J. B. F. HERRESHOFF.

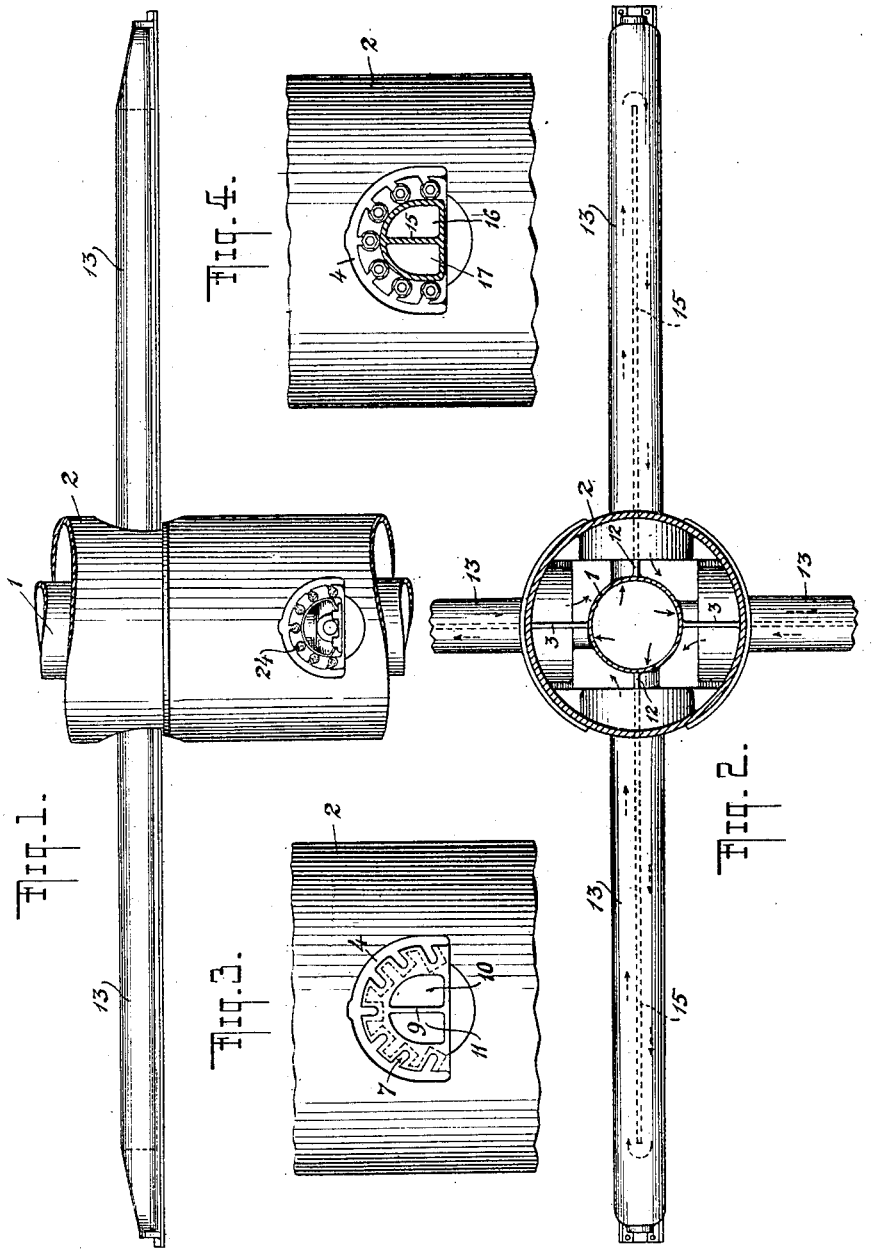
ROASTING FURNACE.

APPLICATION FILED APR. 12, 1912.

1,085,419.

Patented Jan. 27, 1914.

