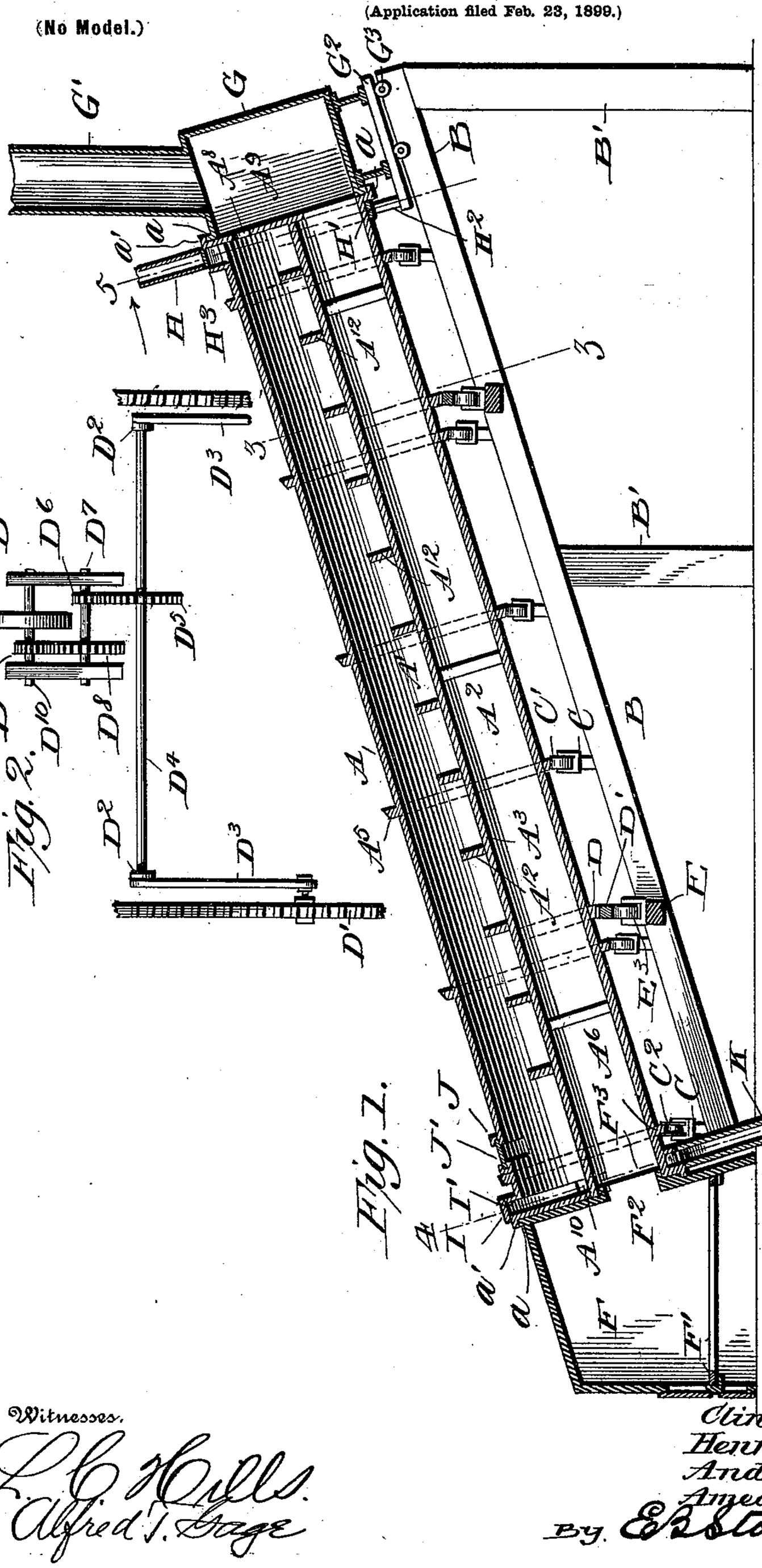
No. 635,418. Patented Oct. 24, 1899.

C. D. BOUTON, H. H. GREEN, A. D. ROSS & A. A. CHAINEY.

ORE ROASTER.

(Application filed Feb. 23, 1899.)

