

2 Sheets—Sheet 1.

No. 602,761.

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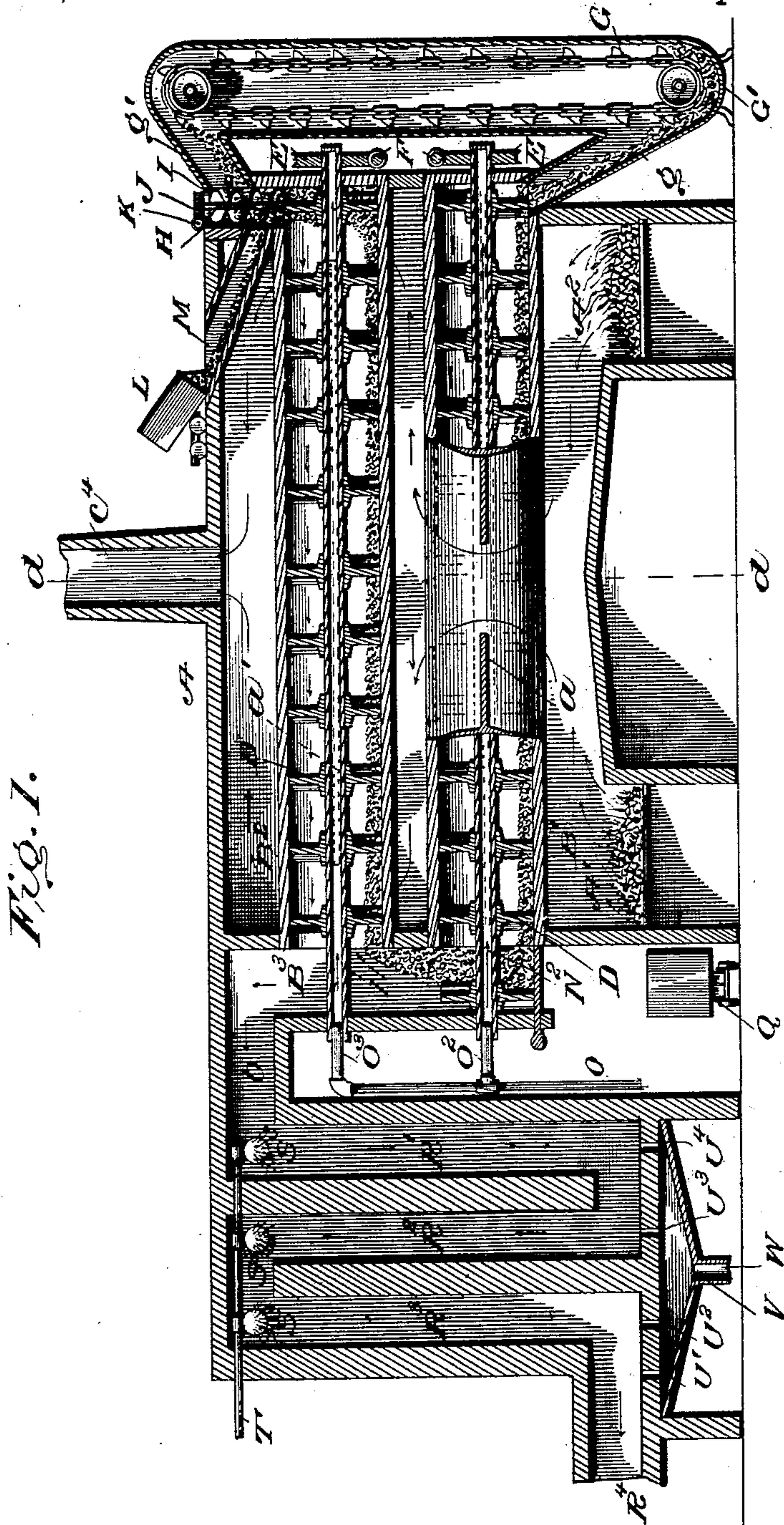


Fig. 1.

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UNITED STATES PATENT OFFICE.

JAMES MANES, OF DENVER, COLORADO, ASSIGNOR OF ONE-FOURTH TO
LEONARD HANSCOM FLANDERS, OF SAME PLACE.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 602,761, dated April 19, 1898.

Application filed August 17, 1897. Serial No. 648,558. (No model.)

