2 Sheets—Sheet 1.

C. OLSTED.

Furnace for Desulphurizing Ore.

No. 204,075. Patented May 21, 1878.

Fig. 1.

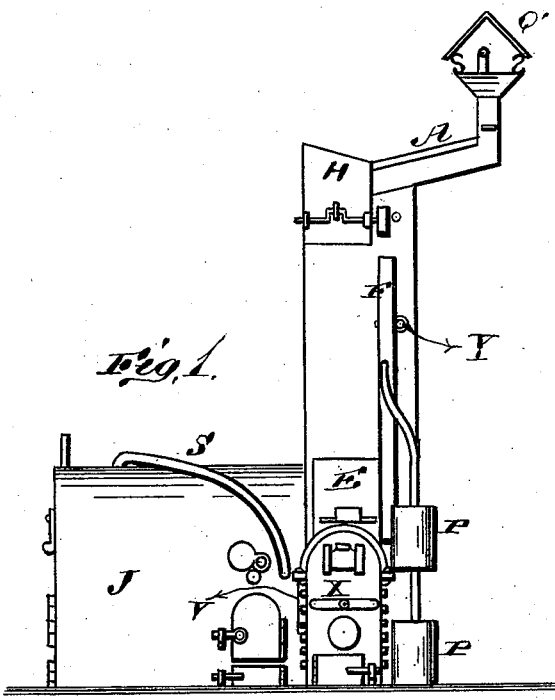


Fig. 2.

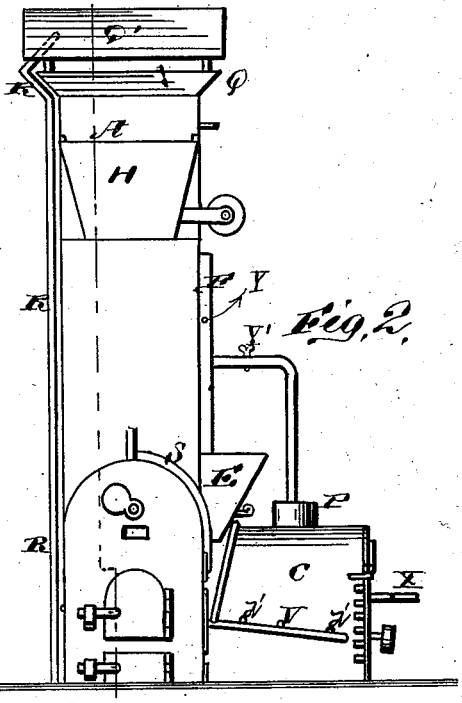


Fig. 3.

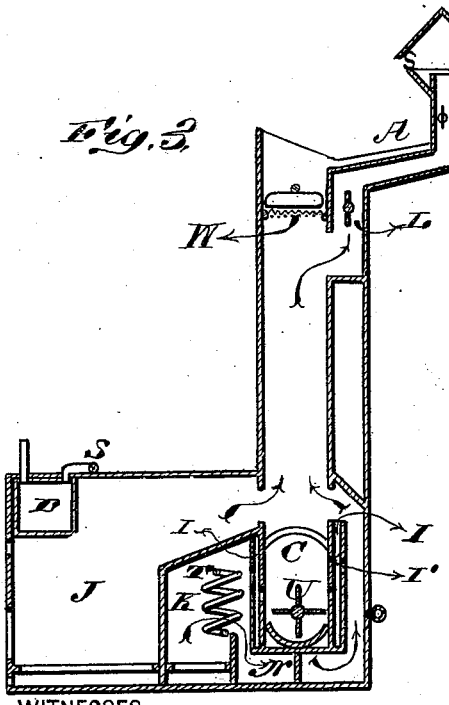
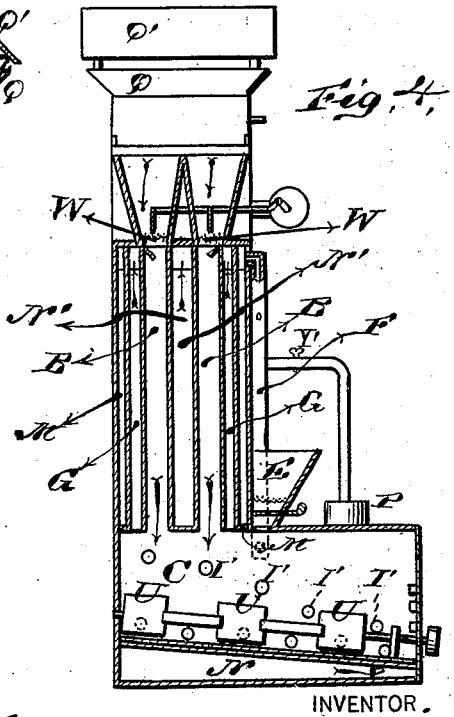


Fig. 4.



