No. 714,099. Patented Nov. 18, 1902.

W. F. COLLINS.

APPARATUS FOR ROASTING ORES.

(Application filed Apr. 16, 1902.)

(No Model.)

Fig. 1.

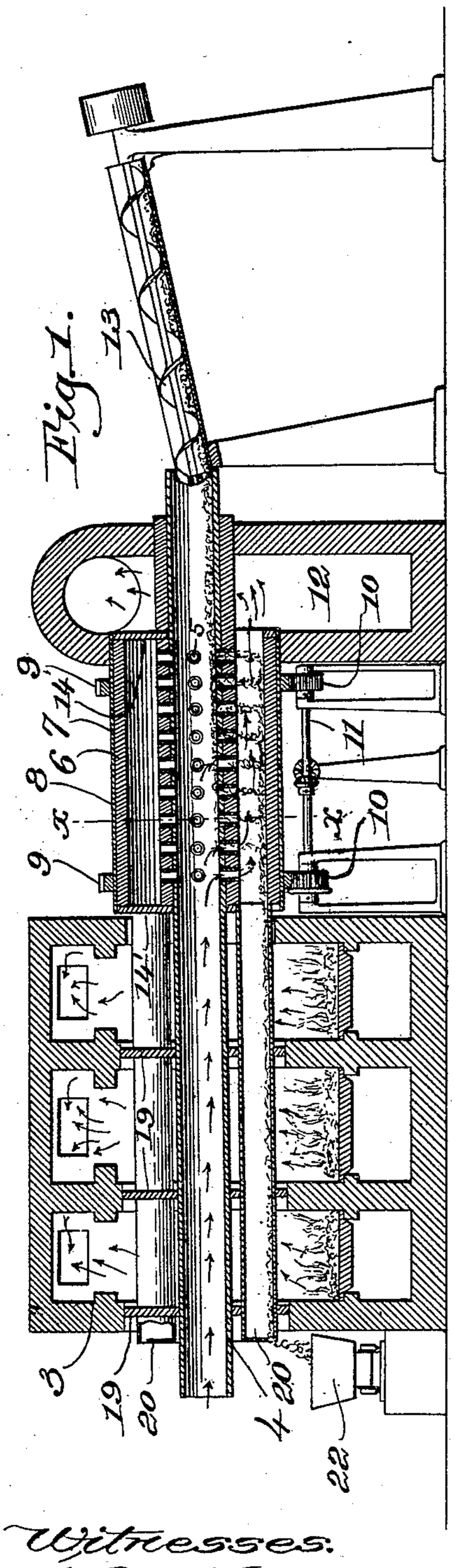

Fig. 3.

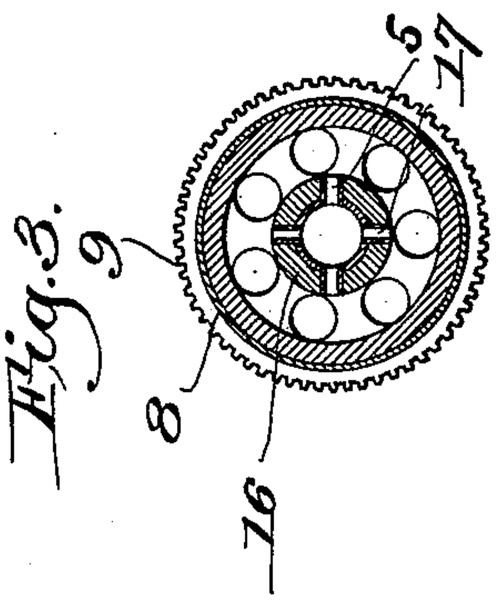

Fig. 4.

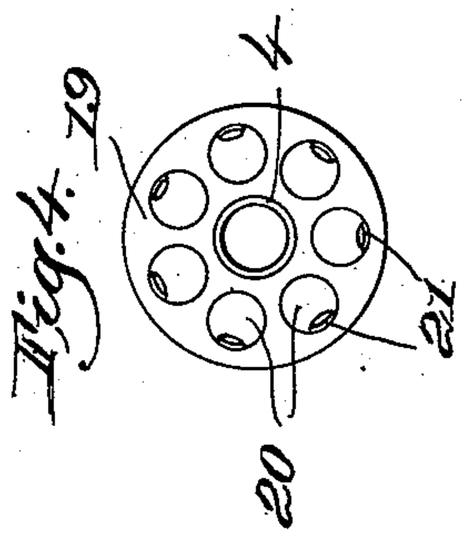

Fig. 2.

