

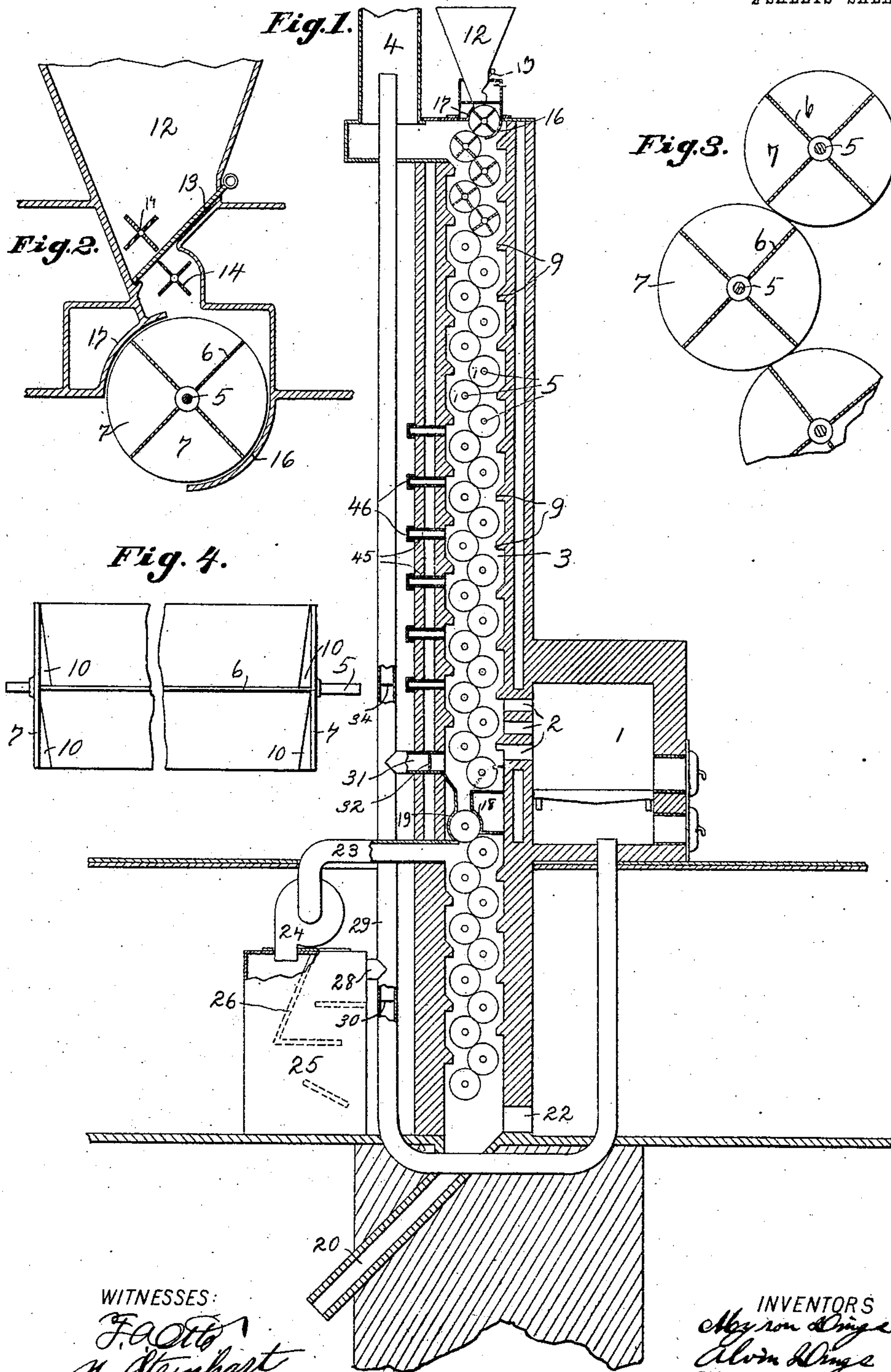
No. 849,465.

