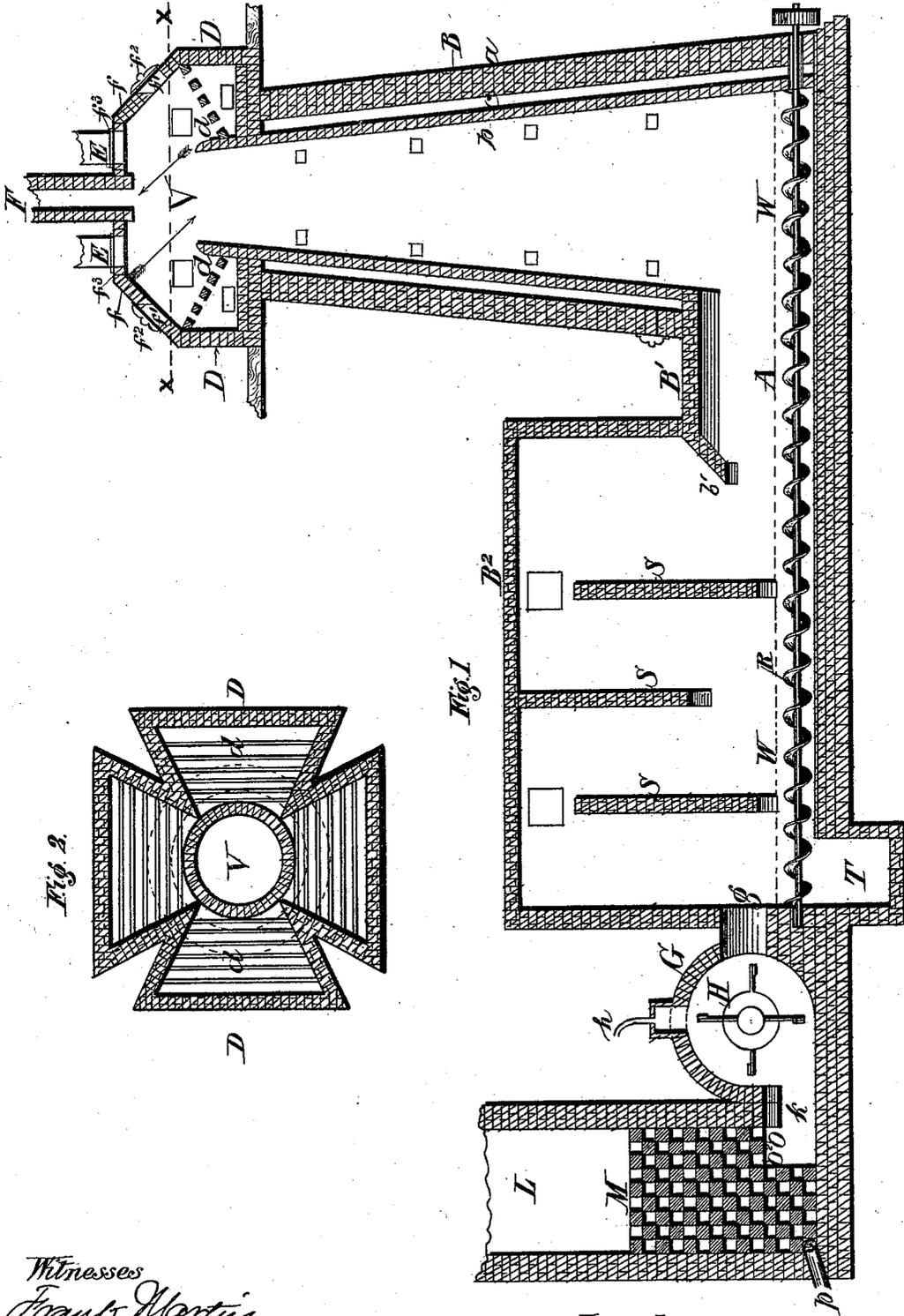


(No Model.)

J. J. STORER.  
ORE ROASTING FURNACE.

No. 516,663.

Patented Mar. 20, 1894.



Witnesses  
 Frank Martin  
 John H. Farmer

Inventor  
 Jacob J. Storer.

