UNITED STATES PATENT OFFICE.

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ROASTING-FURNACE SHAFT.

1,119,325.


To all whom it may concern:

Be it known that I, Harry H. Stout, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented a certain new and useful Improvement in Roasting-Furnace Shafts, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to roasting furnaces, especially such as are used for roasting ores, and such as are provided with stationary hearths upon which the ore is stirred and distributed by rakes or plows affixed to rotating arms, said arms being in turn affixed to and rotatable with a central vertical shaft which extends through central apertures in the hearths, and is rotated by any suitable mechanism. A furnace of such type is described and illustrated in the patent to John B. Francis Herreshoff, No. 976,175, dated November 22, 1910.

More particularly my invention relates to the central rotatable shafts of such furnaces, of the type in which the shaft is provided with an axial passage for conducting a cooling medium into passages of the rabbet arms, and with an annular passage surrounding said axial passage, for conducting the medium from passages of the rabbet arms to the exterior of the furnace, the axial and annular passages being formed by an outer generally cylindrical wall and an inner generally cylindrical wall concentrically disposed with respect to said outer wall, removable therefrom, and held in spaced relation thereto by means of suitable securing devices.

Generally speaking, the object of my invention is to produce a shaft of the kind described which will be easy of manufacture, and assembling or dismounting and will be free from other defects and disadvantages of shafts known before my invention, as for instance warping and buckling due to the intense heat to which such shafts are subjected.

Referring to the accompanying drawings illustrative of an embodiment of my invention, Figure 1 is a section of a portion of a sectional shaft constructed in accordance with my invention, the section being taken along the line 1-1 of Fig. 3. Fig. 2 is a plan view of one of the sections thereof. Fig. 3 is a cross section along the line 3-3 of Fig. 1 and Fig. 4 is an enlarged sectional detail showing the means of fastening the inner and outer walls together.

The shaft illustrated is composed of a suitable number of superposed sections of which three only are shown in the drawings. Each section is secured at its ends to the adjacent sections by means of suitable fastening means such as the bolts 1 cooperating with the apertured abutting end flanges or lugs 2 of the sections. The sections are generally of similar structure so that a description of one of them will be applicable to all. Each section is generally cylindrical in form. Concentric with the outer cylindrical wall 8 is an inner cylindrical wall 4. The former may be made of cast metal while the latter may be sheet metal formed into a cylinder. Projecting inwardly from the outer member are the ribs 5 connected together at their inner ends by ring 6 which is concentric with the outer wall and has an internal diameter sufficient to allow a freely slidable movement of the inner wall 4 therethrough. These rings are provided one at each end of each section so that when the sections are secured together by means of the bolts, the lower ring of one section abuts the upper ring of the adjoining section. The joint between the two sections is preferably a rabbed joint, the rabbing being provided either at the abutting portions of the outer walls 3 or of the rings 6; proper alignment of the sections is thus insured. An annular groove 7 is formed in the inner surface of the rings 6, as by cutting away the inner edge of each ring, the cutting extending to the abutting plane of the ring. When two sections are secured together with adjoining rings 6 in contact with each other, the groove 7 is formed in the inner surface of the two rings at the plane of contact. One or both of the ends of the inner walls 4 are expanded or peened over so as to extend into the groove 7. In the drawings only one end 8 of each inner wall is shown so expanded. By such construction the end portions of the inner wall are positioned concentrically with respect to the outer wall and at the same
time they are free to move longitudinally independently of the outer wall. The walls so positioned form an axial passage 9 within the tubular inner wall and the annular passage 10 between the inner and outer walls.

At the places at which rabble arms are to be fastened to the arms, the outer wall is suitably conformed to cooperate with fastening devices for said arms, such conformations as shown including a flanged boss 11 projecting outwardly from a recessed portion 12 of the wall, the recess being such that the outwardly projecting boss does not extend beyond the peripheral surface of the outer wall. The wall 12 is apertured and the aperture is inclosed by the flanged boss 11, whereby a passage 13 is produced which is adapted to afford communication between the annular space 10 and one of the passages of the cooperating, hollow, rabble arms. A passage 14, similarly provided, is continued by means of a suitable tubular connection 15 and by virtue of the aperture 16 in the inner wall 4 is adapted to afford communication between the axial passage 9 and a passage of said rabble arm.