PATENTED APR. 9, 1907.

M. & A. DINGS.
ORE ROASTING AND TREATING APPARATUS.

APPLICATION FILED JUNE 17, 1905.

2 SHEETS—SHEET 1.



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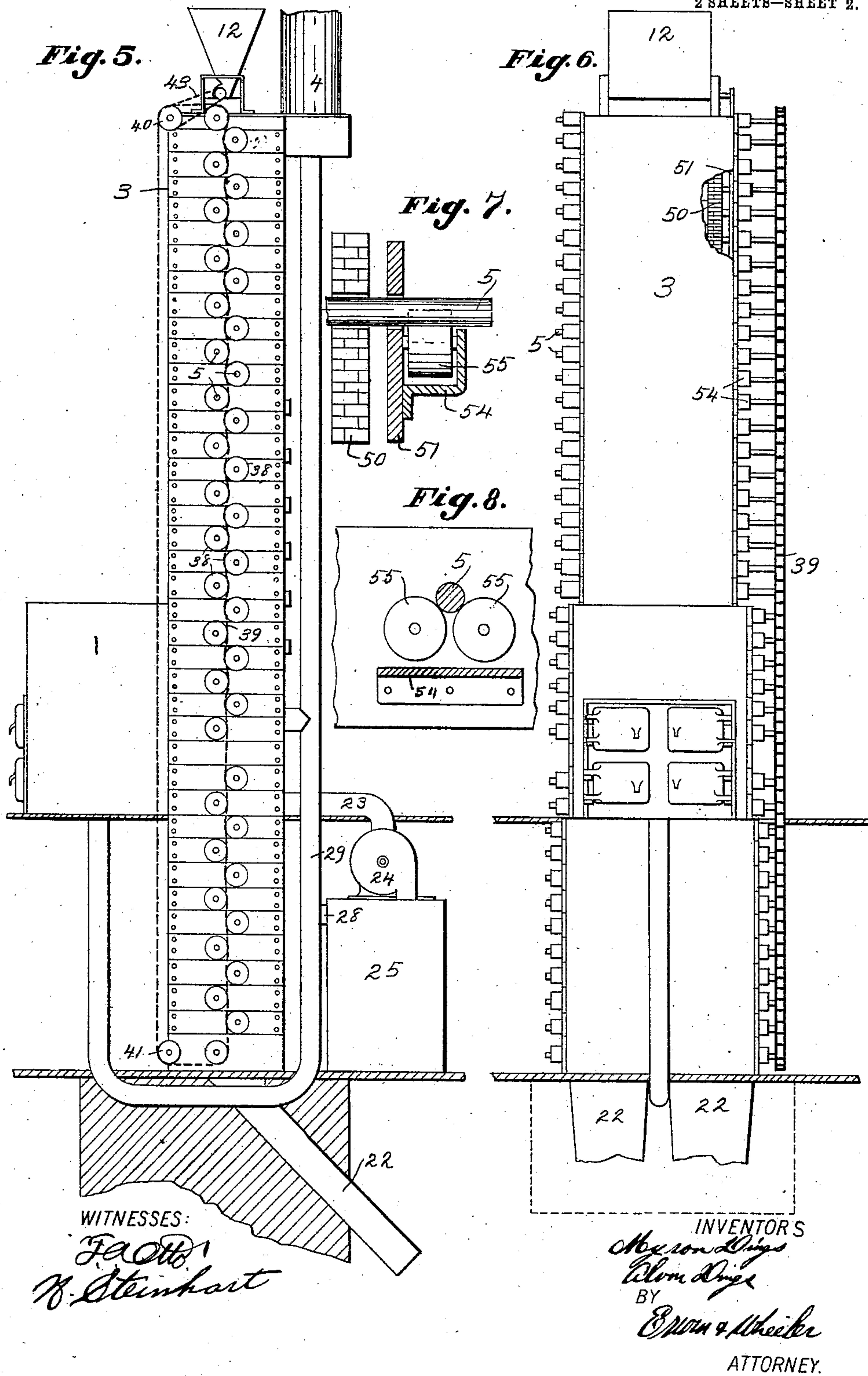
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UNITED STATES PATENT OFFICE.