# UNITED STATES PATENT OFFICE.

JACOB J. STORER, OF HELENA, MONTANA, ASSIGNOR TO THE UNITED MILL AND FURNACE COMPANY, OF MONTANA.

## ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 516,663, dated March 20, 1894.

Application filed March 8, 1893. Serial No. 465,217. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB J. STORER, of Helena, county of Lewis and Clarke, and State of Montana, have invented certain new and useful Improvements in Ore-Roasting Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention is designed as an improvement on those ore-roasting furnaces into which the raw ore to be operated upon is introduced from above in a finely pulverized condition.

Its object is to provide an improved furnace for the treatment of ores, especially for the gold and silver they may contain, whether they be what are known as pyritic or oxide ores, or whether other metals are contained therein. By continued working with those furnaces many defects have been developed which this invention is designed to remedy.

To these ends the invention consists in the peculiar construction, arrangement and combinations of parts hereinafter more particularly described and then definitely claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts.

Figure 1 represents a vertical, longitudinal section of my improved furnace. Fig. 2 represents a sectional plan of fire places and gas expansion chamber on lines X X Fig. 1.

In the drawings A represents the water tank constructed, preferably, of brick and internally cemented. Connected with this at one end and rising vertically therefrom is the furnace shaft B of cylindrical cross section and expanding from above downward. This shaft, which extends from the roofs of the fire places downward, consists of an exterior wall *a* and an interior fire brick wall *b*, between which is an annular air space *c* which is closed at both top and bottom. About the top of this shaft and constructed so as to internally communicate with it, are fire places D directly opposite each other, so constructed with sloping grates *d* and sloping roof *f* that the heat therefrom shall be radiated through their throats, as indicated by arrows, directly into

the vertical axis of the shaft. Openings *f'*, that may be closed by stoppers or doors *f''*, are for feeding fuel into these fire places. In the fire place roofs are fixed stove pipes E, provided with dampers *f'''*, which pipes serve to carry off the smoke and gases when the fires are first lighted.

A cylindrical pipe or conductor F, preferably of brick, is set vertically above and between the fire places, with its vertical axis corresponding with that of the shaft B.

The tank A, as will be seen, is completely covered, partly by the furnace shaft B, partly by an arch B' having a sloping lip *b'*, extending horizontally from the furnace shaft B, and partly by a chamber or flue B<sup>2</sup>, containing dust deflecting walls S. In the end wall of the chamber B<sup>2</sup>, openings *g'* communicate with a spray wheel chamber G, in which is an exhaust fan H, which also serves as a spray wheel for comminuting into fine spray water that is designed to be introduced upon it, during the operation of the furnace, through a pipe *h*. The exit *k* from the spray wheel chamber communicates with the interior of the smoke stack L, which latter is filled for some distance from the bottom upward with lattice or cob work M, constructed preferably of strips of wood *o*, with alternating spaces *o'*. The combined areas of these openings or spaces being amply sufficient for the easy escape of all the furnace gases that are not wetted down by the spray wheel. In the bottom of the smoke stack is shown a pipe *p* for conducting away the water that may be thrown into said stack and cob work. A screw conductor R, is shown in the bottom of tank A, the purpose of which is to thoroughly agitate in the water the ore that is introduced through the furnace shaft, and remove it into one or more settling pits, one of which is shown at T.

In operating this furnace it is designed to keep the tank A partly filled with water, the water line being indicated by dotted line W.

This furnace is designed for the heating and roasting of ores, especially those to be worked for the gold and silver they may contain. And preparatory to being introduced into the furnace they are to be finely pulver-

ized. If an ore contains sufficient sulphur to maintain the desired temperature in the furnace by its combustion as it falls down the shaft, the heat and flame from the fireplaces will not have to be supplemented by other fuel; but if the ore does not contain sufficient sulphur for such purpose, pulverized coal in proper quantity is mixed and introduced with it.

