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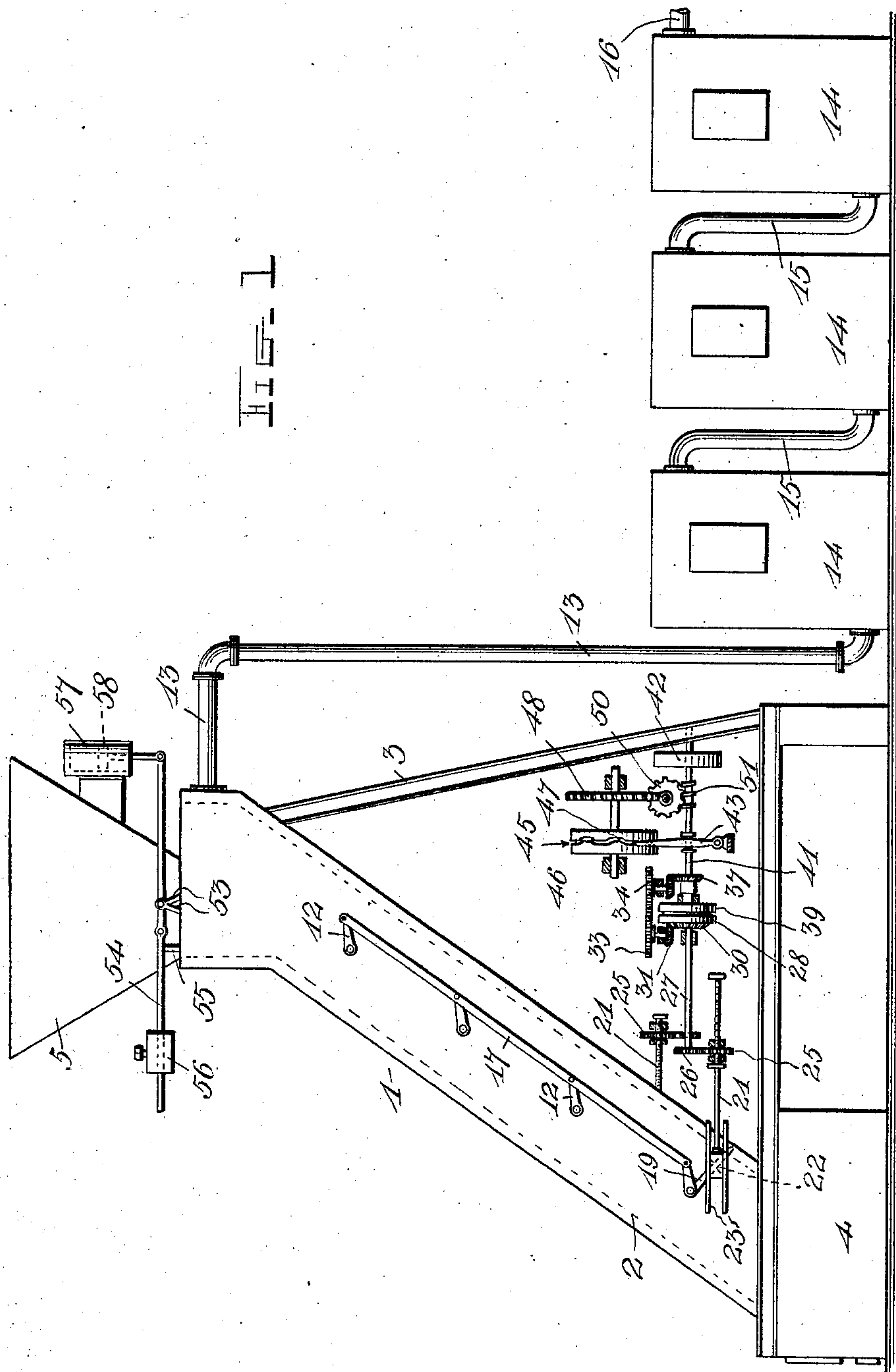
PATENTED FEB. 26, 1907.

C. F. BURGESS.

FURNACE FOR REDUCING CINNABAR ORE.

APPLICATION FILED SEPT. 5, 1905. RENEWED FEB. 4, 1907.