(No Model.) 2 Sheets—Sheet 1.



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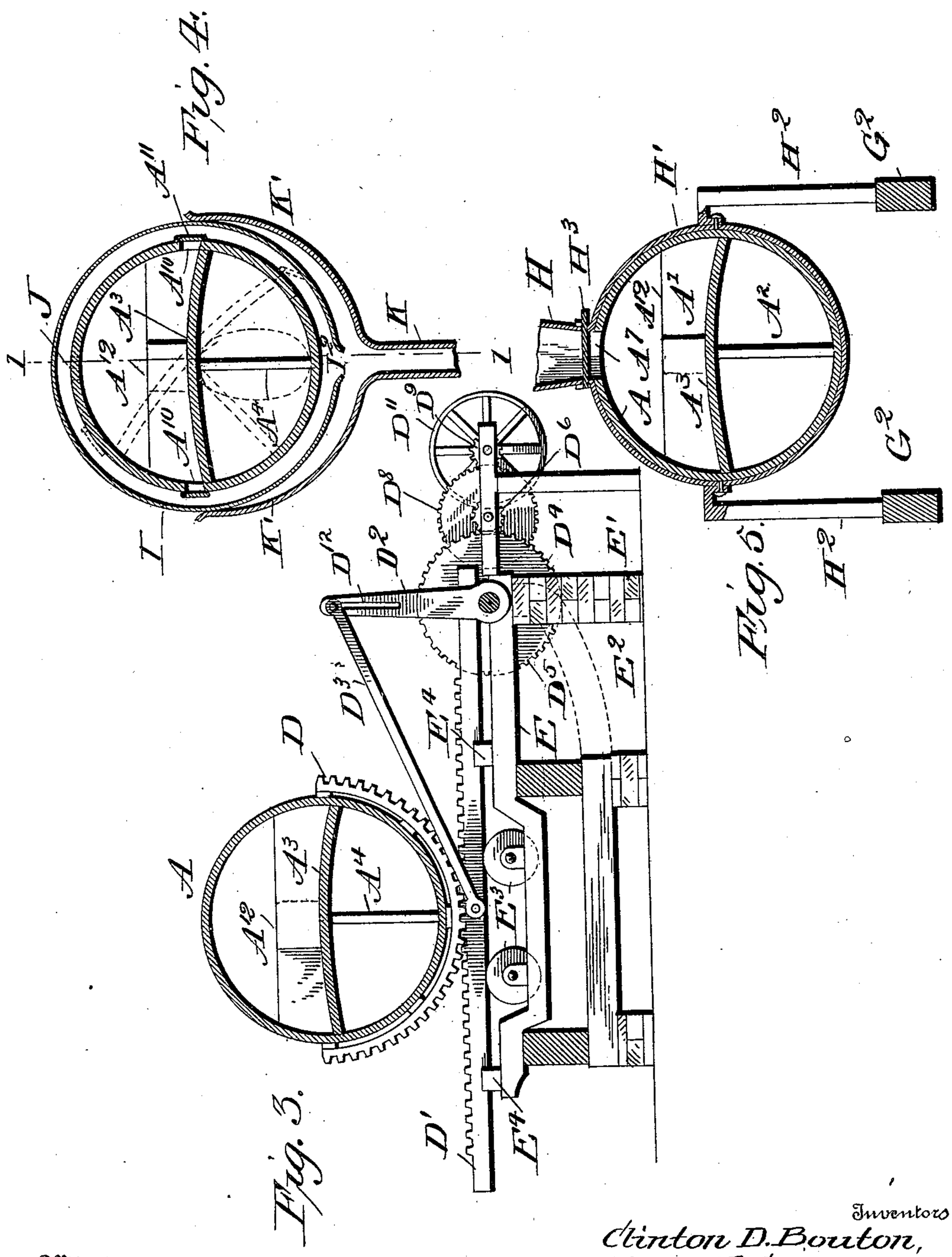

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UNITED STATES PATENT OFFICE.

CLINTON D. BOUTON, OF ITHACA, NEW YORK, AND HENRY H. GREEN, ANDREW D. ROSS, AND AMEDE A. CHAINEY, OF SUNSHINE, COLORADO.

