

C. A. LUCKHARDT.
Quicksilver Furnace.

No. 159,692.

Patented Feb. 9, 1875.

Fig. III

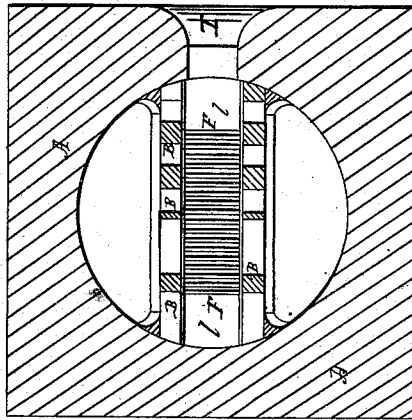


Fig. II.

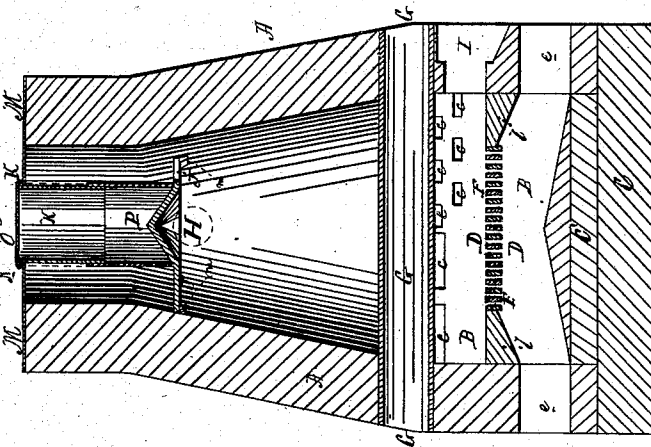
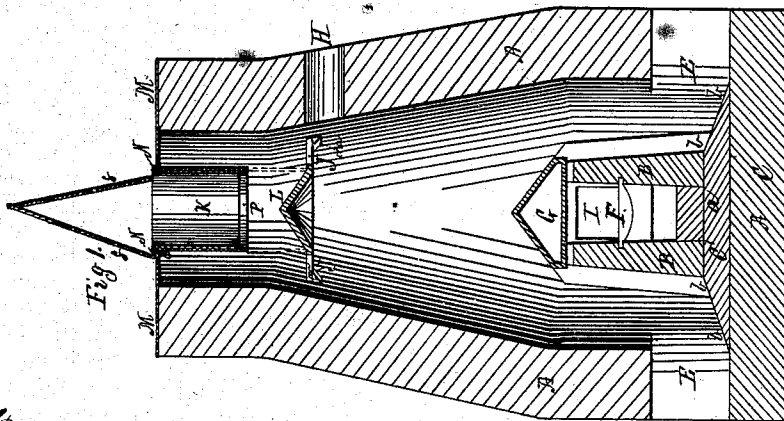


Fig. I.



Witnesses.

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CÆSAR A. LUCKHARDT, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN QUICKSILVER-FURNACES.

Specification forming part of Letters Patent No. **159,692**, dated February 9, 1875; application filed August 6, 1874.

To all whom it may concern:

Be it known that I, CÆSAR A. LUCKHARDT, of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Furnaces for Treating Quicksilver Ores; and I do hereby 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 represents a vertical section taken centrally through the furnace; Fig. 2, a similar view, but taken at right angles thereto; and Fig. 3, a horizontal section of the same.

My improvement relates to a new and improved mode of constructing a furnace for the extraction of quicksilver from its ores.

To treat quicksilver ores in an expeditious and economical manner, and so as to obtain the largest possible percentage of metal therefrom, the operation should be continuous—that is to say, the furnace should be supplied with fresh ores at top for reduction as fast as the wasted and depleted ores are withdrawn at the bottom, so that there may be no loss of time and labor, or unnecessary waste of fuel, in following the alternating operations of cooling off, discharging, and refilling of the furnace. To effect these objects there should be a perfect utilization of the fuel, and that solely for its only legitimate object, to wit, the reduction of the ores, and to do that effectually the heat ought to be so applied as to roast the ores evenly and uniformly all around, that they may all be gradually, simultaneously, and uniformly raised to the required degree of heat to effect the reduction, and thus all be equally well roasted, *i. e.*, depleted of their metal; and it consists in a fire-place centrally arranged in the lower part of a stack-furnace adapted to the extraction of mercury from its ores by a continuous process, in such manner as not to extend from side to side of the furnace, said fire-place for this purpose having end supports to keep the fire-bars out of contact with the walls of the furnace; and it further consists in the combination of a flue,

open to the air at both ends, with the fire-place of a quicksilver-furnace.

To enable others skilled in the art to make, construct, and use my improvement, I will now proceed to describe its details.

In the drawings, the furnace A is represented as being of the stack variety, and may be made externally and internally of any suitable shape; but each are preferably made in the manner of a truncated pyramid or cone from the plane of a line drawn horizontally immediately above the line of the fire-place. The lower part of the interior from that line to the base of the furnace is also preferably built on the same principle, but in a reverse direction, being made wider above at the line just alluded to than at its base, the object of which is to crowd the ore, as it were, between its wall and the walls B of the fire-place, and thus assist, in connection with the base of the furnace, in supporting the charge of ore above. On the inside of the furnace on its base C is erected a fire-place, D. The walls B of this fire-place may be made of any suitable material, such as fire-brick, &c.; but for some reasons it is preferred to make it of cast-iron, and is so arranged as to sit on a bed-plate, C', the sides of which, next the openings E, through which the refuse of the roasted ore is discharged, are beveled or inclined, as shown at *b*, to facilitate the discharge. The grate-bars F of the fire-place, it will be observed, do not extend all the way across the interior of the furnace, but on the contrary terminate at a considerable distance at either end from the interior walls of the latter, with the view of centrally arranging it, as it were, in the middle of the furnace, that the whole heat may be expended and utilized upon the ores, and not wasted upon heating the walls of the furnace. For this purpose, if desired, it may be made circular or oval, instead of being made with parallel sides, as shown in the drawing. Immediately above the fire-place, and extending entirely through the furnace from side to side, is arranged a flue, G, each end of which opens on the outside of the furnace, for the passage of air to keep its lower side cool, and which forms the roof of the fire-place D. This flue is inclined in the man-