WITNESSES

E. H. Bates

George E. Upham

INVENTOR.

Christian Olsted.

Gilmore & Smith & Co.

ATTORNEYS.

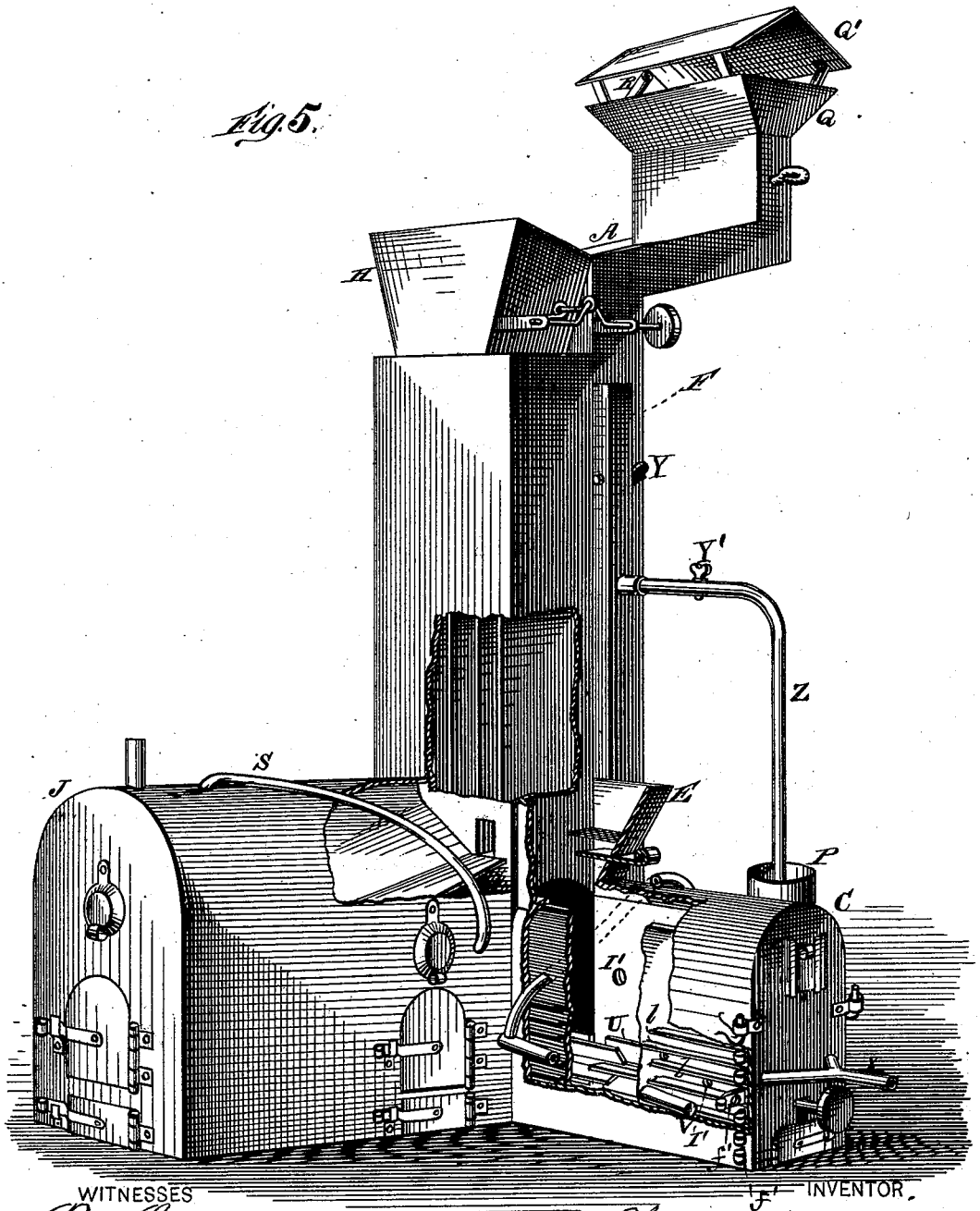
2 Sheets—Sheet 2.