2 SHEETS—SHEET 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 5.

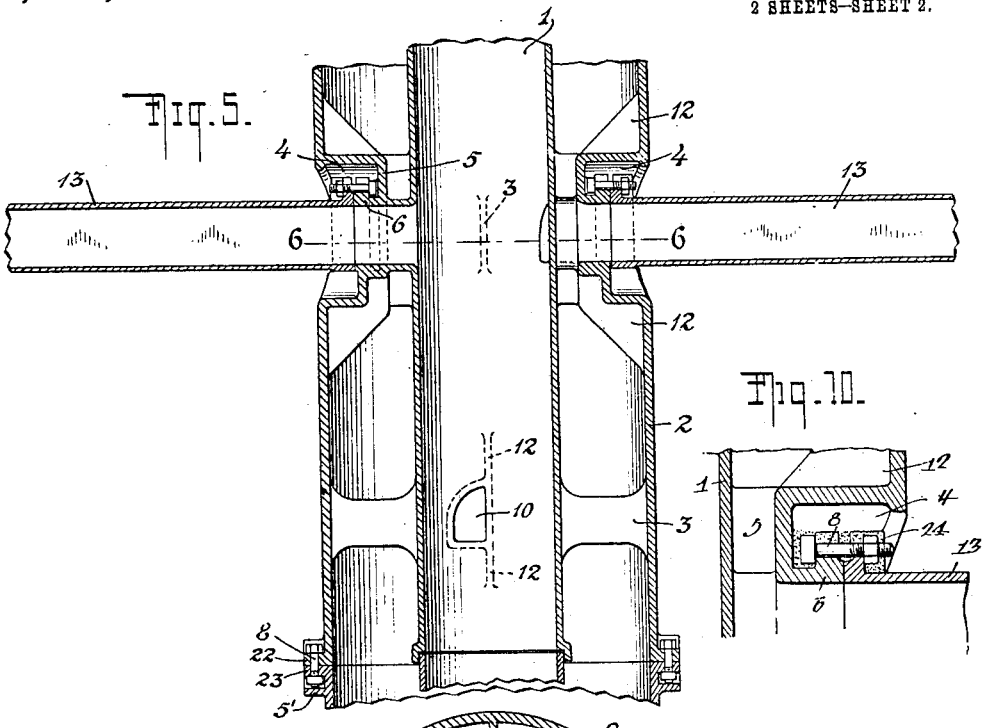


Fig. 10.

Fig. 6.

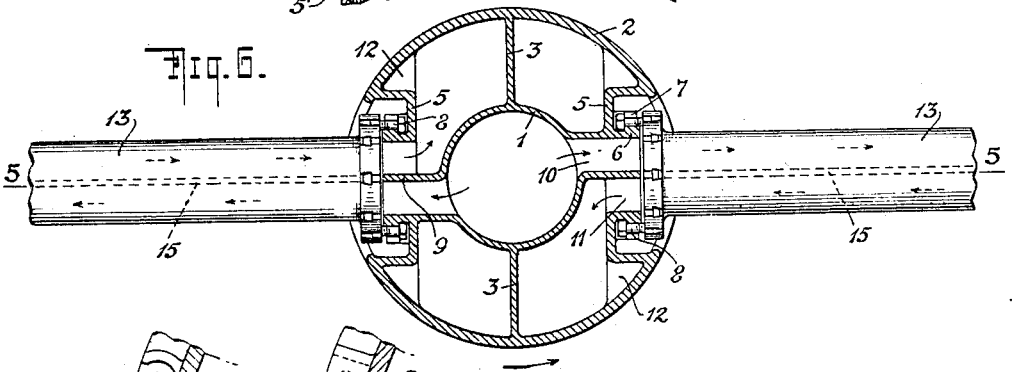


Fig. 8.

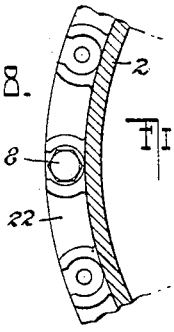


Fig. 9.

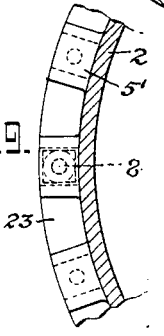
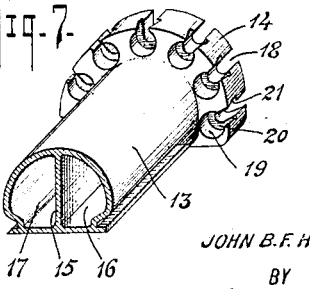


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOHN B. F. HERRESHOFF, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO NICHOLS COPPER CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ROASTING-FURNACE.