To all whom it may concern:

Be it known that I, JAMES MANES, of Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Metallurgical Furnaces; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

10 This invention is an improved ore roasting or calcining furnace especially designed for treating auriferous ores, but capable of practical utilization in the arts in various other ways or for various other purposes. Its ob-
15 ject is to enable a charge of ore or material to be moved in a stream continuously and repeatedly through the retorts until it is thoroughly calcined or oxidized, and to facilitate such oxidation air or steam or mixtures there-
20 of can be injected into the mass of moving ores within the retorts during the treatment thereof.

The invention is summarized in the claims hereto appended, and the following description, taken in connection with the accompanying drawings, will enable those skilled in the art to thoroughly understand and practically utilize it.

30 In said drawings, Figure 1 is a longitudinal vertical section through the complete apparatus. Fig. 2 is a transverse vertical section on line *d d*, Fig. 1. Fig. 3 is a rear end elevation. Figs. 4 and 5 are detail views of the hollow shaft and stirrer-blades.

35 B' B^2 designate similar cylindrical retorts arranged horizontally one over the other and within a furnace A , having, as shown, two fire-chambers A' A^2 at its opposite ends. Baffles a a' are arranged in the furnace beside
40 the retorts, so as to compel the products of combustion to take a tortuous passage around said retorts on their way to the uptake c^4 . The furnace and retorts may be of any suitable construction. For economy the furnace
45 may be of brick and the retorts of sheet or cast metal.

50 The rear ends of the retorts which extend through the wall of the furnace A open into a vertical passage B^3 , which connects at top by a passage b with a fume-condenser, hereinafter referred to. Ore is supplied to the

front end of upper retort B^2 through a throat I , in which is a worm-feed H , which is driven by a worm-gear J from a shaft K . Any suitable mechanism may be used to operate the
55 worm-gear, the object being to have a feed device in the throat which will operate to prevent escape of fumes from the retort while facilitating the feed of ore thereto. Fresh ore can be supplied to throat I from a hopper
60 M , into which the ore can be dumped from a car, as indicated at L in the drawings.

Within retort B' is a screw conveyer consisting of a central hollow shaft N' , on which are attached at intervals segmental propeller-blades D , (shown more clearly in Figs. 4
65 and 5,) said blades being so set as to force the ore along in the retort from front to rear and out into passage B^3 . Within retort B' is a worm conveyer consisting of a hollow shaft
70 N^2 , also provided with a series of segmental blades D , shaft N^2 extending through passage B^3 also and having a set of blades D upon it in such passage, whereby the material is forced
75 from passage B^3 into retort B' and through this retort from rear to front, it escaping from front end of the retort through a chute g into the bottom of a vertical conveyer-casing G' , within which is an endless conveyer G , of any
80 suitable construction, which carries the ore up and drops it into a top chute g' , by which it is delivered into the feed-throat I , as indicated in Fig. 1.

The conveyers on the retorts may be rotated by worm-gears E from shafts F , as indicated in
85 the drawings, or in other convenient manner.

It will be noted that shafts N' N^2 are hollow, and air or steam or mixtures thereof or other gases can be introduced into said pipes from a suitable supply by means of pipe o' and
90 branch pipes o^2 o^3 , as indicated in Fig. 1. From the pipes N' N^2 the steam or air escapes through perforations in the blades D into the body of the ores as they stir the latter, as is evident.

95 Figs. 4 and 5 show that the blades D are provided with a central radial passage x , which communicates with an opening 3 in the pipe N' or N^2 , to which the blade is attached, and with a passage y extending along and near
100 the outer edge of the blade, from which passage y the air, steam, &c., escape through

numerous small perforations $z z$, as indicated in the drawings. Thus the ore may be subjected to the effect of a powerful oxidizing agent within the retorts during the treatment thereof, said agent being applied directly to the ore at the most advantageous points and in the most advantageous manner.

The fumes and gases evolved from the ore or material in the retort pass into passage B^3 and through passage r into the fume-arrester, which, as shown, comprises a series of vertical passages $R' R^2 R^3$, &c., communicating alternately at top and bottom, so as to cause the fumes to take a tortuous passage therethrough. In the top of each passage $R' R^2 R^3$ is a spray $S' S^2 S^3$, respectively supplied with steam or water or other proper precipitant through a pipe T . The effect of the spray is to condense the fumes, and the valuable precipitates falling upon the floor escape through openings $U' U^2 U^3 U^4$ into the collector V , from whence they pass through spout W into a receiving-tank. (Not shown.) The spent fumes can escape through outlet R^4 .