C. OLSTED.

Furnace for Desulphurizing Ore.

No. 204,075. Patented May 21, 1878.

Fig. 5.



WITNESSES

Robert Everett

George E. Upham

INVENTOR.

Christian Olsted.

Filmore, Sinclair & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

CHRISTIAN OLSTED, OF BOULDER, COLORADO, ASSIGNOR TO OLSTED FURNACE COMPANY.

IMPROVEMENT IN FURNACES FOR DESULPHURIZING ORE.

Specification forming part of Letters Patent No. **204,075**, dated May 21, 1878; application filed August 4, 1877.

To all whom it may concern:

Be it known that I, CHRISTIAN OLSTED, of Boulder, in the county of Boulder and State of Colorado, have invented a new and valuable Improvement in a Furnace for Desulphurizing Ore; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a side elevation of my furnace for desulphurizing ores. Fig. 2 is a front view of the same. Fig. 3 is a longitudinal vertical sectional view taken through the line *x x*, and Fig. 4 is a transverse vertical sectional view thereof. Fig. 5 is a perspective view of the apparatus.

This invention relates to that class of furnaces which are used to desulphurize gold or silver ores. In most processes the difficulty experienced in treating certain ores arises from the difficulty of properly desulphurizing the ore. In attempting to burn the sulphur some of the valuable metals are consumed and pass off in the fumes. Attempts have been made to separate the sulphur from the ore and then consume the sulphur; but these attempts have not been successful, owing to an improper construction of the furnace or of the flues, or both. Again, if the ore is exposed to the atmosphere immediately before it is treated, it will absorb moisture from the atmosphere, which moisture interferes more or less with a proper treatment of the ore. These and other difficulties are entirely obviated by my invention, the nature of which is fully pointed out by the claims.

The annexed drawings, to which reference is made, fully illustrate my invention.

A represents an elevated drying-floor, heated by the escape-heat in the furnaces passing under it in the main flue. H is a hopper, conveying the ore from the drying-floor to the ore-passages B B. W are sieves, through which the ore enters the ore-passages B from the hopper H. B B are ore-passages, through which the ore falls to the floor of the desulphurizing-chamber C; U, paddles, for agitating ore in the desulphurizing-chamber; E, hopper or box, containing lignite or other combustible substance suitable for the purpose; J, main furnace; G G, flues in the flue-chimney from the main furnace; K, auxiliary furnace with a superheater; N, flue from the auxiliary furnace under and behind the chamber C into the flue-chimney. N′ is a continuation of the flue N in the flue-chimney; L, main flue near the top of the main chimney, into which the flues G G, N′, and F discharge; M M, air-spaces in the flue-chimney, to serve as non-conductors of heat in the flues G G; C, oxidizing and desulphurizing chamber; I I, air-spaces in the double wall of the chamber C on both sides of the chamber, with a damper in each air-space for the purpose of regulating the supply of air. The partitions *l* corresponding to each damper are intended to extend from the front of the machine—that is to say, from the damper *f′* to the rear of the air-chambers. I′ I′ are holes through which air passes from the air-spaces I I into the chamber C. F is a flue extending from the desulphurizing-chamber, which is a separate flue till it turns into the main chimney just below the drying-floor. This flue is provided with a branch, Z, to be used in case of condensing the vapors, and these flues are provided with dampers Y Y′, to regulate the flow into the condensing-tub or main chimney, as may be desired. Q is a pan, near or at the top of the chimney, surrounding the main flue. Q′ is a cover to the pan Q. R is steam-pipe, jetting steam against the under side of the cover Q′. D is boiler for generating steam. S is steam-pipe, and T coil, for superheating steam from the boiler D. V is a pipe from which the superheated steam is jetted into the chamber C upon the heated ore. X is a pipe attached to the front of the machine (see Fig. 5) by means of branch pipes, through which air may be forced into the air-passages I I. The branches of the pipe X communicate with spaces (not shown) at the forward end of the air-chambers, which spaces are formed by the front wall of the machine and dampers, and the inner and outer walls of the air-chamber. Y is a damper in the flue F. Y′ is a damper in the flue or pipe to the condensing-tub; P, condensing tubs or tanks.