ORE-ROASTER.

SPECIFICATION forming part of Letters Patent No. 635,418, dated October 24, 1899.

Application filed February 23, 1899. Serial No. 706,619. (No model.)

To all whom it may concern:

Be it known that we, CLINTON D. BOUTON, of Ithaca, Tompkins county, State of New York, and HENRY H. GREEN, ANDREW D. ROSS, and AMEDE A. CHAINEY, residing at Sunshine, in the county of Boulder, State of Colorado, citizens of the United States, have invented certain new and useful Improvements in Ore-Roasters, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to ore-roasters, and particularly to a roaster in which the feed of the ore is produced by the oscillatory action of the roaster.

The invention has for its object to produce improved means for supporting the roasting barrel or cylinder against an endwise movement and for imparting to the same an oscillatory movement.

It has a further object to improve the details of the feeding and delivery mechanism in order to secure the most advantageous handling of the material possible.

A further object is to provide for the longitudinal expansion of the roasting-barrel, so as to prevent any injury to the same or adjacent parts by reason of expansion when the barrel becomes highly heated.

Other objects and advantages of the invention will hereinafter appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical longitudinal section through the roaster on line 1 1 of Fig. 4. Fig. 2 is a detail plan view of the mechanism for producing an oscillatory movement of the roasting-barrel. Fig. 3 is a cross-section illustrating the oscillatory mechanism on the line 3 3 of Fig. 1. Fig. 4 is a vertical cross-section through the delivery portion of the barrel on the line 4 4 of Fig. 1, and Fig. 5 is a similar view at the feeding end of the barrel on the line 5 5 of Fig. 1.

Like letters of reference indicate like parts throughout the several figures of the drawings.

The letter A designates a roasting barrel or cylinder, which may be of any desired construction and lined with fire-brick or other heat-resisting material, said barrel being divided into a roasting-compartment A′ and a heating-flue A^2 by means of a longitudinal partition A^3. This partition is substantially horizontal in position and may be supported by any suitable means—for instance, posts or standards A^4 beneath the same. The particular construction of this barrel and the arrangement of the passages or chambers therein are not essential to the objects of this invention, and the same may be varied in the uses of the roaster. The barrel A is supported in any suitable manner—for instance, upon beams B, maintained in an inclined position by means of vertical standards or piers B′, upon which are mounted suitable journal-boxes C, carrying supporting-rollers C′, upon which rest and travel peripheral tracks or ways A^5, having a beveled face to insure contact in a horizontal line with the supporting-roller C′, and thus carry the weight of the barrel or cylinder which is movable upon a series of these supporting rollers and tracks.

For the purpose of imparting an oscillatory motion to the barrel or cylinder A a segmental rack-gear D is provided and adapted to mesh with a reciprocating rack-bar D′, to which motion is transmitted from a crank-arm D^2 by means of an intermediate link or pitman D^3. The crank-arm D^2 is mounted upon and rotated by a driving-shaft D^4, suitably supported at one side of the barrel upon an extending frame E, the outer end of which may rest upon a pier E′ and be supported by means of a truss-beam E^2, as shown in Fig. 3. The frame E may also be used to support suitable bearing-rollers E^3, upon which the rack-bar D′ may rest, said bar being guided in its movement by means of lugs E^4 at opposite sides thereof. The crank-arm D^2 may be provided with a suitable slot D^{12}, within which one end of the pitman D^3 can be adjusted to vary the length or extent of movement imparted to the rack-bar D′, and thus regulate or limit the degree of oscillation imparted to the barrel. The driving-shaft D^4 is provided at opposite ends with similar crank-arms, so as to impart motion to the barrel at opposite sides of the longitudinal center thereof, and thus apply the power

thereto in such manner as to prevent any strain upon the parts, as would be the case where the oscillating power is applied at a single point. The driving-shaft D^4 may be actuated by any suitable means—for instance, a pinion or gear D^5 thereon may mesh with a similar gear D^6, supported upon a shaft D^7, located upon any adjacent fixed part, said shaft also carrying a gear D^8, meshing with a gear D^9 upon a shaft D^{10}, which is driven by means of a belt frictionally engaging the pulley D^{11}, located thereon. This structure of oscillating gears causes the barrel to start slowly and gradually gain in speed and then slow down as it reaches the limit of its oscillation, thus causing no jar at the moment when the direction of oscillation is changed, which is substantially at the time when the crank-arm and pitman have rotated to a dead-center. This obviates the jar and strain upon the machine caused by quickly starting and stopping and produces a smooth continuous oscillation of the barrel, found particularly desirable in producing a feed of the ore through the roasting-chamber.