MYRON DINGS AND ALVIN DINGS, OF MILWAUKEE, WISCONSIN.

ORE ROASTING AND TREATING APPARATUS.

No. 849,465.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed June 17, 1905. Serial No. 265,640.

To all whom it may concern:

Be it known that we, MYRON DINGS and ALVIN DINGS, citizens of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Ore Roasting and Treating Apparatus, of which the following is a specification.

Our invention relates to improvements in ore roasting and treating apparatus, and pertains especially to that class of such devices in which the ore is successively dumped from one holding member to another in a chimney leading from a heating-furnace.

The objects of our invention are, first, to provide a series of tilting buckets which are self-bracing and self-supporting and which are arranged to revolve and act continuously in receiving and delivering the ore, the revolving movement preventing the buckets from warping or bending under the influence of the intense heat to which they are subjected; second, to provide a form of construction in which the ore is introduced without permitting the escape of the heated air and gases in the chimney; third, to provide for cooling the ore after the roasting operation without waste, and also to provide means in connection with the cooling apparatus for varying the supply of oxygen to the roasting ore and for saving the heat absorbed by the roasted ore; fourth, to provide means for utilizing the cooling apparatus to regulate the furnace either by supplying air to the combustion-chamber or by forcing the draft in the stack leading from the roasting-chimney; fifth, to provide a form of construction in which any portion of the chimney may be inspected or opened for the removal of buckets without destroying the remainder of the chimney.

In the following description reference is had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of our invention drawn to a plane cutting the chimney and combustion-chamber. Fig. 2 is a detail view of the hopper through which the ore is fed to the raised chimney, showing also the initial bucket at the top of the chimney. Fig. 3 is an enlarged detail view of a series of buckets. Fig. 4 is an enlarged plan view of one of the buckets with the central

portion broken away. Fig. 5 is a side elevation of our invention, showing the driving connections. Fig. 6 is a detail view of a portion of the rear wall, illustrating the means for removing individual buckets. Figs. 7 and 8 are detail views, partly in section, illustrating the supporting roller-bearings for the bucket-shafts.

Like parts are identified by the same reference characters throughout the several views.

1 is the combustion-chamber, provided with bridge-wall flues 2, leading into a chimney 3, which at its upper end communicates with a stack 4. The chimney 3 is crossed by a series of shafts 5, and each of these shafts within the chimney is provided with radially-extending flanges 6 and disks 7 at the ends of the flanges, which form a set of buckets adapted to successively receive and dump the ore as the shaft is rotated. The shafts 5 are arranged in a zigzag row within the chimney and are revolved in opposite directions, whereby each of the buckets on one shaft is adapted to dump the ore into a bucket on the next shaft below it. The walls of the chimney are provided with inwardly-projecting ledges 9, having inclined upper surfaces adapted to direct any material popping out of the buckets or scattered therefrom when the buckets are tilted into the buckets carried by the shaft below. The disks 7 are provided with angular inner surfaces or fillets 10 for each of the buckets extending with increased divergence from the outer wall of the disk in the direction of rotation, whereby as the bucket is tilted the material is slightly concentrated toward the center and prevented from falling on the end disks of the next succeeding buckets.

The material is fed into the chimney through a hopper 12, which is provided with a regulating-slide 13 and a rotary agitator 14, which regulates the passage of material to the initial set of buckets. The chimney is provided with concave shields 16 and 17, which conform in curvature substantially with the margins of the disk 7, and extend around the buckets to a sufficient extent to form a turnstile-trap through which the ore is carried without permitting the escape of smoke and gases. After passing the flues 2 the material is delivered through another

gate formed by shields 18 and 19, when it is conveyed by similar buckets through a lower chamber of the chimney and delivered to the exterior through an inclined slide 20.