4 SHEETS—SHEET 1.



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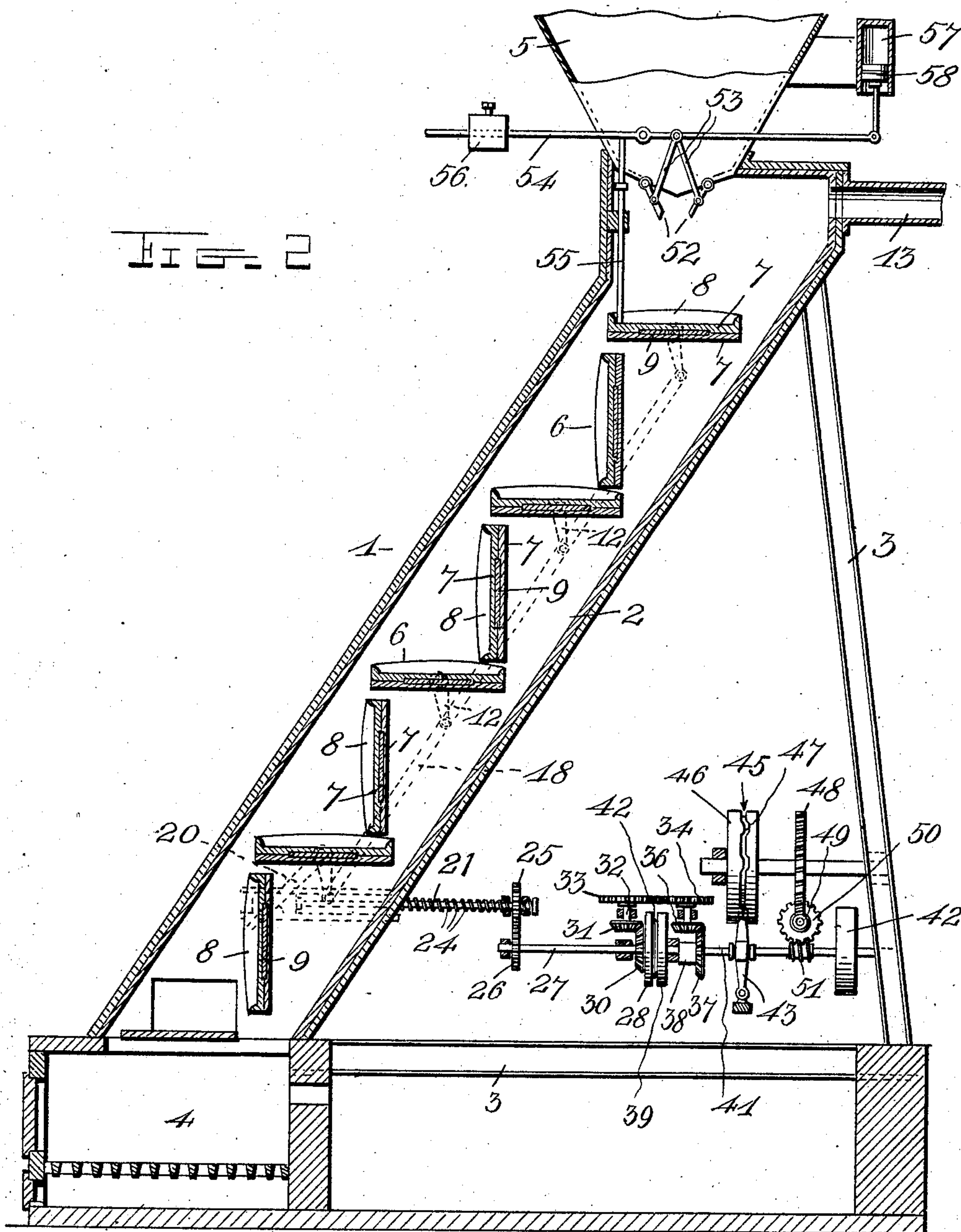
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