In operating this furnace fires are built in the fire places and the dampers in the smoke pipes are kept open until the fuel is well ignited; then the said dampers are closed and the spray wheel is made to revolve, thus causing the flames from the fire places to be drawn closely over the fire bridges down the interior of the shaft B. When the interior of said shaft has become sufficiently heated, the finely pulverized ore is introduced into the head of the shaft by a current of air down the conductor F. On issuing from the mouth of this conductor the descending column of air-borne ore, or mingled ore and coal, is instantly exposed on all sides to the heat radiated from the grate fires and the sloping walls of the fire places through their wide open throats, and is thereby at that point superficially ignited. In some cases, in the class of furnaces above referred to, as well as in this furnace, the flame from the fire places being drawn closely down over the fire bridges, have little or no effect on the falling ore until the latter has passed below the said fire bridges. But this improved furnace essentially differs from others in the respect that in those there is no direct radiation of heat upon the falling ore from the fire surfaces and interior walls of the fire places; the heated air and gases alone conveying heat into the shaft, so that none of the ore could ignite until it had reached and passed the fire bridges. Nor was there space there afforded for the necessary lateral expansion of the gases generated by combustion of the ores; hence, when formed, these gases were violently forced downward in the line of least resistance carrying with them the ore, a considerable portion of which would reach the water in the tank in an insufficiently heated and but partially de-sulphurized condition, unless the shaft were very high, or the ore but slowly fed into it. In this furnace, however, it will be seen that at the lower end of the conductor F, and between it and the fire bridge walls, a gas expansion chamber V, is formed by the wide open throats of the surrounding fire places. It is found that the hot air and gases generated in these fire places and issuing therefrom, form what may be called an elastic cushion, that yields to the lateral expansion of the gases generated by the falling ore, sufficiently to prevent its too rapid downward movement, so that time is there afforded for the whole mass of the ore for ignition at that point, and, consequently, for subsequent complete combustion in its passage down the shaft. Thus it is obvious that the gas expansion chamber is necessary for the proper working of furnaces of this class, and that it also very materially increases its capacity. Falling down the shaft B, the heavier particles of the ore fall into the water, and settle to the bottom of the tank. The lighter particles, drawn forward by the action of the draft and spray wheel, pass beneath the arch B', which causes them to converge, so that they are brought in contact with the sloping lip thereof, whereby they are deflected downward, so that the bulk of them is thrown into the water of the tank while still at a red heat; it being a very desirable matter in working some classes of ores that all the particles, if possible, should enter the water at a high temperature and should not pass on to the spray wheel where they would be converted into soluble salts by the action of the sulphurous and other gases that are there wetted down by the spray. The most minute air-floated particles of ore, together with the gaseous products of combustion, pass along the horizontal chamber or flue,—where some of the particles of ore are deflected downward into the water by the deflecting walls S,—and out through the opening or openings in the end of said chamber or flue, into the spray wheel chamber where they are wetted down and thrown forward with the spray into and upon the cob or lattice work in the base of the smoke stack. This cob or lattice work presents a very extended surface which, when wetted by the spray, serves, in combination with it, to thoroughly condense and wet down all gases, metallic fumes and ore dust escaping from the furnace, which might otherwise pass up and out of the smoke stack; and these gases and dust being thus wetted down and held in solution or suspension in water, are conducted off and out of the smoke stack to a suitable place of deposit (not shown) by a pipe *p*.

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

1. In a furnace constructed substantially as shown, a gas expansion chamber formed in the upper part of the ore heating and desulphurizing shaft, and fire-places surrounding the same with wide-open throats arranged to allow the heat therefrom to act by radiation on the descending ore, substantially as described.
2. In a furnace constructed substantially as and for the purpose specified, wherein the raw ore is fed into the top of a heated shaft, the combination with said shaft, of fire places, having wide-open throats, with their tops arranged to radiate heat directly upon the descending ore, substantially as described.
3. In a furnace constructed substantially as and for the purpose described, wherein a covered water tank for the reception of the desulphurized and oxidized ore is set beneath, and arranged to communicate with a vertical

shaft, down which, when heated, the pulver-  
ized ore is fed, the combination with said  
tank and shaft, of a passage leading from the  
vertical shaft over a portion of the tank and  
5 terminating in a deflecting lip, to deflect the  
fine air-floated particles of ore into the wa-  
ter, substantially as described.

In testimony that I claim the foregoing I  
have hereunto set my hand, in the presence of  
two witnesses, this 28th day of February, 1893. 10

JACOB J. STORER.

Witnesses:

FRANK MARTIN,  
JOHN H. FARMER.