In operation, the pulverized ore is placed

upon the drying-floor A. After the ore is thoroughly dried on said drying-floor it passes through the hopper H, without being exposed to the outer atmosphere, into the sieves W directly over the ore-passages B. The object of these sieves, which should be constantly shaken, or in which stirrers should be moved back and forth, is to distribute the ore equally in the ore-passages, and also to so separate it that it will fall loosely and not in a compact stream. In this condition the heat from the adjoining flues acts more readily on each particle of the ore while on its passage to the oxidizing and desulphurizing floor.

The ore-passages, it will be seen, are so arranged as to have smoke-flues each side of them, the effect of which arrangement is that by the time the ore reaches the floor of the chamber C it is very hot.

From the moment this heated ore reaches the floor revolving paddles U, turned in any convenient manner, agitate it and successively pass it forward toward the front of the chamber. At a point outside of a line of the ore-passages toward the front of the chamber lignite or other combustible substance falls from the hopper E and mingles with the heated ore. This combustible substance is ignited by coming in contact with the heated ore, thus aiding combustion of the sulphur, which now rises in fumes from the ore. If this mingling of the combustible substance with the heated ore takes place directly under the ore-passages, or where the ore will fall on it after ignition has taken place, the ore falling upon it will have a tendency to extinguish the flame. Hence, as stated above, the mingling must take place at a point outside of a line of the ore-passages toward the front of the chamber.

To still further facilitate the desulphurizing process by facilitating the combustion of the sulphur fumes, air is forced through the pipe X into the ore-chambers I I, either by the induced current or by mechanical pressure, where it becomes heated, and then enters the chamber C through the openings I′ I′ formed in the inner walls of the chambers, supplying oxygen to the flames; and steam from the boiler D, which has been superheated in the coil T, escapes from the pipe V, through branch pipes *d′*, directly into the same chamber C in fine jets upon the heated ore. This chamber C is kept at a proper temperature by the heat from the auxiliary furnace K passing under and behind it through the flue N.

The chamber C is constructed sufficiently long for accomplishing the purpose desired, and the ore is then ejected through an opening at the front of the chamber. The gases of combustion from the chamber pass into the chimney. Some of the precious metals are liable to pass off in these gases. To prevent this I place the cover Q′ over the main flue at the top of the chimney, but in such a position that it does not interrupt the draft. Against the under side of this cover I jet steam from the steam-pipe R, as I find that any damp surface exposed to fumes containing metal will arrest the particles of metal coming in contact with it.

Around the top of the main flue is the pan Q, into which this fine metal, caught on the cover Q′, falls, if such a quantity accumulates as to detach itself.

In the treatment of some ores, for the double purpose of arresting the precious metal so passing off in fumes and to save the sulphur, instead of allowing these fumes to pass off through the main flue L, I pass them through condensing-tanks, as at P, after first closing the valve Y in the main flue and opening the valve Y′ in the branch.

What I claim as new, and desire to secure by Letters Patent, is—

1. A desulphurizing-chamber, C, distinct and separate from the furnace, and having no flue-connection therewith, in combination with heated ore-passages B, arranged between the flues G, and having no connection therewith, whereby the ore is dried and heated before its entrance to the desulphurizing-chamber, substantially as described.

2. Furnace J, with a boiler, and an auxiliary furnace, K, with a superheater, in combination with pipe V, with its branch pipes *d′*, and the desulphurizing-chamber C, by means of which superheated steam is injected into the latter.

3. The combination, substantially as hereinbefore described, of the chamber C, air-chambers I I, lying on each side ot said chamber and communicating therewith by means of the air-holes I′, and air-regulating dampers *f*, for the purposes set forth.

4. The inclined drying-floor A, leading into the hopper H, in combination with the main flue L under said floor, and flues G G N′ F, whereby the ore is dried before feeding the same to the ore-chamber, substantially as described.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

CHRISTIAN OLSTED.

Witnesses:

LEVI W. DOLLOFF,

S. J. MACKY.