

July 2, 1940.

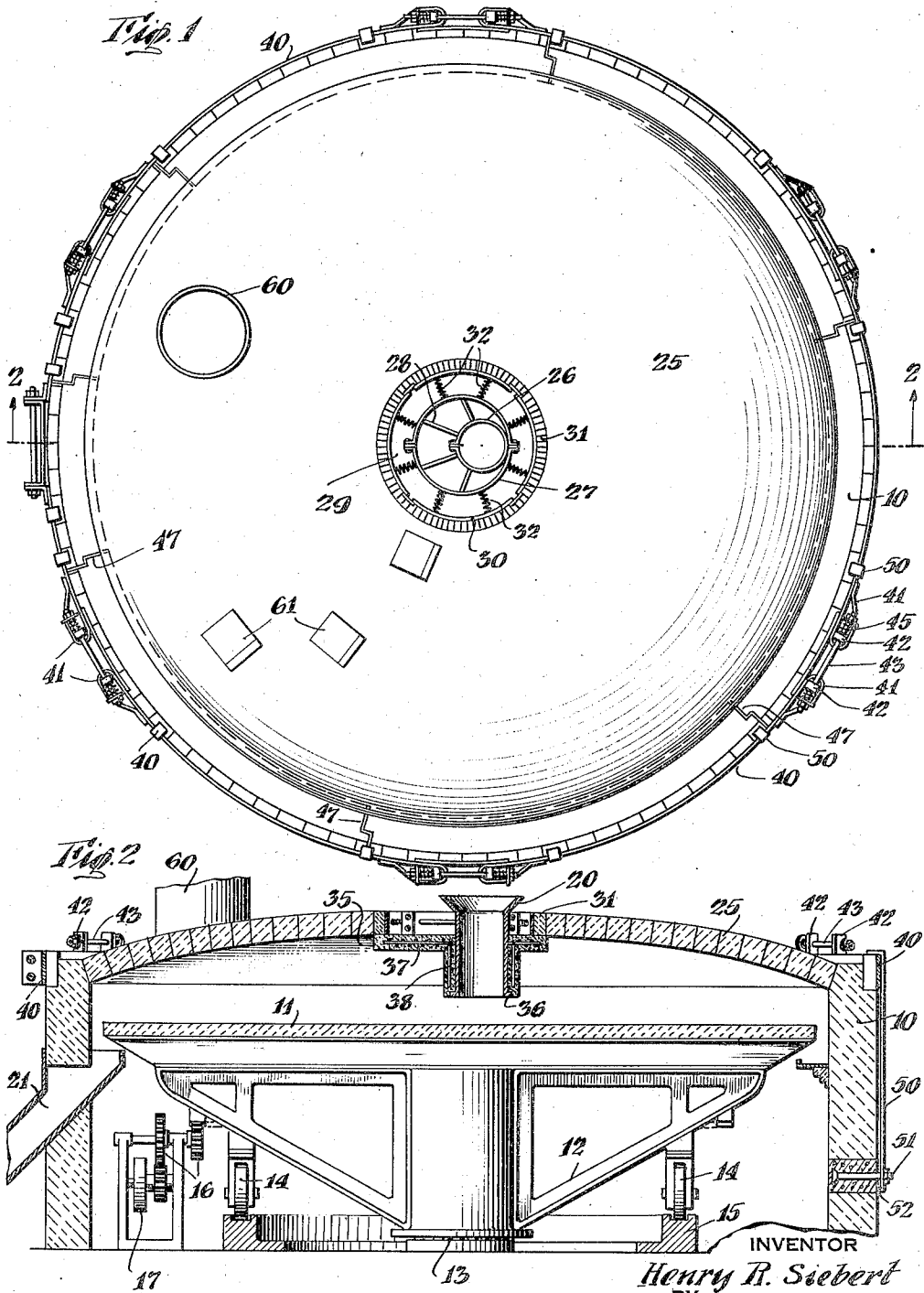
H. R. SIEBERT

2,206,679

FURNACE ARCH CONSTRUCTION

Filed Aug. 17, 1939

2 Sheets-Sheet 1



INVENTOR
Henry R. Siebert
BY
James K. Kent
ATTORNEY

July 2, 1940.