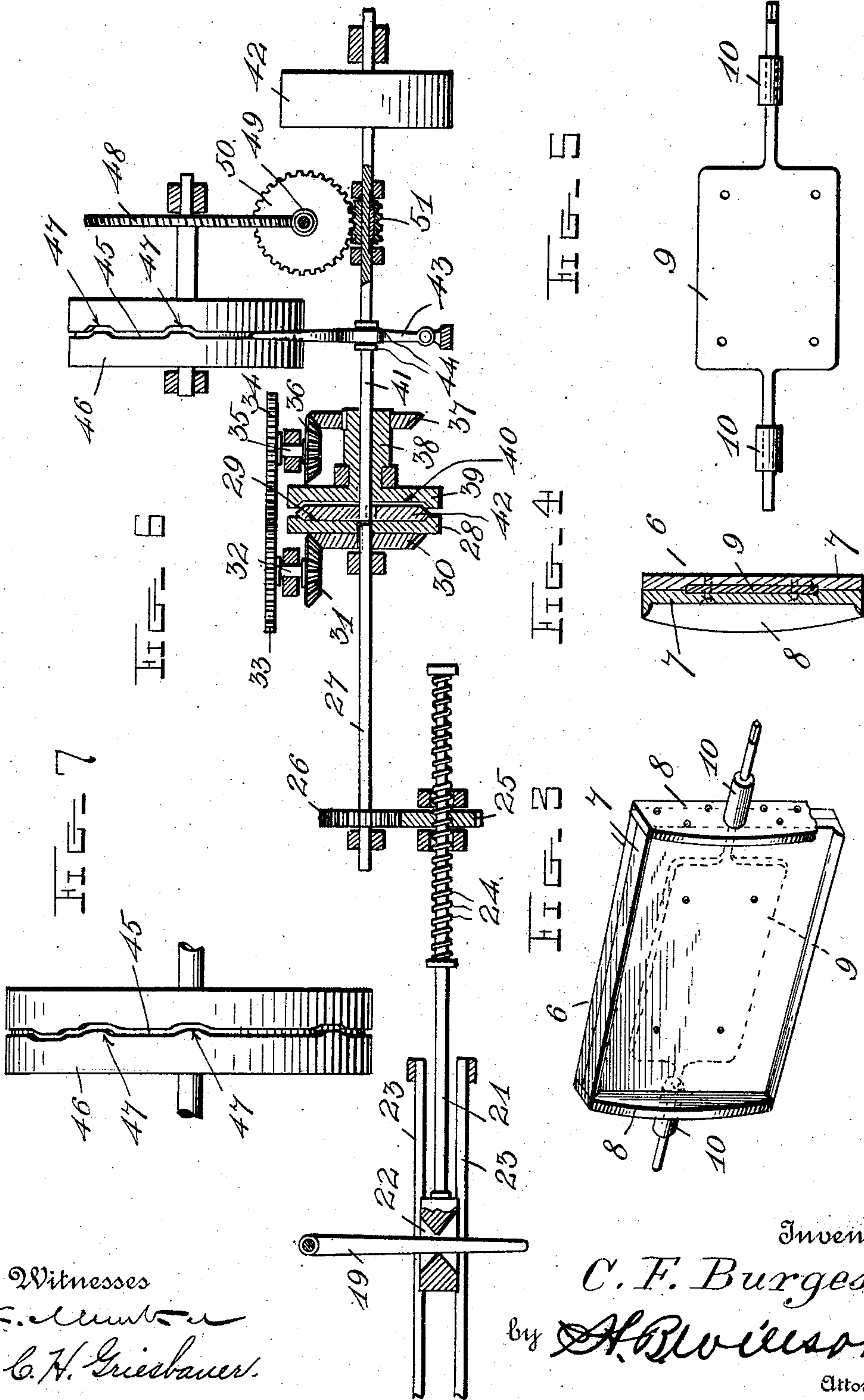
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4 SHEETS—SHEET 3.