The tubular connections 15 are joined to the inner wall 4 by bolt-and-nut fastening devices 17 passing through bolt holes in said connections and said wall. The bolt holes in one or both of said joint members are larger than the shanks of the bolts, as shown particularly in Figs. 4 of the drawings, so that the members may move slightly longitudinally independently of each other although they are firmly held against independent radial movement and form a fluid-tight joint.

To increase the tightness of the joint suitable packing, as asbestos cement 18, may be inserted in a suitable groove provided in the face of the tubular connection and surrounding the passage 14.

In the device shown, the shaft sections are articulated together in axial alignment the outer walls 8 of adjacent sections abutting each other at their ends whereby the annular passages 10 of the sections are in communication with each other. The bolts 1 cooperatively with the flanges 2 of the sections insure such a close contact between the sections as to prevent leakage. The inner walls of the sections are in substantial alignment with each other so that the axial passages 9 of the sections communicate with each other, the connection of the sections being such as to prevent substantial leakage but allow longitudinal movement of the inner wall of each section independently of the outer wall thereof or of the walls of the other sections.

In the operation of the furnace, a cooling medium, preferably air at ordinary temperature is induced or forced through the axial passage 9 and the various passages 14 into the rabble arms; after traversing passages in the arms it is discharged therefrom through the passages 13 into the annular passage 10 from which it may escape into the atmosphere. In traversing the arms the air takes up heat therefrom, thus cooling the same, and the thus heated air is then conducted into the annular passage 10. It will readily be understood that the inner passage 9 of the shaft contains air at ordinary temperature, and the annular passage 10 contains air at a considerably higher temperature, while the gases externally of the shaft have an extremely high temperature due to combustion upon the hearths of the furnace. The temperature in the passage 9 may be 60°F. to 100°F. in the passage 10, 200°F. to 400°F. and externally of the shaft 1100°F. to 1600°F. It will be seen therefore that the inner wall 4 is of a much lower temperature than the outer wall 3; consequently in actual use of the furnace they will expand unequally. The slidable connections between the walls 4 and the rings 6 will permit such expansion at the end portions of said walls without injury of any kind to the shaft. The slidable connections between the tubular connections 15 and the inner wall will allow such expansion at the places of communication between the axial passage 9 and passages of the rabble arms, likewise without injury of any kind. The inner wall is held in position at no point by connections other than slidable ones so that the outer 100 and inner walls are free throughout their lengths for relative movement longitudinally of the shaft.

I claim:

1. A shaft comprising tubular, apertured walls spaced apart, a tubular connection extending between said walls and connecting said apertures, and means for joining said tubular connection and one of said walls whereby said walls may move longitudinally relatively to each other.

2. A shaft comprising tubular, apertured walls spaced apart, a tubular connection extending between said walls and connecting said apertures, and means for joining said tubular connection and one of said walls, said means comprising a bolt extending through aligned bolt-holes in said joined members and a nut cooperatively with the bolt, the bolt-hole in one of said members being larger than the bolt-shank, whereby a fluid-tight joint is formed between said members and yet said members are capable of slight movement longitudinally independently of each other.

3. A shaft comprising articulated sections, each section comprising an outer wall, the ends of the outer walls of adjoining sections abutting each other, an inner wall spaced from said outer wall, the outer and
inner walls being apertured, a tubular connection extending between said walls and connecting said apertures, and means for joining said tubular connection and one of said walls, whereby said walls may move longitudinally relatively to each other.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARRY H. STOUT.

Witnesses:

FRITZ ZIEGLER, JR.

JOHN A. FERGUSON.