H. R. SIEBERT

2,206,679

FURNACE ARCH CONSTRUCTION

Filed Aug. 17, 1939

2 Sheets-Sheet 2

Fig. 3

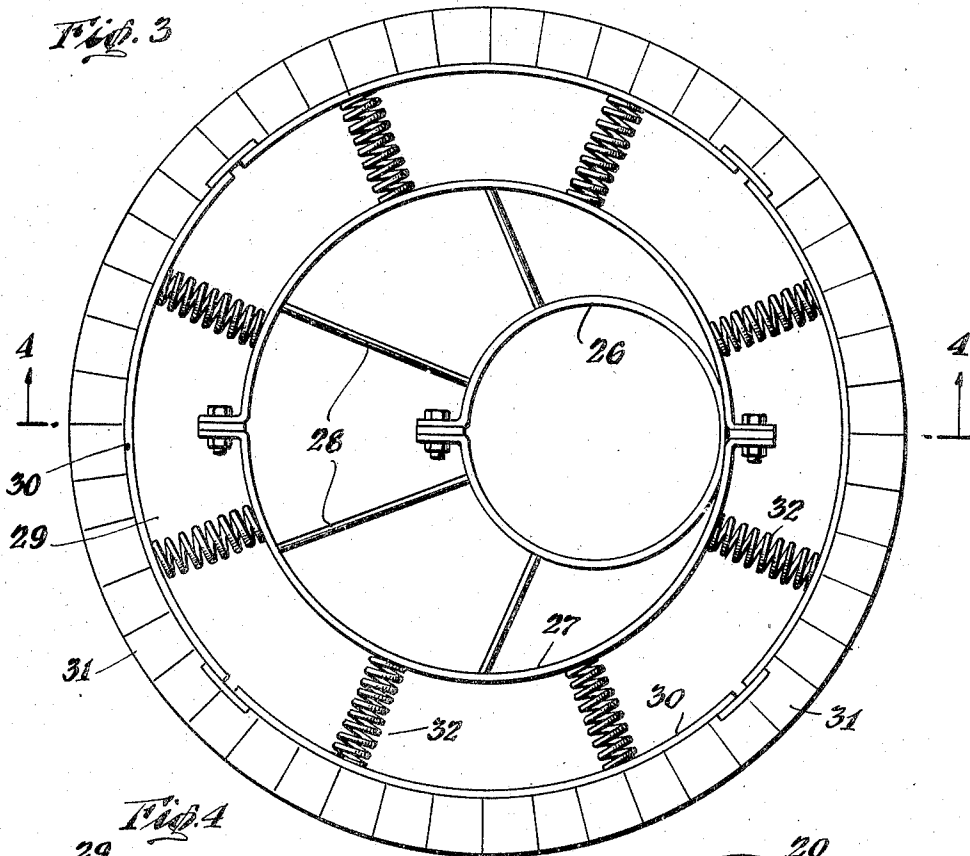


Fig. 4

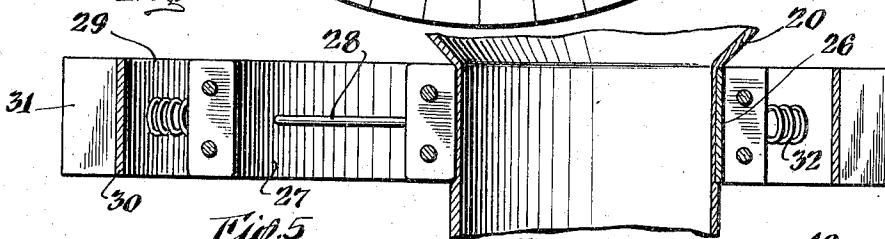


Fig. 5

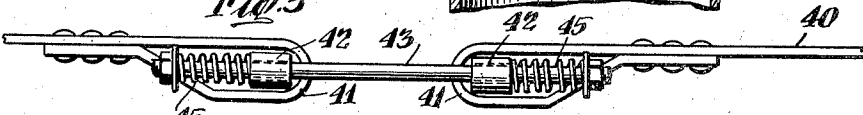
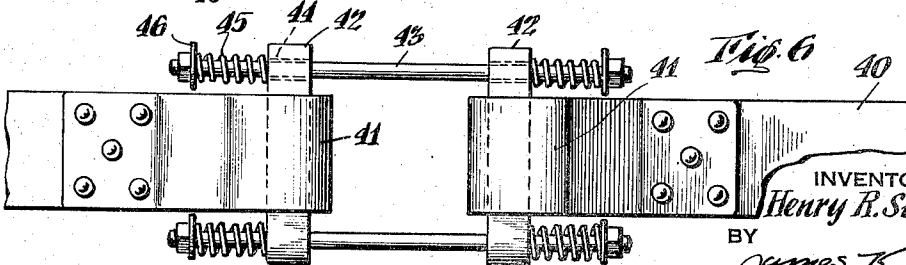


Fig. 6



INVENTOR
Henry R. Siebert
BY James K. Bent
ATTORNEY

UNITED STATES PATENT OFFICE

2,206,679

FURNACE ARCH CONSTRUCTION

Henry R. Siebert, Salt Lake City, Utah, assignor
to American Smelting and Refining Company,
New York, N. Y., a corporation of New Jersey

Application August 17, 1939, Serial No. 290,555

10 Claims. (Cl. 263-46)

This invention relates to furnace roofs and more particularly to an arch roof construction for circular metallurgical furnaces, such, for example, as Godfrey roasters or the like.