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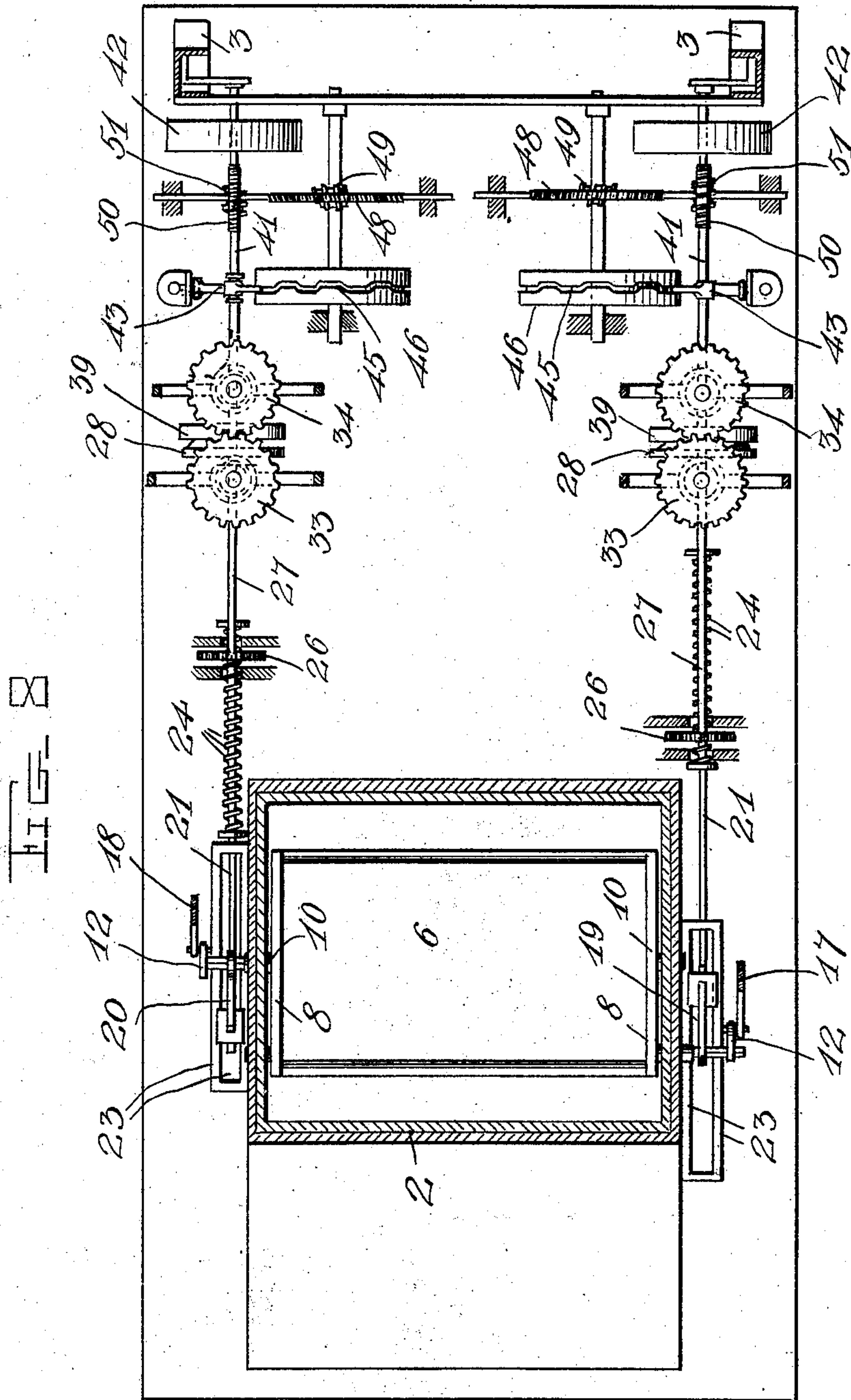
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FURNACE FOR REDUCING CINNABAR ORE.