1,085,419. Specification of Letters Patent. Patented Jan. 27, 1914.

Application filed April 12, 1912. Serial No. 690,222.

To all whom it may concern:

Be it known that I, JOHN B. F. HERRESHOFF, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Roasting-Furnaces, of which the following is a specification.

My invention relates to roasting furnaces and particularly to furnaces for roasting ores and of the type shown in my Patent numbered 976,175 and dated November 22, 1910.

One of the objects of my invention is to increase the life and efficiency of such furnace by so constructing the central rotating member and the rabble arm members that, especially at their points of connection, they may be maintained at a lower temperature than heretofore.

Another object is to provide connecting means between the central member and the arm members which shall be protected from the intense heat of the furnace and at the same time be easy of access for removing and attaching the arm members.

Another object is the provision of connecting means for furnace elements, which may be insulated from the heat of the furnace by a suitable heat insulating medium.

Other objects of my invention will be pointed out or will otherwise appear in the following description of one embodiment thereof which is shown in the accompanying drawings in which—

Figure 1 shows in side elevation a portion of the central rotatable member of a furnace of the type mentioned, with rabble arms attached thereto. Fig. 2 is a plan view of the mechanism shown in Fig. 1, Fig. 3 is an elevation of a portion of the central member with the rabble arm removed, Fig. 4 is an elevation similar to that of Fig. 3 with the rabble arm attached and broken off near the attaching flange, Fig. 5 shows in vertical section on the line 5—5 of Fig. 6 a portion of the central member and attached rabble arms, Fig. 6 is a section of the central member on the line 6—6 of Fig. 5, the rabble arms appearing in plan view, Fig. 7 is a perspective view of the flanged portion of a rabble arm. Fig. 8 is a detail view showing the upper surface of the attaching flange of one of the central member sections, Fig. 9 is a detail view similar to that of Fig. 8, but showing the lower surface of the cooperating attaching flange and Fig. 10 is an enlarged sectional detail of the arm and shaft connection, showing particularly the position of the insulating material.

It will be understood that the furnace to which my invention is applicable comprises a series of superimposed hearths which support the ore or other material to be treated. The hearths are provided with apertures for the passage of ore and of evolved gases alternately near the center and the periphery thereof, and are further provided with central openings through which extends a central member rotatably supported above and below the hearths in suitable bearings. Attached to this member above the hearths are rabble devices comprising rabble arms equipped in the usual manner with rabbles which are adapted to extend into the ore to be treated. The rabbles are usually angularly disposed so that upon the rotation of the central member the rabbles above each hearth move the ore thereon gradually toward the opening in said hearth, through which opening it falls upon the next lower hearth.

The central rotatable member shown in the drawings comprises a shaft 1, surrounded by a concentric sleeve 2. The shaft and sleeve may be of integral construction and held in separated, concentric relation by strengthening ribs 3. At the points of attachment of the rabble arms, the walls of the sleeve extend inwardly so as to form recesses or pockets 4 from the innermost walls 5 of which extends outwardly a substantially semi-circular flange 6. The flange 6 is provided with slots 7 for the reception of bolts 8 the heads of which are adapted to be positioned in suitable pockets in the flange between the slots therein and the inner wall 5. These pockets extend outwardly in the direction of the slots 7 to the periphery of the flange 6, as particularly shown dotted in Fig. 3, and are shaped internally so that the bolt heads are held from turning. The flange 6 is provided with a central vertical partition 9 which, together with the walls of the flange on one side of said partition, extends to the shaft 1 to form a passage 10

to connect the shaft with the recess 4. The opposite side of the flange is formed into a passage 11 to establish communication between the interior of the sleeve 2 and the recess. The walls of the recess 4 are strengthened by means of lugs 12 within the sleeve 2.

