Jan. 24, 1928. 1,656,924

R. H. SMITH

ANNEALING FURNACE

Filed March 14, 1925

Fig. 1.

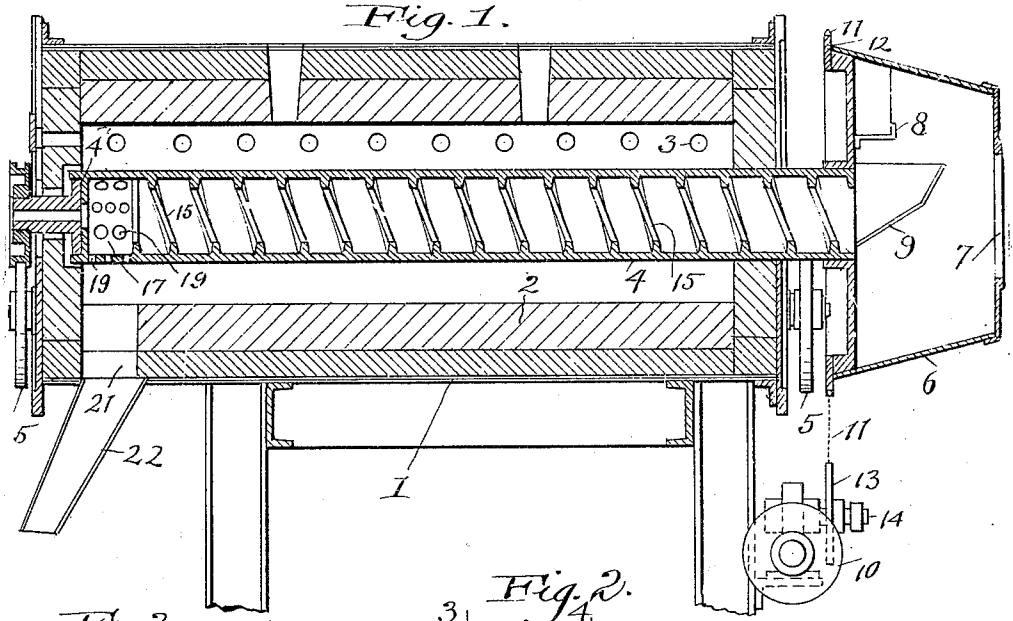


Fig. 2.

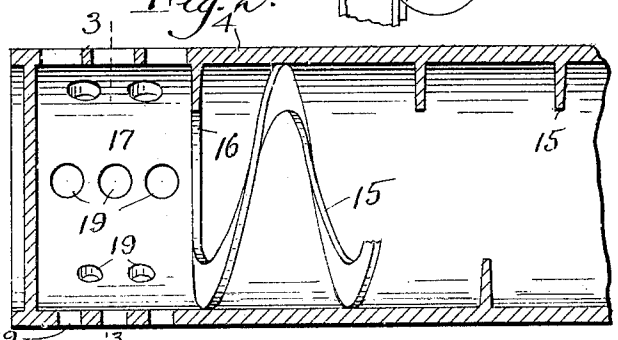


Fig. 3.

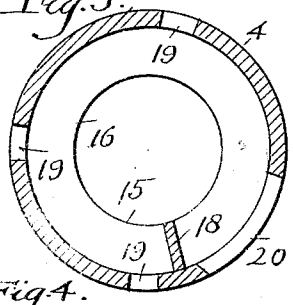
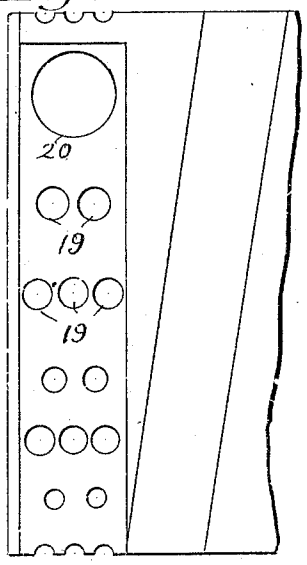


Fig. 4.