APPLICATION FILED SEPT. 6, 1905. RENEWED FEB. 4, 1907.

4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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FURNACE FOR REDUCING CINNABAR ORE.

No. 845,690.

Specification of Letters Patent.

Patented Feb. 26, 1907.

Application filed September 5, 1905. Renewed February 4, 1907. Serial No. 355,725.

To all whom it may concern:

Be it known that I, CHARLES F. BURGESS, a citizen of the United States, residing at Yreka, in the county of Siskiyou and State of California, have invented certain new and useful Improvements in Furnaces for Reducing Cinnabar Ore; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in furnaces for reducing cinnabar ore.

The object of the invention is to provide a furnace and reducing apparatus for treating cinnabar ore for the production of quick-silver.

Another object is to provide means whereby the ore deposited into the heating-chamber of the apparatus may be kept in continued motion during the reducing process.

A further object is to provide means whereby the fumes and gases will be drawn out of the heating-chamber and means for condensing said fumes and gases.

With the above and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of the reducing-furnace and condensing apparatus. Fig. 2 is a vertical sectional view of the reducing-chamber. Fig. 3 is a perspective view of one of the ore-receiving leaves removed from the furnace. Fig. 4 is a cross-sectional view of the same. Fig. 5 is a detail view of the inner plate of said leaves. Fig. 6 is an enlarged sectional view of the leaf-operating mechanism of one side of the furnace. Fig. 7 is a detail side view of the drum for automatically shifting the main drive-shaft; and Fig. 8 is a horizontal section of the machine, showing the leaf-operating mechanism in plan.

Referring more particularly to the drawings, 1 denotes the heating apparatus, which consists of an inclined chute 2, which is suitably supported in a frame 3. At the lower end of the chute 2 is arranged a heating-furnace 4. At the upper end of the chute 2 is arranged a feed-hopper 5, said hopper being provided with means whereby the same is automatically opened and closed to dis-

charge the ore therefrom at proper intervals, said discharging mechanism being hereinafter described.

Within the chute 2 is revolubly mounted a series of ore-receiving leaves 6, said leaves being arranged one above the other, as shown. The leaves 6 are each preferably constructed of a pair of rectangularly-shaped soapstone plates 7, which are suitably connected together at their ends by end plates 8 and between which is arranged a flat metal plate 9. The ends of this plate 9 have formed thereon laterally-projecting trunnions 10, which project through the sides of the chute 3, whereby said leaves are revolubly mounted in the chute. To the trunnions 10, on one end of each of the plates 9, is connected a short crank-arm 12, with which is adapted to be connected suitable mechanism for revolving said leaves.

Connected to the upper end of the chute is a suction-pipe 13, the lower end of which connects with a series of condensing-tanks 14, of which there may be any suitable number. Said tanks are connected by pipes 15, which extend from the upper portion of one tank to the lower portion of the next adjacent tank, whereby the overflow from one of said tanks will be conveyed to the next, and so on throughout the series. To the last condenser is connected a suction-pipe 16, which leads to a suitable pumping mechanism, not shown, but by means of which the fumes and gases will be drawn out of the heating-chamber and through the condensing-tanks, thereby condensing and retaining the entire product of the reduced ores.

In order that the leaves 6 may be tilted to discharge the ore deposited thereon at the proper time, a suitable mechanism is provided, said mechanism consisting of connecting-bars 17 and 18. The bar 17 is adapted to connect the ends of the crank-arms 12 of every other leaf on one side of the chute or heating-chamber, and the connecting-rod 18 is adapted to connect the crank-arms of the intermediate leaves on the opposite side of the chute or heating-chamber. Connected to the shaft or trunnion of the lowermost leaf on one side of the chute or heating-chamber is an operating-lever 19, a similar lever being connected to the trunnion of the leaf next above the lower leaf and on the opposite side of the heating-chamber, as shown. When

the lever 19 is operated to tilt the lower leaf, every second leaf above the same will be simultaneously tilted by means of the connecting rod or bar 17, and in a similar manner by the operation of the lever 20 in turning the leaf above the lower leaf each intermediate leaf will be tilted by means of the connecting-rod 18.

To operate the levers 19 and 20, suitable driving mechanism is provided, said mechanism being the same for each of the levers 19 and 20, and a description of that on one side of the machine will be sufficient. The driving mechanism consists of a reciprocating bar 21, on the outer end of which is formed an elongated opening or passage 22, through which the operating-lever 19 is adapted to pass, a similar operating-bar being provided on the opposite side of the chute or heating-chamber to receive the operating-lever 20. The slotted or apertured end of the reciprocating bar 21 is slidably mounted in suitable guides 23. On the opposite end of the reciprocating bar 21 is formed a series of coarse screw-threads 24, and on said threaded end is mounted a spur-gear pinion 25, said pinion being arranged between suitable guides or stop-bars, as shown, and provided with interior screw-threads adapted to engage the threads 24 on the bar 21. Engaging the pinion 25 is a similar pinion 26, fixed on the end of a suitably-mounted shaft 27, said shaft having fixed on its opposite end a friction-disk 28, in the outer face of which is formed an annular recess 29. Also mounted on the shaft 27 is a beveled-gear pinion 30, which meshes with a similar pinion 31, fixed on the lower end of a vertically-mounted shaft 32, on the upper end of which is fixedly mounted a horizontally-disposed spur-gear 33. The gear 33 is engaged with a similar gear 34, fixedly mounted on the upper end of a vertically-disposed shaft 35, on the lower end of which is fixed a beveled-gear pinion 36. Said pinion 36 is engaged with a beveled-gear pinion 37, which is fixedly mounted upon a sleeve 38, on the opposite end of which is secured a friction-disk 39, said disk being provided on its outer face with an annular recess 40.