An object of the invention is to provide a sprung arch roof construction having novel and improved means to prevent the contraction or expansion of the materials from causing deformation of the roof.

Another object is to provide a construction wherein the material of the arch is maintained under substantially constant compression, regardless of changes in dimension thereof due to expansion and contraction.

Another object is to provide a novel and improved means for closing the center of the arch about the eccentric feed hopper.

Another object is to provide a convenient, dependable and efficient construction of the type above indicated.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawings, in which a specific embodiment thereof has been shown for the purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of a furnace roof embodying the present invention;

Fig. 2 is a transverse section, taken on the line 2-2 of Fig. 1;

Fig. 3 is an enlarged detail view showing the center closure and supporting means;

Fig. 4 is a transverse section taken on the line 4-4 of Fig. 3;

Fig. 5 is a plan view of the spring coupling means for the outer roof band; and

Fig. 6 is a side elevation of the coupling means of Fig. 5.

The invention is shown by way of illustration as embodied in a Godfrey roaster of generally standard construction comprising circular side walls 10 and a rotating turntable or hearth 11 supported on a frame 12 and rotatably mounted by means of a bearing 13. Wheels 14 riding on a circular rail 15 serve to balance and help to support the assembly. The turntable 11 may be rotated by suitable means, such as a gear train 16, driven by suitable means, such as a belt pulley

17. The charge is applied to the hearth near the center thereof by an eccentric feed spout 20. The roaster is provided with suitable rabble arms (not shown) of standard construction for advancing the charge radially to a peripheral discharge spout 21. It is to be understood that the portions of the roaster thus far described are of standard construction and that only so much thereof has been set forth as is necessary to an understanding of the present invention. Furthermore, the invention is also applicable to other types of furnaces. The turntable or hearth may, for example, be made stationary and the furnace may be provided with rotating rabble arms, as is well known in the art. The invention may also be applied to other circular furnaces of the general type herein disclosed.

In accordance with the present invention, the roaster is provided with an arched roof 25 formed of suitable refractory brick and sprung between the top portions of the side walls 10. The roof is so constructed that it is normally held in position by the keystone effect of the arch. The feed spout 20, in the embodiment shown, is clamped in a split ring 26 which, in turn, is eccentrically mounted in a second split ring 27 to which it may be secured by tie rods 28, the parts being welded or otherwise secured as may be desired. The arch roof 25 is provided with a central opening 29 formed by a metal ring 30 which is secured to the innermost row of bricks 31. The ring 27 is concentrically mounted within the ring 30 and is held by a set of radial compression springs 32. The ring 30 is shown as formed in sections so that it may expand or contract as may be required to accommodate itself to changes in the dimension of the arch caused by expansion or contraction of the brickwork. The springs 32 are adapted to supply the necessary pressure for maintaining the arch in position at all times, regardless of any changes in dimensions thereof.

For closing the opening 29, a refractory plate 35 is provided. This plate may be formed of refractory cement cast about the feed spout 20 and supported by a bottom flange 36 formed on said spout. Suitable reinforcing rods 37 may be embedded in the refractory plate 35 for strengthening the assembly. These rods are preferably covered by a soft material 38, such as several layers of roofing paper or the like, so as to prevent the expansion and contraction of the rods from cracking the refractory material. The plate 35 closes the opening 29 and slidably engages the innermost row of brick 31.

In order to prevent the side wall from being pushed outwardly by the action of the springs 32, a retaining band 40 is positioned herearound. This retaining band 40 is shown as formed in sections, each terminating in a loop 41 through which a bar 42 passes. Links 43 extend through suitable openings 44 in the ends of the bars 42 and are resiliently secured by compression springs 45 positioned around the links 43 between the bars 42 and adjusting nuts 46. The springs 45 are designed and constructed to hold the band 40 under sufficient tension to cause the roof and walls to withstand the action of the springs 32 and, at the same time, to permit a limited amount of radial movement as may be required due to the expansion and contraction of the brickwork.

The walls 10 are shown as provided with expansion joints 47 which extend to a point at least below the turntable 11 so as to permit the walls to expand and contract with the roof. In order to prevent the band 40 from sliding upwardly, a plurality of tie-rods 50 may be provided which extend over the band 40 downwardly on the outside of the walls 10 and are anchored by bolts 51 set in pockets of concrete 52 formed in said walls.

It is to be understood that the roof may be provided with a suitable offtake flue 60 and with suitable burner openings 61 in accordance with known practice.