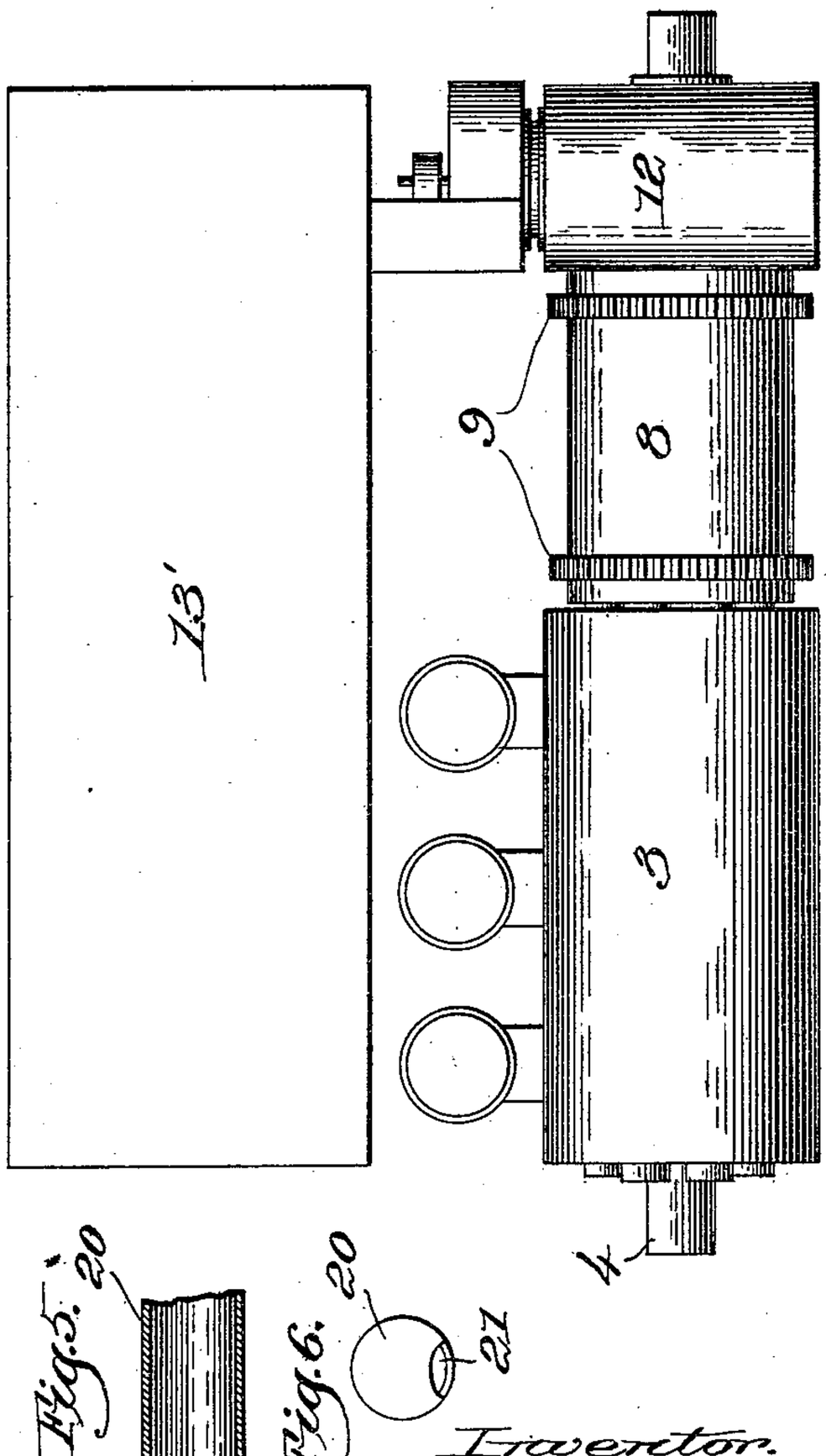

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 714,099, dated November 18, 1902.

Application filed April 16, 1902. Serial No. 103,156. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. COLLINS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Apparatus for Roasting Ores, of which the following description, in connection with the accompanying drawings, is a specification, like figures on the drawings representing like parts.

In the treatment of auriferous ores for the purpose of extracting gold therefrom, especially by the chlorination process, it is essential that the ore be brought to what is termed a "dead roast" before it is subjected to the chlorination process in order that the ore may be freed from any sulfur or arsenic, or both, because if the ore contains even a small amount of sulfur or arsenic, or both, a comparatively large amount of chlorin is necessary for the extracting of the gold.

This invention relates to that class of ore-roasting apparatus in which the oxidizable auriferous ore is delivered first to a heated combustion-chamber, in which the greater portion of the sulfur or arsenic, or both, is removed from the ore by combustion or oxidation, the temperature of the chamber being maintained by heat-units wholly or partially supplied from the ore itself and after being thus partially oxidized is delivered to a retort, which is heated by extraneous heat and in which retort the ore is brought to a dead roast.

