The valve 74 is normally maintained seated by means of a spring 80. A pipe 82 leads from the chamber 65 to a suitable source of compressed air.

The chamber 70 communicates with the outside atmosphere by means of an opening 84. In the position shown, it will be obvious, by looking at the drawing, that access of the compressed air to the cylinder 60 will be prevented, and the piston 59 is, therefore, maintained in its lowest or retracted position by spring 62.

For energizing the electro-magnet 78, a coil or solenoid 90 is provided. This coil 90 is electrically connected to a main 92 and to a brush 94, as shown in Fig. 2. A second brush 95 is electrically connected to a main 96. A series of contact members 97 are insulatedly mounted on one of the members 48. Fig. 2 shows both brushes in engagement with a contact member 97. The number of brushes is the same as the number of trays. In this position, an electric current will flow through the coil 90. The contact members 97 are so located that a hearth tray 45 will be opposite to the discharge outlet when the brushes engage one of said members.

When the motor 99 operates the gear 42, it will drive the conveyer 19 by means of the gearing previously described. This will cause the hearth-trays 45 to travel through the chamber 14 that is heated by means of the resistor members 16. The material placed on the hearth-trays will, therefore, be heat-treated. It will be obvious that the conveyer 19 will be continuously moving after the motor 98 is started.

When a tray, having heat-treated material thereon, arrives at a position opposite the discharge outlet 52, a contact member 97 will engage the pair of brushes 94 and 95 and thus close the circuit through the coil 90. This will cause the valve-rod 76 to move downwardly because of the action of the electro-magnet 78. This closes the valve 75 and opens valve 74, thus permitting compressed air to flow into the lower end of the cylinder 60 and forcing the piston 59 upwardly against the action of spring 62. This will cause the roller bearing 57 to engage with a hearth-tray 45 that is to be dumped, and the hearth tray will be tilted to the position shown in dotted line in Fig. 1, thus discharging material therefrom into the discharge outlet 52, through which the material will fall into the quench tank 53. The roller bearing 57 minimizes the friction of the hearth-tray with the ram 55. The contact members 97 are, of course, of such length as to maintain the tray 45 in tilted position for a sufficient length of time to effect a discharge of material therefrom.

The continued rotation of the conveyer will carry the contact member 97 out of engagement with the brushes 94 and 95, thus opening the circuit through the solenoid 90 and deenergizing the core member 78. This will permit the spring 80 to force the valve-rod 76 upward and seat the valve 74 again, thus cutting off the air supply from the cylinder 60. The valve 75 will be unseated and will permit the escape of air from the cylinder to the outside atmosphere. The spring 62 will then return the piston 59 to its retracted position. This will permit the tray 45 to return to its normal position.

Charging of the empty tray may be effected through a suitable charging door (not shown).

It is obvious that my invention could be applied to a furnace in which the conveyer was not rotary. It is also obvious that other means than that shown could be used for controlling the operation of the ram and for varying the time cycle between successive dumpings of the trays 45.

While I have shown and described, for purposes of illustration, a particular form of my invention, it may, of course, be embodied in other forms without departing from the spirit and scope thereof, as set forth in the appended claims.

I claim as my invention:

1. In a furnace, the combination with an annular hearth, a plurality of trays on said hearth, and means for effecting movement of said hearth, of a pneumatic ram the operation of which is initiated by the movement of the hearth for successively tilting said trays.

2. In a furnace, the combination with an annular hearth, a plurality of trays on said

hearth, and means for effecting movement of said hearth, of pneumatic means operative at definite periods for effecting a tilting movement of said trays in sequence.

3. In a furnace, the combination with an annular hearth, a plurality of trays on said hearth, and means for effecting movement of said hearth, of pressure-actuated means controlled by the movement of said hearth for successively tilting said trays.

4. In a furnace, in combination a conveyer, a material-receiving tray secured to said conveyer, means for effecting continuous movement of said conveyer, and pneumatic means positioned beneath said furnace for periodically effecting the discharge of material from said tray.

5. In a furnace, in combination a conveyer, a tray pivotally secured to said conveyer, means for continuously driving said conveyer, pneumatic means for operating a piston to periodically tilt said tray, the operation of said pneumatic means being controlled by the movement of said conveyer.

In testimony whereof, I have hereunto subscribed my name this 13th day of July, 1926.

JOHN F. BAKER.