The sleeve 38 is loosely mounted upon a main drive-shaft 41, on one end of which is fixed a friction-disk disposed between the recessed faces of the friction-disks 28 and 39, with one or the other of which said disk 42 is adapted to be engaged and by which one or the other of said disks 28 or 39 is driven. The motion of said disks is imparted to the shaft 27 through the gearing hereinbefore described to drive said shaft in one direction or the other, the motion of said shaft being imparted to the interiorly-threaded gear 25 through the gear 26. By thus revolving the threaded gear 25 in one direction or the other on the threaded end of the rod or bar 21 said

bar will be moved in one direction or the other, as will be understood. The main drive-shaft 41 may be operated in any suitable manner, but is here shown as provided with drive-pulleys 42, one upon each side of the machine, as shown in Fig. 8. The construction of the parts being the same on each side, only one will be described. In order that the intermediate friction-disk may be automatically shifted into frictional engagement with the disk 28 or 39 to operate the reciprocating bar 21 and tilt the leaves 6 at the proper time, a shifting-lever 43 is connected with said main drive-shaft. The lever 44 is pivotally mounted at its lower end and is loosely engaged with the shaft 41 between collars 44 on said shaft, the upper ends of said lever being adapted to project into and to engage a groove or channel 45, formed in the periphery of a suitably-mounted operating-drum 46. Said groove or channel 45 is provided with offsets or irregular courses 37, whereby when the drum revolves the upper end of the levers 43, arranged on opposite sides of the drum 46, will be swung in one direction or the other, thereby shifting the main drive-shafts 41 to cause the friction-disk thereon to engage one or the other of the friction-disks 28 and 39, as hereinbefore described. The arrangement of the offset portions of the groove or channel 45 in the drum 46 is such that the lever 43 will be operated at the proper time and moved in the proper direction. Fixedly mounted on the shaft of the drum 46 is a worm-gear 48, adapted to mesh with a worm 49, with which is connected a worm-gear 50. Said gear 50 is engaged by a worm 51 on the main drive-shaft 41, whereby the motion from said shaft 41 is imparted to the drum 46, said motion being reduced to the proper speed through the worm-gears hereinbefore described, so that the movement of the drum is properly regulated to cause the operating mechanism of the leaves to be driven at the correct speed. The worm 51 is keyed to the main drive-shaft 41 to permit said shaft to be shifted by the lever 43, as hereinbefore described.

By the arrangement of the driving mechanism as herein shown and described the leaves 6 will first be tilted to a sufficient inclination to allow ore deposited thereon to gradually dump or slide off onto the next leaf below, after which the leaves are moved to a vertical position and then turned back to their original horizontal position. The arrangement of the operating mechanism is such that one set of leaves will be moved at a time, the alternate leaves or those on the other set remaining in a horizontal position to receive the ore from the leaves that are being actuated.

In order that the ore may be discharged from the hopper upon the uppermost leaf in suitable quantities and at the proper time,

said hopper is provided with obliquely-disposed hingedly-mounted trap-doors 52, said doors being provided with links 53, the upper ends of which are pivotally connected to an operating-lever 54, pivotally connected to one side of the hopper, as shown. Suitably arranged in the upper end of the heating-chamber is a slidably-mounted operating-rod 55, the upper end of which is in engagement with the operating-lever 54 and the lower end of which is adapted to be engaged by the uppermost leaf in the heating-chamber when the engagement of said leaf with the lower ends of the rod 55 will force said rod upwardly, thereby rocking the operating-lever 54 to cause the same through the links 53 to open the trap-doors 52, thus discharging the ore from the hopper onto said upper leaf, from which said ore is deposited on the leaves below through the operating mechanism hereinbefore described. As soon as the upper leaf is tilted, and thus disengaged from the lower end of the operating-rod 55, the lever 54 will be operated to close the trap-doors 52 by means of a counterweight 56, adjustably mounted on the end of said lever, as shown. In order to prevent the weight 56 from closing the trap-doors too suddenly, a retarding device or brake is provided. Said brake is here shown and is preferably in the form of a pneumatic check and consists of a cylinder 57, in which is arranged a plunger or piston 58, the rod of which is pivotally connected to the adjacent end of the operating-lever 54, as shown.