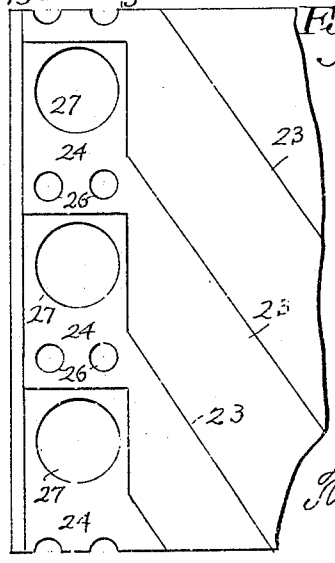


Fig. 6

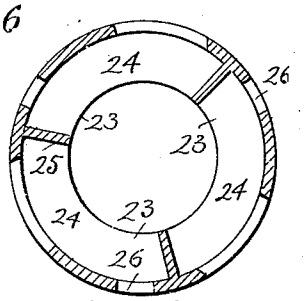


Fig. 5.

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UNITED STATES PATENT OFFICE.

ROY H. SMITH, OF KENT, OHIO.

ANNEALING FURNACE.

Application filed March 14, 1925. Serial No. 15,489.

This invention relates to improvements in annealing furnaces and more particularly to the mechanism for advancing the material through the furnace and discharging the same from the furnace into the quenching tank.

In annealing small metallic articles such as rivets and bolts it has heretofore been common practice to employ a substantially horizontal tubular screw conveyor extending longitudinally within the chamber of the furnace and having its discharge end over a quenching tank mounted below the discharge end of the furnace. The internal rib of the screw forms a helical passageway along the inner surface of the tube along which material is advanced in separate masses resting upon the bottom of the tube, each mass being discharged separately and at intervals corresponding to the period of rotation of the screw.

It is the object of the present invention to obtain a more perfect quenching of the articles by distributing the discharge of articles from the conveyor throughout the rotation thereof so that the discharge of material into the quenching tank in bunches is avoided.

References should be had to the accompanying drawings forming a part of this specification in which Fig. 1 is a central longitudinal section through the furnace and tubular conveyor; Fig. 2 is a longitudinal section on an enlarged scale through the discharge end of the tubular conveyor; Fig. 3 is a transverse section on line 3—3 of Fig. 2; Fig. 4 is a developed plan of the discharge end of the conveyor; Fig. 5 is a transverse section through the discharge end of a conveyor of modified construction; Fig. 6 is a developed plan of the discharge end of the conveyor shown in Fig. 5.

Reference should be had to the accompanying drawings in Fig. 1 of which is shown an annealing furnace 1 of conventional construction having a cylindrical body and closed ends lined with suitable refractory material 2. The furnace 1 provides an elongated cylindrical heating chamber which may be heated by suitable burners 3 and, longitudinally of the furnace at the axis thereof, there extends a rotary tubular screw conveyor 4 which serves to convey the material to be heated through the heating chamber. The conveyor 4 has its open inlet end projecting through one end wall of the furnace and its discharge end closed by a suitable closure and bearing member 4^a which projects through the opposite wall of the furnace, the opposite ends of the conveyor 4 being rotatably supported upon suitable rollers 5 journaled in the end walls of the furnace. A feed drum 6 is secured outside the furnace to the projecting inlet end of the tubular conveyor 4 and serves to supply material to the conveyor. The drum 6 has its inner end secured to the open end of the tubular conveyor 4 and its outer end is provided with an inlet opening 7 through which the material to be fed to the conveyor may be introduced. The inner wall of the feed drum 6 has attached thereto a scoop 8 which gathers material from the bottom of the drum as it passes below the axis of rotation and delivers the material into a chute 9 which is also fixed to the inner end wall of the drum during its movement above the axis of rotation, the chute 9 opening into the interior of the tubular conveyor 4. The tubular conveyor and feed drum may be driven by a suitable motor 10 through a belt 11 passing over a pulley 12 secured to the inner end of the drum 6 and over a pulley 13 fixed to a countershaft 14 driven by the motor 10. The rotary tubular conveyor 4 is thus supplied with material from the feed drum 6 and the feed drum and conveyor are continuously rotated so that the material will be advanced through the conveyor.