5 The section of the chimney below the shields 18 and 19 constitutes a cooling-chamber, near the base of which air is admitted through an aperture 22 and drawn off through a suction-pipe 23 by means of a suction-fan 24, which delivers the air to a settling-chamber 25, the latter being made sufficiently large to allow the dust to settle. Baffle-boards 26 may, if desired, be provided in the chamber 25 to break up the air-currents and facilitate settling the dust. The chamber 25 discharges through a duct 28 into a pipe 29, by means of which the air may be passed through a damper at 30 into the ash-pit of the furnace 1 or through a branch 31 into the roasting-section of the chimney or through the damper 34 into the stack 4. The branch pipe 31 is provided with a damper 32. This damper is opened and the other dampers are closed when an additional supply of oxygen is desired for the roasting ore. As the air thus introduced has been heated by the ore in the cooling-section of the chimney, it is obvious that the oxygen will readily act upon the ore in the roasting-section.

The fan and also the buckets are actuated from any suitable source of power. To operate the buckets, the bucket-shafts 5 are extended through the wall of the chimney on one side and are provided with sprocket-wheels 38, as best illustrated in Fig. 5. A driving sprocket-chain 39 is passed between the respective sprocket-wheels of the series, whereby they are driven alternately in opposite directions. On the return side the chain is passed over end sprockets 40 and 41. The agitator 14 is driven from the shaft of the sprocket-wheel 40 by another sprocket chain or belt 43.

45 Referring to Fig. 1, it will be observed that one of the walls of the chimney is provided with a series of tubes 45, each of which is normally closed by a cap 46, which may be removed when it is desired to inspect the roasting operation within the chimney. Referring to Fig. 6, it will be observed that one of the walls is arranged with an inner brick wall 50 and an outer metallic wall 51, separated by an intervening air-space. The latter provides bearings for the shafts 5 and is made in removable sections. When it is desired to remove or repair any one of the buckets or bucket-shafts, the corresponding section of the outer wall is removed, whereupon the bricks may be torn out of the inner wall to a sufficient extent to permit the removal of such buckets and bucket-shaft. Each of the walls of the chimney may be constructed in this manner, if desired. It will

also be observed that the outer wall-sections 65 (which are of metal) are provided with boxes 54, into which the bucket-shafts extend. Antifriction-rollers 55, journaled in these boxes, support the shafts and avoid the necessity of lubrication.

While we have described the buckets as being located in a chimney, it will of course be understood that any suitable chambers may be provided and, if desired, separate chambers may be used for roasting and for cooling the ore.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith, and a series of shafts arranged one above another in said chamber; each of said shafts being provided with imperforate wing-flanges arranged to form a set of buckets closed at the sides and adapted to successively receive and discharge material from the buckets of the next higher shaft.

2. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith, supporting rotary shafts arranged at different levels in said chamber; and each provided with tilting buckets closed at the sides and ends and adapted to successively receive and retain substantially all the material from the buckets of the next higher shaft for a definite interval; and means for rotating said shafts.

3. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets having imperforate side and end walls and adapted to successively receive material from the buckets of the next higher shaft; and means for rotating said shafts; each alternate shaft being rotated in a direction opposite that of the intermediate shafts; and said buckets being arranged and adapted to receive and discharge material intermittently.

4. In apparatus of the described class, the combination of an ore-heating chamber; a furnace having flues leading thereto; a series of rotary shafts arranged in zigzag order from the upper to the lower portion of said chamber; means for rotating the shafts; buckets on the shafts, each comprising end disks mounted on the shafts and provided with wing-flanges between them, extending radially from the shaft and adapted to receive and dump the material from one shaft to another at different intervals; and inwardly-projecting baffles on the side walls of said chamber adapted to direct material into the buckets; said shaft-rotating mechanism

being adapted to actuate the alternate shafts in a direction opposite that of the intermediate ones.

5. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets adapted to successively receive material from the buckets of the next higher shaft; and means for rotating said shafts; together with an ore-cooling chamber provided with similar shafts and buckets; and means for drawing air through said chamber.

6. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets adapted to successively receive material from the buckets of the next higher shaft; and means for rotating said shafts; together with an ore-cooling chamber provided with similar shafts and buckets; and means for drawing air through said chamber in a direction opposite that of the movement of the material.

7. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets adapted to successively receive material from the buckets of the next higher shaft; and means for rotating said shaft; together with an ore-cooling chamber provided with similar shafts and buckets; means for drawing air through said chamber; and a turnstile-gate for passing material from one chamber to the other.

8. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets adapted to successively receive material from the buckets of the next higher shafts; means for rotating said shafts and buckets; a cooling-chamber means for drawing air through said chamber; a settling-chamber for receiving the air from the cooling-chamber; and a vent therefor adapted to permit the delivery of air to the heating-chamber.

9. In apparatus of the described class, the combination with a furnace, of an ore-heating chamber connected therewith; supporting rotary shafts arranged at different levels in said chamber, and each provided with tilting buckets adapted to successively receive material from the buckets of the next higher shafts; means for rotating said shafts and buckets; a cooling-chamber means for drawing air through said chamber; and means for

delivering said air either to the furnace, the heating-chamber, or to a vent-stack connected therewith.

10. In apparatus of the described class, an ore-heating chamber provided with tilting buckets arranged to form a conveyer for material to be roasted, and each adapted to retain substantially all the material from the preceding bucket for a definite interval and a series of sight-tubes communicating with said chamber and provided with suitable caps.

11. In apparatus of the described class, an ore-heating chamber provided with a series of cross-shafts and buckets mounted thereon; and a separate outer wall for said chamber, formed in removable sections provided with antifriction-bearings for the cross-shafts.

12. In apparatus of the described class, the combination with an ore-heating chamber, of a series of rotary shafts therein, provided with bucket-flanges and end disks forming buckets closed at the sides and ends; each shaft and its flanges being arranged to rotate with sufficient lead over that of the next shaft and bucket-flanges to facilitate the delivery of material from one bucket to the other.

13. In apparatus of the described class, a shaft having radial bucket-flanges; and end disks, provided with fillets projecting into the buckets and increasing in thickness in the direction of shaft rotation.

14. In apparatus of the described class, the combination of an ore-heating chamber; a furnace having flues leading thereto; a series of rotary shafts arranged in zigzag order from the upper to the lower portion of said chamber; means for rotating the shafts; end disks on each shaft; and flanges projecting outwardly from each shaft between the end disks thereon and forming with the disks a set of buckets, each adapted to receive material from a bucket on the preceding shaft.

15. In an ore roasting and treating apparatus, the combination with a furnace, a heating-chamber, and a cooling-chamber; of a dust-collector; means for passing air from the cooling-chamber through the dust-collector; and valved discharge connections leading from the dust-collector to the heating-chamber.

16. In an ore roasting and treating apparatus, the combination with a furnace, a heating-chamber, and a cooling-chamber; of a dust-collector; means for passing air from the cooling-chamber through the dust-collector; and valved discharge connections leading from the dust-collector to the heating-chamber; together with means for also utilizing such heated air to increase the draft of the furnace.

17. In an ore roasting and treating apparatus, the combination with a furnace and a

heating-chamber, of a cooling-chamber;
means for passing air through the cooling-
chamber; and valved connections for utiliz-
ing the heated air from the cooling-chamber
5 either to increase the supply in said heating-
chamber or to increase the draft of the fur-
nace.

In testimony whereof we affix our signa-
tures in the presence of two witnesses.

MYRON DINGS.
ALVIN DINGS.

Witnesses:

JAS. B. ERWIN,
NELLYE TAUGHER.