The barrel is provided at its lower end with a fire-box F, which is preferably stationarily located and provided with horizontally-disposed grate-bars F′ and with a flanged opening F^2, communicating with the heat-flue A^2 of the barrel or cylinder. (See Fig. 1 and dotted lines on Fig. 4.) The upper end of the cylinder is provided with a suitable smoke-box G, having an escape-stack G′, and mounted upon a truck G^2, adapted to reciprocate upon rollers G^3, carried upon the supporting-beam B. This structure permits a longitudinal expansion of the barrel without danger of buckling or breaking any of the joints thereof, as the truck will move freely upon its supporting-rollers and the several supporting-rollers for the barrel likewise permit a longitudinal movement without interfering with their action. The lower end of the beam B is provided with a grooved or flanged roll C^2, mounted in a box C and adapted to engage a coöperating flange A^6. This flange and roller are particularly intended to prevent the end thrust of the barrel against the fire-box F and are located in such position as to most effectually support the barrel and restrain any thrusting action thereof incident to weight or other causes.

The fire-box F and smoke-box G are supported against rotation, while the rotatable cylinder or barrel A is closely fitted in relation to these parts by any suitable means—for instance, a ring *a* upon the ends of both the fire and smoke boxes and an overlapping annular flange *a*′, provided at each end of the barrel A. The fire-box is also provided with a flange F^3, extending into the fire-flue A^2 of the barrel. These flanges are made of such an extent as to permit the expansion of the several parts without disconnecting the same, so as to permit the escape of heat or products of combustion.

The barrel is fed from a hopper H, supported above the barrel by means of a circumferential band H′, within which the barrel A oscillates. This band H′ is held against rotation by supports H^2, resting upon the movable truck G^2, as shown in Fig. 1. A slide H^3 is provided at the lower portion of the hopper by which the feed of ore may be controlled or entirely cut off. It will be seen that as the feed-opening A^7 of the barrel passes beneath the hopper H a charge of ore will be admitted into the roasting-chamber, and in the continued oscillation of the barrel the opening A^7 passes beneath the band H′, and thus prevents the escape of sulfur or other gases from the ore through the hopper, which would be both obnoxious and dangerous in a roaster of this character. The continued and automatic oscillation of the barrel successively feeds charges of ore to the roasting-chamber, so that the same is gradually fed downward without choking the chamber and the operation rendered automatic. The escape of the sulfur and other gases is permitted by a series of openings A^8 in the end wall A^9 of the roasting-chamber, so that the gases pass into the smoke-box and are drawn from the chamber by the draft through the smoke box and stack, so as to be partially or wholly consumed by the products of combustion. The ore when it reaches the lower end of the barrel in its roasted condition is delivered through openings A^{10} at opposite sides of the barrel and discharged within a casing I. These openings may, if found desirable, be closed by pivoted doors A^{11}, which will be opened by the weight of the ore and automatically closed by gravity when the barrel is oscillated to shift the ore to the opposite side, as shown by dotted lines in Fig. 4. An air-inlet J is also provided at the lower end of the roasting-chamber and controlled by a slide J′ to admit the necessary amount of air to oxidize the ore and carry the gases liberated therefrom to the opposite end of the chamber and into the stack. The casing I, into which the ore is discharged, is rotated with the barrel and supported by means of a rib I′ to allow space for the opening of the doors and passage of the ore. The lower portion of this casing is provided with a discharge-opening I^2, through which the ore is discharged into a suitable chute or hopper K to a place of storage, said hopper being stationarily supported and provided with upward extensions K′, extending peripherally of the casing I. This structure permits the constant discharge of the ore without danger of a draft or undue quantity of air entering the roasting-chamber through the discharge-openings, which will be liable to occur when said openings communicate with the atmosphere.