The interior of the tubular conveyor is provided with one or more helical ribs 15 extending from the inlet end and terminating adjacent the discharge end of the tube. If a single helical rib is employed, this rib will form a single helical passageway for material along the inner surface of the cylinder and if a plurality of ribs are employed, a plurality of such helical passageways will be formed. In Figs. 1 to 4 of the drawing, a conveyor having a single helical rib is shown and in Figs. 5 and 6 there is shown a conveyor having a plurality of such helical ribs. Referring to Figs. 1 to 4 the rib 15 terminates in an end portion 16 at right angles to the axis of the tube and spaced from the closed end thereof forming a discharge chamber 17 into which the material is delivered by the screw. The circular rib 16 terminates short of the end of the discharge end of the rib 15 so as to provide a passage for the material into the discharge chamber 17 and a partition rib 18

extends across the chamber parallel with the axis thereof at the end of the circular rib 16. As the tube rotates the material remains by gravity in the bottom portion thereof and is advanced in separate masses between successive turns of the helical rib 13 along the spiral passageway formed by the rib 15. During each rotation of the tubular conveyor a mass of material is fed into the discharge chamber 15 as the discharge end of the helical rib 15 passes below the axis of rotation. This mass of material will enter the chamber 17 immediately in front of the partition rib 18 and in order to distribute the discharge of material throughout the rotation of the tube, the discharge chamber 17 is provided with circumferentially spaced discharge openings 19 which vary in size. The smallest openings are placed adjacent the partition rib 18 and increase in size away from the partition member in the direction of rotation of the tube, the last opening being a large opening 20 adjacent the opposite side of the rib 18 to insure the complete discharge of each mass of material. A mass of material entering the chamber 17 is deposited over the smaller of the discharge openings 19 and during the rotation of the tube the successive openings of progressively increasing diameter pass beneath the mass of material so that the material is discharged with substantial uniformity throughout the rotation of the tube. The material discharged from the chamber 17 passes through a discharge opening 21 in the bottom of the furnace onto a chute 22 which delivers the material to the quenching tank.

In Figs. 5 and 6 of the drawing a modified conveyor construction is shown in which the tube is provided with a plurality of parallel helical ribs 23 forming a corresponding number of helical passageways on the interior of the tube from the inlet to the discharge end thereof. Each passageway so formed discharges into a separate discharge chamber 24 occupying equal spaces about the periphery of the discharge portion, these chambers being separated by partition ribs 25 similar to the partition rib 18 and the periphery of the discharge portion of the tube being provided with small openings 26 to each of the spaces 24 at the end thereof into which the material is delivered and with a large opening 27 adjacent the opposite end of each of the spaces 24 so that material entering the discharge portion is delivered thereto over the small openings so that a portion of the material will be discharged through these openings and then upon continued rotation the remainder of the material will be discharged through the large opening.

Having described my invention, I claim:

1. The combination with a furnace having a heating chamber, of a conveyor extending within the chamber, said conveyor comprising a horizontally disposed tubular member having an inlet, a discharge portion and a helical internal rib extending from the inlet to the discharge portion, said discharge portion having a closed end spaced from said internal rib and peripheral discharge openings spaced circumferentially and of increasing size away from the end of the rib in the direction opposite the direction of rotation of the tubular member.

2. The combination with a furnace having a heating chamber, of a rotary tube extending within the chamber, said tube having an inlet, a discharge portion closed at its outer end, and a plurality of parallel internal helically disposed ribs extending from the inlet to the discharge portion, said discharge portion having a peripheral outlet adjacent each of said internal ribs.

3. The combination with a furnace having a heating chamber, of a conveyor extending within the chamber, said conveyor comprising a horizontally disposed tubular member having an inlet, a discharge portion and a helical rib extending from the inlet to the discharge portion, said discharge portion having a closed end spaced from the end of said internal rib and having an internal rib extending axially from the end of the helical rib to the closed end, said discharge portion having spaced discharge openings throughout its circumference which increase in size away from said axial rib in a direction opposite the direction of rotation of the tubular member.

4. The combination with a furnace having a heating chamber, of a rotary tube extending within the chamber, said tube having an inlet, a discharge portion closed at its outer end and a plurality of parallel internal helically disposed ribs extending from the inlet to the discharge portion, said discharge portion having a longitudinal rib extending from the end of each helical rib to the closed end and having a peripheral outlet adjacent each of said internal ribs.

In testimony whereof, I hereunto affix my signature.

ROY H. SMITH.