In the operation of this invention, the charge is fed through the feed spout 20 and is advanced outwardly on the turntable 11 by the rabble arms (not shown) until it is peripherally discharged through the discharge spout 21. The charge is heated in the usual manner by the burners extending through the burner openings 20, the combustion and roasting gases being removed through the offtake flue 60. This type of furnace is subjected to extreme temperature variations which cause the brickwork to expand and contract by an amount which, at times, may be sufficient to cause the arch to collapse unless temporary supports are used during the shut down periods. The present invention eliminates this difficulty, however, by maintaining the arch under sufficient radial compression at all times, due to the action of the springs 32 and 45, to prevent the same from buckling or collapsing. The life of the brickwork is thus materially increased, and the necessity for shutting down the roaster at frequent intervals for repairing or rebuilding the arch is avoided.

Although a specific embodiment of the invention has been shown herein for purposes of illustration, it is to be understood that the invention is capable of many uses, as will be readily apparent to a person skilled in the art, and that, accordingly, various changes and modifications may be made within the scope of the appended claims.

What is claimed is:

1. An arch roof for a circular furnace or the like comprising a sprung arch having a central opening, and spring means positioned in said central opening for maintaining said arch under compression sufficient to support the same as the dimensions of the arch change due to expansion and contraction of the materials thereof.

2. An arch roof for a circular furnace or the like comprising a sprung arch having a central opening, an expansible ring in said opening and resilient means applying radial pressure to said ring sufficient to support said arch during

changes in dimensions thereof caused by expansion and contraction of the material.

3. An arch roof for a circular furnace or the like comprising a sprung arch having a central opening, an expansible ring in said opening, a rigid member positioned concentrically within said ring, and spring means extending between said ring and said member applying radial pressure to said ring sufficient to support said arch during changes in dimensions thereof caused by expansion and contraction of the material.

4. A furnace comprising circular side walls, a circular arch roof sprung from said side walls, said roof having a central opening, resilient means in said opening applying radial pressure sufficient to support said arch during changes in dimensions thereof caused by contraction of the material when the furnace is shut down, a retaining band around said side walls in substantial alignment with said roof, and resilient means holding said retaining band under tension adapted to counteract the thrust of said roof produced by said first resilient means.

5. A furnace comprising circular side walls, a circular arch sprung from said side walls, said arch having a central opening, resilient means in said opening applying radial pressure sufficient to support said arch during changes in dimensions thereof due to contraction when the furnace is shut down, a retaining band around said side walls in substantial alignment with said roof, and resilient means holding said retaining band under tension adapted to counteract the thrust of said roof produced by said first resilient means, said side walls having expansion joints to permit movement thereof with said roof as the materials expand and contract.

6. A furnace comprising circular side walls, a circular arch roof sprung from said side walls, said roof having a central opening, resilient means in said opening applying radial pressure sufficient to support said arch during changes in dimensions thereof, a retaining band around said side walls in substantial alignment with said roof, resilient means holding said retaining band under tension adapted to counteract the thrust of said roof produced by said first resilient means, and tie-rods engaging said band, said tie-rods extending downwardly over said wall and being anchored thereto to prevent displacement of said band.

7. A furnace comprising a sprung arch of refractory brick having a central opening, an expansible ring in said opening engaging the inner row of brick, a second ring within said opening concentric with said first ring, spring means extending between said first and second rings to apply radial pressure to said first ring adapted to support said arch during changes in dimensions thereof, a feed spout mounted eccentrically within said second ring, and a refractory plate carried by said feed spout and closing said central opening.

8. A circular furnace roof construction comprising a sprung arch of refractory brick having a central opening, an expansible ring in said opening engaging the inner row of brick, a second ring within said opening concentric with said first ring, spring means extending between said first and second rings to apply radial pressure to said first ring, a feed spout mounted eccentrically within said second ring, and a refractory plate carried by said feed spout and closing said central opening, said refractory plate comprising a cast refractory having a plurality of metal

reinforcing members disposed therein, said reinforcing members having a covering of soft material adapted to prevent cracking of the refractory due to expansion or contraction of said members.

9. A metallurgical furnace of the Godfrey type having an arch sprung from the upper portion of the furnace side wall, an expansible ring in the center of said arch, a ring of lesser diameter within said expansible ring, coil springs between said rings, a charge hopper carried by said ring of lesser diameter, a retaining band encircling the

perimeter of said arch, and resilient means maintaining said retaining band under tension.

10. In a circular furnace arch roof having a central opening, resilient means mounted within said opening exerting pressure radially toward the periphery of said arch, peripheral resilient means opposing the radially exerted pressure aforesaid, and charging means extending through said central opening and positioned eccentrically with respect thereto.

H. R. SIEBERT.