In accordance with my invention I provide a suitable furnace, through which extends an open-ended tube having one end projecting beyond the furnace and provided with perforations. Surrounding the projecting end of the tube is a cylindrical combustion-chamber, and extending through the furnace outside of the tube are one or more retorts, which are adapted to be heated by the heat generated in the furnace and which have communication with the combustion-chamber.

Suitable means are provided for rotating the combustion-chamber and the tube and retort and also for feeding the oxidizable ore to the perforated end of the tube. As the combustion-chamber and tube rotate the ore is delivered through the perforations in the tube into the combustion-chamber in a more or less disseminated condition, where partial oxidation of the ore takes place, and from the combustion-chamber the ore is delivered to the heated retort, where the dead roast is obtained.

By placing the retort outside of the tube and rotating the retort about the tube the circle of rotation of the ore in the retort is greatly increased, and the proper dissemination of the ore in the retort is accomplished without the necessity of any special device for this purpose.

In the drawings, Figure 1 is a vertical sectional view of my improved ore-roasting furnace. Fig. 2 is a plan view thereof. Fig. 3 is a section on the line $x\,x$, Fig. 1. Fig. 4 is an end view of a part of the furnace. Fig. 5 is a sectional view of the end of one of the retorts, and Fig. 6 is an end view thereof.

3 designates a suitable furnace, through which passes the central or feeding tube 4, said tube being slightly inclined and projecting at one end beyond the furnace, said projecting end being provided with perforations 5. Surrounding the projecting end is a cylindrical combustion-chamber 6, which will preferably be constructed with an outer metallic shell 7, having a lining 8, of fire-brick or other refractory material.

The combustion-chamber is rotatable and is herein illustrated as provided with exterior rings 9, which rest upon and are driven by rolls or gears 10, carried by the shaft 11, which shaft may be driven in any suitable or usual way. The tube 4 projects beyond the combustion-chamber and through a chamber 12 and into position to receive ore from any suitable feeding device 13. The chamber 12 is connected to a suitable settling-chamber 13′, as usual.

The ends or heads 14 14′ of the combustion-chamber are preferably fast to the central feeding-tube 4, so that the rotation of the chamber will be communicated to said feeding-tube, and the head 14′ is provided with a series of apertures 15, (see Fig. 3,) which open into the chamber 12 and through which the heated gases caused by the combustion

of the ore pass to said chamber 12, as presently described.

The perforated portion of the tube 4 will be preferably provided with a casing 16, of fire-brick or similar material, and suitable ducts or nipples 17 extend through the perforations in the tube 4 and the fire-brick and serve to conduct the oxidizable ore to the combustion-chamber, as presently described.

Situated outside of the tube 4 and extending through the furnace are one or more retorts, which are connected to rotate with the said tube and have communication with the interior of the combustion-chamber. As one convenient way of supporting these retorts I have illustrated the tube as having rigidly secured thereto a series of disks 19, in which are supported the retorts 20, there being seven such retorts in this embodiment of my invention.

One end of each retort is extended into the disk 14 and communicates with the annular combustion-chamber, while the other end of said retorts is shown as extending slightly beyond the furnace in a position to deliver the ore therefrom. By means of this construction the tube, the combustion-chamber, and retorts are constructed to rotate together as one integral piece. I will preferably partially close the exposed end of each of the retorts, as seen in Figs. 5 and 6, a suitable opening 21 being provided, through which the ore may be discharged into any suitable receptacle, such as a car 22.

The operation of the device is as follows: The feeding device 13 operates to feed oxidizable ore to the end of the feeding-tube 4, and owing to the inclination of the tube the rotation of the combustion-chamber and the feeding-tube through the gears 9 and 10 cause the ore to be distributed along the projecting perforated end of said tube, the ore in its movement on the interior of the rotating tube being gradually delivered in a disseminated condition through the ducts 17 into the combustion-chamber, where it is subjected to the direct action of hot gaseous products and heated air which is drawn in through the open end of the central tube 4 and through the ducts 17, the draft to maintain this action being secured either by a natural draft or by a fan, as desired. The heated air as it passes over and through the ore in the rotating combustion-chamber combines with the sulfur and arsenic in said ore and creates combustion, which internally heats the combustion-chamber to such a temperature as to eliminate the greater portion of the sulfur and arsenic, or both, contained in the ore. The rotation of the combustion-chamber and the retorts causes the ore after having been treated in the combustion-chamber to pass gradually into the retorts 20, which are externally heated by the heat generated in the furnace, the ore in its passage through the retorts being brought to a condition known as "dead roast."