From the foregoing description it will be obvious that the ore will be introduced at the upper end of the barrel and gradually fed downward therein by means of suitable re-

tarding devices—such, for instance, as alternately-disposed partitions A^{12}—until it reaches the lower end of the barrel, where it is discharged in the manner hereinbefore described. The roasting-chamber is maintained in a heated condition by the products of combustion passing through the flue A^2 beneath the same, which in their passage create a draft to draw the gases liberated from the ore from the roasting-chamber and into the discharge-stack. It will be seen that the location of the fire-box with substantially level grate-bars maintains the fuel always in a proper position within the box, while the supporting-rollers hold the barrel against endwise movement and sustain the weight thereof at a number of points to prevent binding against the actuating mechanism or against the end of the fire-box to which it is connected. The structure presented also permits expansion of parts without affecting their relative connection or causing buckling or breaking of the barrel, while the arrangement of the feed-hopper and discharge-opening is such that these parts are not affected by the heat or products of combustion used in roasting, which will warp and destroy metallic parts with which they come into contact. Furthermore, the driving mechanism is such as to produce the most desirable and smooth oscillation of the barrel with the minimum expenditure of power and with the best results in the feeding and roasting of the ore.

It is obvious that changes may be made in the details of construction and configuration of the several parts without departing from the spirit of this invention as defined by the appended claims.

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

1. In an ore-roaster, the combination with an inclined roasting-chamber having a feed-aperture therein, of a stationary box at one end thereof, a smoke-box at the opposite end, a movably-mounted truck beneath said smoke-box, bearings for said chamber adapted to permit a longitudinal movement of the chamber upon the bearings, means for oscillating said chamber, and a feed-hopper carried by an apertured band surrounding said barrel and supported from said truck whereby said hopper is arranged to register with the feed-aperture in said chamber; substantially as specified.

2. In an ore-roaster, the combination with an inclined barrel having a feed-aperture in its upper portion, a stationary apertured band surrounding said barrel, a feed-hopper carried by said band and arranged to intermittently communicate with said feed-aperture in the movement of the barrel, and means for oscillating said barrel; substantially as specified.

3. In an ore-roaster, the combination with an inclined barrel having a feed-aperture, a stationary apertured band surrounding said barrel, a feed-hopper carried by said band and arranged to communicate with said feed-aperture in the movement of the barrel, a truck movable longitudinally of said barrel, means for supporting said band from said truck, and means for oscillating said barrel; substantially as specified.

4. In an ore-roaster, the combination with an inclined barrel having discharge-openings at opposite sides thereof, of a casing surrounding said barrel to receive the material discharged from said openings, means for oscillating said barrel, and doors pivotally mounted at the upper edge of said discharge-openings so as to alternately open and close by gravity in the oscillations of the barrel; substantially as specified.

5. In an ore-roaster, the combination with an inclined barrel having discharge-openings at opposite sides, and means for oscillating said barrel, of a casing having a discharge-opening and surrounding said barrel to receive the material discharged from said openings, doors pivotally mounted at the upper edge of said discharge-openings to be alternately opened and closed by gravity, and a discharge-chute communicating with said opening in said casing; substantially as specified.

6. In an ore-roaster, the combination of an inclined roasting-barrel provided at its lower portion with discharge-openings upon opposite sides, means for oscillating said barrel, a casing surrounding said openings and provided at its lower portion with a discharge-opening, and a stationary chute surrounding the lower portion of said oscillated barrel and casing; substantially as specified.

7. In an ore-roaster, the combination of a roasting-cylinder mounted for oscillation, a segmental gear thereon, a horizontally-disposed rack-bar meshing with said gear, a rotatable crank-arm, and a pitman pivotally connected to said bar and crank-arm; substantially as specified.

8. In an ore-roaster, the combination of a roasting-cylinder mounted for oscillation, a segmental gear thereon, a horizontally-disposed rack-bar meshing with said gear, a rotatable crank-arm, a pitman pivotally connected to said bar and crank-arm, and roller-bearings for supporting said rack-bar; substantially as specified.