Each rabble arm 13 is provided at its inner end with a substantially semi-circular flange 14 and with a central vertical partition 15 extending from the inner end to a point near the outer end, the partition 15 forming an inlet passage 16 and an outlet passage 17 in communication with each other near the outer end of the arm. The rabble arms are secured by means of the bolts 8 to the flanges 6 of the sleeve 2 so that the passages 16 and 17 of the arms are in communication with the passages 10 and 11 respectively of the central member, the partition 15 abutting the partition 9. In this position the flange of each arm is situated entirely within the recess 4.

The flange 14 of each arm is provided with slots 18 which extend to the periphery of the flange in a generally upward direction similarly to the corresponding slots 7 in the flange of the central rotatable member. These slots 7 and 18 are of sufficient width to accommodate the shanks of the bolts 8 and are angularly disposed in a generally upward direction so that the bolts may be easily removed into and out of position and furthermore so that an insulating material may be readily applied to them.

The outer face of each flange 14 is provided with a plurality of recesses 19 each substantially concentric with the axis of a bolt 8 when positioned at the bottom of its slot, and of suitable size to receive a nut for the bolt and a suitable tool for turning the nut. When tightened into place, the nut is adapted to seat upon the bottom 20 of the recess and is in effect embedded within the flange. A portion of the longitudinal wall of the recess is undercut as at 21.

The central rotatable member is preferably made in sections, as shown in Fig. 5, and these sections are provided with terminal external flanges 22 and 23 through which fastening means extend to secure the sections together. The fastening means preferably comprise bolts 8 coöperating with the flanges, the bolt nuts being inserted into pockets formed by the flange and abutting wall 5′ on one section and the heads in recesses in the other section. The wall 5′ is similar in function to the wall 5 and the recesses may be similar to the recesses in the flange 14, previously described. The pockets open laterally of the bolt and the recesses longitudinally thereof.

In the operation of the furnace, the central member and the rabble arms and associated parts are subjected to an intense heat under which the various means for connecting parts together are apt to be destroyed. A circulation of cooling fluid, preferably air, is maintained for the purpose of cooling these parts. The air is first caused to traverse the shaft 1 from which it passes, in the case of each arm, successively through the passage 10, 16, 17 and 11 into the sleeve 2 from which it is removed. The circulation may be obviously caused either by a suction or a pressure device. The central member and its associated rabble arms are preferably rotated in practice in the direction shown by the arrow in Fig. 6. Owing to the resistance to turning offered by the material treated, the rabble arm flanges 14 are pressed with great force against the flanges 6 in the neighborhood of the passages 11 and 17 and there is a corresponding tendency to pull these flanges apart on the opposite side of the partitions 9, that is, in the neighborhood of the passages 10 and 16. The conduction of heat from the hearths to the interior of the sleeve 2 is facilitated on the first-mentioned side because of the intimate contact thus produced between the flanges. On the opposite side, however, the conduction is obviously less perfect, but this side is nevertheless maintained at a proper low temperature by conducting the cold air from the shaft 1 directly by means of the passage 10 to the point at which the flanges tend to draw apart. This location of the inlet and outlet passages 10 and 11 respectively, with regard to the direction of rotation of the central member forms an important feature of my invention.

The point of connection of the arms and the central member is situated within the recess 4, the walls of which are materially cooled because their inner surfaces are continually bathed by the air flowing in the sleeve 2. This air manifestly is at a very low temperature relatively to that of the atmosphere outside of the sleeve. The connecting means is further protected by a suitable insulating material 24 (Figs. 1 and 10) which, on account of the structure described, may be packed around the bolts, the bolt heads and nuts. The undercut portions 21 of the flange 14 obviously prevent the packing from being displaced. If desired, the packing may be inserted so as completely to fill the recesses 4. As a packing, asbestos or other poor conductor of heat may be used. In some cases it may not be necessary to insert an insulating material by hand, but the ore dust which accumulates in the furnace may serve as such insulating material. The inclination of the bolt slots is such that descending dust will readily fill them and the bolt head and nut recesses, and be held therein. The undercut portions 21 furthermore, as will be seen, especially

by an inspection of Fig. 6, are such that an increased area for collecting dust is presented. The cooling of the various furnace parts at the points of connection thereof is further enhanced by making the bolt flanges of relatively large dimensions. The fastening bolts are thus relatively small and are in effect embedded in a large mass of metal through which the heat is readily conducted into contact with the cooling fluid. The flanges, moreover are forced into intimate contact with each other without packing or other separating medium and are preferably made integral with the furnace parts to which they are attached, so that the best possible conducting path is produced between relatively hot and relatively cool portions of the furnace.