It will be observed from the above that the ore is delivered to the combustion-chamber in a more or less disseminated condition by being delivered through the perforations in the tube 4, and because the heated air which supports combustion in the combustion-chamber is brought into the chamber through the tube 4, in which practically none of the ore is, I obtain better combustion and more perfect oxidation of the ore than if the air was all carried through the retorts themselves. Moreover, by using a device in the nature of a disseminator for delivering the ore to the combustion-chamber I greatly facilitate oxidation.

Another important feature of my invention resides in placing or situating the retorts on the exterior of the tube 4 so that each retort rotates about an axis exterior to itself. With this construction the circle of rotation of the ore is very much larger than if each retort rotated about its own axis, and sufficiently perfect dissemination of the ore in the retort is secured without the necessity of using any special device for this purpose.

It will be observed that each of the openings 21 are so situated in the ends of the retorts that they are at the lower side of the retort when said retort is directly beneath the tube 4. With this construction the ore will be delivered from each retort when it is in its lowest position, as shown in Fig. 1, while as the retorts are being carried over the tube 4 the closed end of the tube is so situated as to prevent the ore from being delivered therefrom.

It will be apparent to those skilled in the art that various changes may be made in the structure of the device without in any way departing from the spirit of the invention as expressed in the appended claims.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for roasting ores, a rotatable combustion-chamber, a disseminating device extending through said chamber, and a rotatable retort communicating with said chamber.

2. In an apparatus for roasting ores, a rotatable combustion-chamber, a perforated feeding-tube extending through said chamber, and means to rotate said chamber and feeding-tube whereby the ore delivered to the tube is gradually fed to the combustion-chamber through perforations in the said tube.

3. In an apparatus for roasting ores, a rotatable combustion-chamber, an open-ended perforated feeding-tube extending therethrough, means to deliver ore to said tube, and means to rotate said tube whereby the ore which is delivered to the tube is gradually fed to the combustion-chamber through the perforated portion of the tube.

4. In an apparatus for roasting ores, a rotatable combustion-chamber, a substantially horizontally arranged perforated open-ended

feeding-tube extending through said chamber, means to deliver ore to said tube, and means to rotate the chamber and tube, the construction being such that the ore is delivered to the combustion-chamber through the perforated tube in a more or less disseminated condition.

5. In an apparatus for roasting ores, a furnace, a horizontally arranged tube extending therethrough and projecting beyond the furnace, said projecting end of the tube being perforated, a combustion-chamber surrounding the perforated portion of said tube, and a plurality of rotatable retorts extending through the furnace and communicating with the combustion-chamber.

6. In an apparatus for roasting ores, a furnace, a substantially horizontally arranged tube extending through said furnace and projecting beyond the same, said projecting end of the tube being perforated, a combustion-chamber surrounding said perforated portion of the tube, a plurality of rotatable retorts surrounding the tube and extending through the furnace, and means to rotate said tube and retorts, the construction being such that the ore is delivered to the combustion-chamber through the perforated portion of the tube.

7. In an apparatus for roasting ores, a furnace, a substantially horizontally arranged open-ended tube extending through said furnace, one end of said tube being perforated, a combustion-chamber surrounding said perforated portion of the tube, a plurality of retorts surrounding the tube and extending through the furnace, said retorts each communicating with the combustion-chamber, and means to rotate said tube and retort, the construction being such that the air to support combustion in the combustion-chamber is drawn through the tube.

8. In an apparatus for roasting ores, a furnace, a central open-ended tube extending through said furnace, one end of said tube being perforated, a cylindrical combustion-chamber surrounding said perforated end of the tube, a retort extending through the furnace and situated outside of the tube but mounted to rotate therewith, said retort communicating at one end with the combustion-chamber, and means to rotate the retort.

9. In an apparatus for roasting ores, a furnace, a central open-ended tube extending therethrough and having a perforated portion, a combustion-chamber surrounding said perforated portion, a plurality of retorts extending through the furnace and surrounding said tube, said retorts communicating at one end with the combustion-chamber and having their other ends substantially closed.

10. In an apparatus for roasting ores, a rotatable combustion-chamber, an annular series of retorts, one end of each of said retorts communicating with the combustion-chamber, means to rotate said retorts and combustion-chamber in unison, and means to externally heat said retorts.

11. In an apparatus for roasting ores, a rotatable combustion-chamber, a retort mounted to rotate about an axis exterior thereto, said retort communicating with the combustion-chamber, and means to rotate the combustion-chamber and retort.

12. In an apparatus for roasting ores, a rotatable combustion-chamber, a plurality of retorts, each communicating with the combustion-chamber and mounted to rotate about the axis of the combustion-chamber, and means to heat said retorts externally.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM F. COLLINS.

Witnesses:
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