ner of a roof, as shown in Fig. 1. This particular shape at once serves as a support to the charge of ores being roasted, and at the same time to give to it a free discharge, when roasted, toward the discharge-mouths E of the furnace. The free passage of air through the flue G also cools its upper sides, thereby preventing the ore resting on it from becoming overheated by reason of its close proximity to the fire-place. Near the upper edge of the walls B of the fire-place are pierced a number of holes, c, for the free passage of the products of combustion and of the flames into the body of the furnace, whence it passes through the mercurial ores to be roasted, and thence through an opening, H, arranged in the side of the furnace above the line of the ores being roasted, and thence through a pipe into the condenser.

As many openings H may be arranged in the walls of the furnace as it may be desirable to use, each of which may lead to a separate condenser or system of condensers.

e e represent openings for the discharge of the ashes from the fire-place, and may each be provided with a door having a suitable register, through which to regulate the quantity of air admitted to the fire-place; and in this connection it may here be stated that the intention is to admit more air to the fire than is absolutely necessary for the perfect combustion of the fuel being used, in order that the excess of unburnt air shall, with the products of combustion, be drawn into the interior of the furnace that it may decompose the vapors of the sulphuret of mercury, which have become volatilized by the heat of the furnace, by combining with the sulphur to form sulphurous acid, and thereby set free the mercury. This excess of air or oxygen is the sole means used by me for this purpose, although lime or marble may be mixed with the ores to facilitate the process, if desired.

In order to feed the fire one or more openings, I, leading thereto, may be made, each of which may be provided with a door, and with an air-register, in the same manner as the door of the ash-pit. Immediately above the line of the opening H is arranged a spider, J, and which is supported on suitable lugs m, secured to the inner wall of the furnace; or, if desired, it may be built into the wall. In the center of this spider is formed a conical chute, L. This chute is arranged centrally within the furnace, and so as to leave sufficient space between its outer periphery and the inner wall of the furnace for the free passage of the ore toward the main body of the furnace-chamber below. In the top of the furnace is arranged a metal cylinder, K, concentric with the chute L. This cylinder is cast in one piece with a plate, M, and with another ring or short cylinder, N, of greater diameter than itself, and which, with the upper end of the cylinder K, and which is made to project for a short distance above plate M,

forms a groove for the reception of a removable cap-piece, O, which covers the mouth of cylinder K, for a purpose to be hereafter described. Over that end of cylinder K which lies within the furnace is passed another cylinder, P, and which is made to fit loosely cylinder K. To the upper end of cylinder P are attached the ends of two or more chains, f, the other ends of which are united together for the purpose of raising or lowering cylinder P, as may be required. When lowered, cylinder P rests upon a seat formed on the outer edge of the conical chute L.

When thus lowered, all communication between the interior of the furnace and cylinder K, and which leads out through the top of the furnace, is cut off, thereby preventing escape of the fumes from the furnace when the cap-piece O is removed.

Thus fixed, and the cap-piece O taken off, cylinders K and P are then filled with a fresh charge of ore, and the cap-piece O then replaced, when, by pulling on chains f, cylinder P is raised, discharging the contents into the furnace, and this process is repeated as often as necessary, in order to make the process of roasting continuous.

If desired, the cap-piece O, when fitted into the groove formed by the two cylinders and top plate, and which latter is permanently secured to the top of the furnace-stack in any suitable manner, may have their joints luted, or the groove may be partially filled with mercury or other suitable material, so as to surround the flange of the cap-piece O, and thus prevent the escape of all vapors from the interior of the furnace. The openings in the top plate, M, through which the chains f pass, may also be temporarily luted, if desired.

In raising cylinder P the ends of the chains f may be attached to the end of a rope passing around the sheaves of a tackle-block suitably attached to a frame for the purpose.

The furnace once in operation, as the lower stratum of the ore becomes thoroughly deprived of its mercury, it settles down into the space formed between the walls of the fire-place and lower walls of the furnace; thence it is withdrawn through openings E. This done, the doors, which cover said openings, are again closed, and a new charge of fresh ore then passed into the furnace through cylinders K and P, as before described, and so on continuously and consecutively.

With regard to the condensers for condensing the vapors of the mercury thus expelled from the furnace, any suitable kind may be used; but I prefer to use a special kind of condenser, here unnecessary to be described, as such will form the subject-matter of a separate application for Letters Patent.

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

1. As an improvement in furnaces provided

with a centrally-arranged fire-place, for the extraction of mercury from its ores by a continuous operation, end supports, *b*, as a means of keeping the fire-bars *F* out of contact with the furnace-walls, to avoid heating the latter, substantially as set forth.

2. In combination with the fire-place *D* of a quicksilver-furnace, the flue *G*, open to the air at both ends, for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of July, 1874.

CÆSAR A. LUCKHARDT.

Witnesses:

ADOLPH SCHMOLZ,
ERNST HUHN.