The insulating material is obviously applicable to the connecting means for the sections of the central member in the same manner as for the connecting means described above, and it is to be understood that the insulated connection is applicable to other parts of the furnace as well as those specifically pointed out. The connections between the rabble arms and the central member being all within the recesses 4, it is obvious that the sections of said member may be readily removed through the central openings in the hearths without interference by said connections.

Instead of the bolts shown it will be understood that any other suitable securing means may be used. Furthermore, when I speak of a bolt head in the claims I mean to refer to either the permanent integral head at one end of the bolt or to the movable head, or nut, at the other end thereof.

I claim:

1. In a roasting furnace, the combination of a central rotatable member provided with a recess, a rabble arm extending into said recess, the portion of said arm within said recess being smaller than the recess, whereby a space is formed between the inner wall of the recess and the outer wall of said portion of the rabble arm, and means within said recess and operatively accessible through said space for detachably securing said arm to said member.

2. In a roasting furnace, the combination of a central rotatable member provided with a recess, the inner wall of said recess being provided with an outwardly extending flange, a flanged rabble arm extending into said recess and abutting said first mentioned flange and means coöperating with said flanges for securing said arm to said member.

3. In a roasting furnace, the combination of a central member comprising a hollow shaft and a sleeve surrounding said shaft and spaced therefrom, said sleeve being provided with a recess and separate passages establishing communication between the recess and the shaft and sleeve respectively, a rabble arm provided with channels in communication with said passages at the inner end of the arm and in communication with each other near the outer end of the arm, and means within the recess for securing said rabble arm to said central member.

4. In a roasting furnace, the combination of abutting furnace members provided with securing flanges, a bolt coöperating with said flanges to secure said members together, one of said flanges being provided with a recess for one of the bolt-heads, the other of said flanges being provided with a recess for the other bolt head and heat insulating material in said recesses.

5. In a roasting furnace, the combination of abutting furnace members provided with securing flanges, a bolt coöperating with said flanges to secure said members together, one of said flanges being provided with a recess for one of the bolt-heads, extending longitudinally of the bolt, the other of said flanges being provided with a laterally open recess for the other bolt head and heat insulating material in said recesses.

6. In a roasting furnace, the combination of a furnace member provided with a flange and a wall separated from said flange, a second furnace member abutting said first-mentioned member and provided with a flange having a recess, a bolt coöperating with said flanges to secure said members together and heat insulating material in the space between said wall and said first mentioned flange and in the recess in said second-mentioned flange to cover and protect the heads of said bolt from heat.

7. In a roasting furnace, the combination of a central rotatable member provided with a slotted flange and a wall separated from said flange, a rabble arm abutting said central member and provided with a flange having a recess and a slot in alinement with the slot of said first-mentioned flange, a bolt seated in said slots and securing said member and said arm together, and insulating material in the space between said wall and said first mentioned flange, in said slots and in said recess for covering and protecting said bolt from heat.

8. In a roasting furnace, the combination of a central rotatable member comprising a hollow shaft and a sleeve surrounding said shaft and spaced therefrom, and a rabble device secured to and rotatable with said member, said rabble device being provided with passages in communication with each other near the outer end of the device, and said member being provided with a passage establishing communication between said shaft and the passage of the rabble device or

that side of said device which, during rotation, is subjected to tensile strains due to the resistance to rotation offered by said material, said member being further provided with a passage establishing communication between said sleeve and the other of said passages in said rabble device.

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

JOHN B. F. HERRESHOFF.

Witnesses:
H. H. STOUT,
J. A. FERGUSON.