The chute forming the heating-chamber is preferably lined with pure asbestos, the walls of the same being four or more inches thick, which will afford a perfectly heat-tight compartment and will not be affected by the acids or fumes rising from the roasted ore. The draft through the heating-compartment is controlled by the pumping mechanism hereinbefore mentioned, which draws the fumes and gases through the condensers 14, thus insuring the saving of all the products. The draft in the chute 2 may be regulated by the speed of the pump.

While I have shown and described a furnace for producing heat for the reducing-chamber, the heat may be produced or supplied from any suitable source—such as gas, electricity, &c.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

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

1. In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said frame, said chute being lined with non-heat-conducting material, an intermittently-discharging hopper arranged at the upper end of said chute, a series of pivoted ore-receiving leaves arranged one above the other in said chute, means to tilt said leaves with an intermittent movement, and a heating-furnace arranged at the lower end of said chute, substantially as described.

2. In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said frame, said chute being lined with non-heat-conducting material, an intermittently-discharging hopper arranged at the upper end of said chute, a series of pivotally-mounted ore-receiving leaves arranged one above the other in said chute, means to alternately tilt said leaves with an intermittent movement, a heating-furnace arranged at the lower end of said chute, and means whereby the gas and fumes from the heated ore are drawn off and condensed, substantially as described.

3. In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said frame, said chute being lined with non-heat-conducting material, an intermittently-discharging hopper arranged at the upper end of said chute, a series of pivotally-mounted ore-receiving leaves arranged one above the other in said chute, means to alternately tilt said leaves with an intermittent movement, a heating-furnace arranged at the lower end of said chute, a suction-pipe connected with the upper end of the same, and condensers connected with said suction-pipe, substantially as described.

4. In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said frame, said chute being lined with non-heat-conducting material, an intermittently-discharging hopper arranged at the upper end of said chute, pivotally-mounted ore-receiving leaves arranged in said chute, means whereby said leaves are connected in series or sets, the leaves of one series alternating with those of the other, means whereby said sets or series of leaves are alternately tilted with an intermittent motion, a heating-furnace arranged in the lower end of said chute, and means whereby the gas and fumes from said heated ore are drawn off and condensed, substantially as described.

5. In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said

frame, said chute being formed of non-heat-conducting material, an automatically-discharging hopper arranged at the upper end of said chute, ore-receiving leaves arranged in
5 said chute, trunnions formed on said leaves, whereby the same are journaled one above the other in the sides of said inclined chute, crank-arms secured to the trunnions on one
10 side of said leaves, bars pivotally secured to said crank-arms to connect said leaves in sets or series, the leaves of one series alternating with those of the other, operating-levers connected with the lowermost leaves of each of
15 said series, a driving mechanism connected with said levers whereby the leaves of one of said series are operated alternately with those of the other series, means whereby said leaves are tilted with an intermittent movement to gradually discharge the ore there-
20 from, means to restore the same to their original position, and means to heat said ore as it is discharged by said leaves, substantially as described.

6. In an apparatus of the character described, the combination with a supporting-
25 frame, of an inclined chute arranged in said frame, said chute being formed of non-heat-

conducting material, an automatically-discharging hopper arranged at the upper end of said chute, revolubly-mounted ore-receiving
30 leaves arranged in said chute, means whereby said leaves are connected in series or sets, the leaves of one series alternating with those of the other, means whereby said sets or series of leaves are alternately tilted with
35 an intermittent motion, trap-doors arranged to close the lower end of said hopper, an operating-lever connected to said doors, means engaged by the top leaf when brought to a
40 horizontal position to actuate said lever and open said trap-doors, a weight to close said doors when said lever is released, a check to retard the closing movement of said doors, and means whereby the ore discharged by
45 said levers is heated, substantially as described.

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

CHARLES F. BURGESS.

Witnesses:

CHAS. W. AVERY,

PAUL SCHARPEGGER.