9. In an ore-roaster, the combination of a roasting-cylinder mounted for oscillation, a segmental gear thereon, a horizontally-disposed rack-bar meshing with said gear, a rotatable crank-arm, a shaft for said arm, a pitman pivotally connected to said bar and crank-arm, roller-bearings for supporting said rack-bar, and a frame extending to one side of said barrel to support the shaft of said crank-arm; substantially as specified.

10. In an ore-roaster, the combination of a roasting-barrel mounted for oscillation, segmental gears carried by said barrel, rack-bars located beneath said gears, a driving-shaft carrying at opposite ends crank-arms and con-

nections between said crank-arms and rack-bars; substantially as specified.

11. In an ore-roaster, the combination of a roasting-barrel mounted for oscillation, a segmental gear carried thereby, a rack-bar in mesh with said gear, a driving-shaft provided with a pinion, a slotted crank-arm upon said shaft, and a pitman adjustably mounted in the slot of said arm and pivoted at its opposite end to said rack-bar; substantially as specified.

12. In an ore-roaster, the combination with a barrel mounted for oscillation and having an inlet-opening, fire and smoke boxes at opposite ends thereof, a stationary feed-hopper having a band surrounding said barrel and communicating with the inlet, discharge-openings at opposite sides of said barrel communicating with a discharge-chute, means for supporting said barrel, a gear on said barrel, a rack-bar, a crank-arm, and a pitman connecting said bar and arm; substantially as specified.

13. In an ore-roaster, the combination with a barrel mounted for oscillation and having an inlet-opening, fire and smoke boxes at opposite ends thereof, a stationary feed-hopper having a band surrounding said barrel and communicating with the inlet, discharge-openings at opposite sides of said barrel communicating with a discharge-chute, tracks or flanges on said barrel, supporting-rollers upon which said tracks travel, a gear on said barrel, a rack-bar, a crank-arm, and a pitman connecting said bar and arm; substantially as specified.

14. In an ore-roaster, the combination with a barrel mounted for oscillation and having an inlet-opening, fire and smoke boxes at opposite ends thereof, a stationary feed-hopper having a band surrounding said barrel and communicating with the inlet, discharge-openings at opposite sides of said barrel communicating with a discharge-chute, tracks or flanges on said barrel, supporting-rollers upon which said tracks travel, segmental gears and rack-bar for oscillating said barrel, a crank-arm, and a pitman connecting said bar and arm; substantially as specified.

15. In an ore-roaster, the combination with a barrel mounted for oscillation and having an inlet-opening, fire and smoke boxes at opposite ends thereof, a stationary feed-hopper having a band surrounding said barrel and communicating with the inlet, discharge-openings at opposite sides of said barrel communicating with a discharge-chute, tracks or flanges on said barrel, supporting-rollers upon which said tracks travel, segmental gears and rack-bars driven by crank-arms for oscillating said barrel, and a longitudinally-movable truck beneath said smoke-box supporting said feed-hopper and band; substantially as specified.

16. In an ore-roaster, the combination with a barrel mounted for oscillation and having an inlet-opening, fire and smoke boxes at opposite ends thereof, a stationary feed-hopper having a band surrounding said barrel and communicating with the inlet, discharge-openings at opposite sides of said barrel communicating with a discharge-chute, tracks or flanges on said barrel, supporting-rollers upon which said tracks travel, segmental gears and rack-bars driven by crank-arms for oscillating said barrel, a longitudinally-movable truck beneath said smoke-box supporting said feed-hopper and band, and flanges upon opposite ends of said barrel overlapping an end of said fire and smoke boxes to provide an expansible connection; substantially as specified.

17. In an ore-roaster, the combination with fire and smoke boxes, of an inclined barrel connecting the same and provided with a roasting and a heating chamber, said heating-chamber communicating with both the fire and smoke boxes and said roasting-chamber having a gas-outlet into said smoke-box, feed and discharge devices communicating with said roasting-chamber, and means for supporting said barrel, a gear on said barrel, a rack-bar, a crank-arm, and a pitman connecting said bar and arm; substantially as specified.

In testimony whereof we affix our signatures in presence of witnesses.

CLINTON D. BOUTON.
HENRY H. GREEN.
ANDREW D. ROSS.
AMEDE A. CHAINEY.

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