From the drawings and foregoing description it will be readily perceived that the ores can be treated continuously and repeatedly until thoroughly oxidized, being fed successively through throat I , retort B' , passage B^2 , retort B' , chute g , conveyer G , and chute g' back to throat. Ore can be fed into the throat from hopper M until hot ores are found to come from chute g' . Then no further fresh ore should be fed in until the charge of ore or material in the apparatus is thoroughly treated. When the roasting or other operation is complete, a slide P in the bottom of passage B^3 is drawn out, allowing the roasted ores, &c., to escape into a car or other receptacle Q , as indicated in the drawings. Then a new charge of ore or material can be fed into the retorts and the operation repeated.

This furnace handles the material completely and automatically at little cost. A large amount per day can be handled, and the work is so complete that in roasting of ores they are placed in the furnace and carried by the machinery through the retorts time after time until the roasting is completed. Then by moving a slide the charge is delivered and the furnace is ready for the next charge, so the work can go on night and day and a great many charges handled in a day at a cost of only a few cents per ton. Only one man is needed to attend to each of the furnaces, as the work is all done by machinery from the start.

Many different kinds of work can be done by this apparatus as well as roasting ores. It can be used for roasting coffee in a superior manner, for making gas from coal, &c., for roasting potato-starch, making gum substitute or British gum, for drying and candying fruits, drying grain, and extracting and condensing volatile metals—such as quicksilver, tellurium, bismuth, and all other volatile metals—at little cost, also for oxidizing

zinc and making acids, &c. But little repair will be necessary, as the furnace is built of brick or stone and iron, and the air and steam forced into the hollow pipes and stirrers or propellers keep them from becoming too hot. The fires can also be regulated according to the heat required, making this one of the most complete furnaces offered to the public.

The furnace can be heated by any suitable means.

It may be observed that the casing G' should preferably be tightly closed to prevent cooling of the material while passing therethrough or escape of fumes.

I do not wish to limit myself to the particular construction herein shown and described, as it is capable of modification and variation within the scope of my invention.

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

1. In a metallurgical furnace, the combination of a heating-furnace, a pair of longitudinally-disposed parallel retorts extending through said furnace, a vertical passage at one side of the furnace into which both of said retorts open at one end and through which material passes from the upper to the lower retort, a feed-inlet in the opposite end of the upper retort and an outlet in the adjoining end of the lower retort, a closed casing communicating with the said inlet and outlet openings, and a conveyer in said casing adapted to elevate material discharged from the outlet of the lower retort back into the feed-inlet of the upper retort; a discharge door or slide in said passage, conveyers in said retorts for moving the ore therethrough in opposite directions, and means for injecting air or steam into the retorts, for the purpose and substantially as described.

2. In a metallurgical furnace, the combination of a heating-furnace, a pair of longitudinally-disposed parallel retorts extending through said furnace, a vertical passage at one side of and exterior to the furnace into which both of said retorts open at one end and through which material is directed from the upper to the lower retort, a feed-inlet in the opposite end of the upper retort and an outlet in the adjoining end of the lower retort, a closed casing communicating with the said inlet and outlet openings and a conveyer in said casing adapted to elevate the material discharged from the lower retort back into the upper retort, with a discharge-outlet in the lower end of said passage, a slide for closing said vertical passage, rotary conveyers in said retorts for moving the ore therethrough in opposite directions, and means for injecting air or steam into the retorts, through passages in the hollow conveyer shafts and blades, a fume-arrester communicating with the upper end of said passage having a perforated bottom and means for precipitating the fumes in said arrester, all substantially as and for the purpose described.

3. The combination of the furnace, the passage at one end thereof, the retorts in said furnace opening into said passage, the conveyers in said retorts, a feed-throat communicating with the feed end of the first retort, and a chute at the discharge end of the lowest retort, a conveyer-casing communicating with said throat and chute, and an endless conveyer for elevating material from the chute into said throat; with a fume-arrester connected to said passage, an outlet for calcined ores in said passage, and means for in-

jecting air or steam into the retorts through passages in the hollow conveyer shafts and blades, all substantially as and for the purpose set forth. 15

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JAMES MANES.

In presence of—

C. T. EISENHARDT,
J. J. HUGHES.