H. H. EAMES.

Apparatus for Refining Sulphur.

No. 204,206. Patented May 28, 1878.

Fig. 2

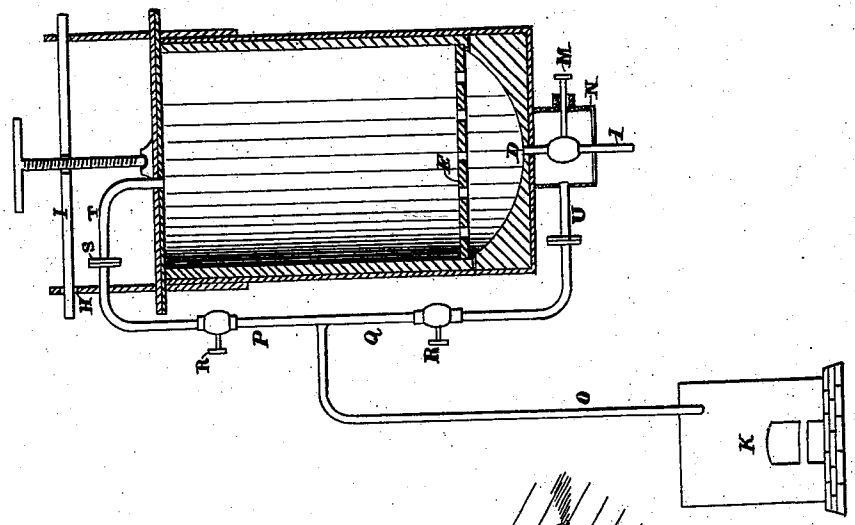
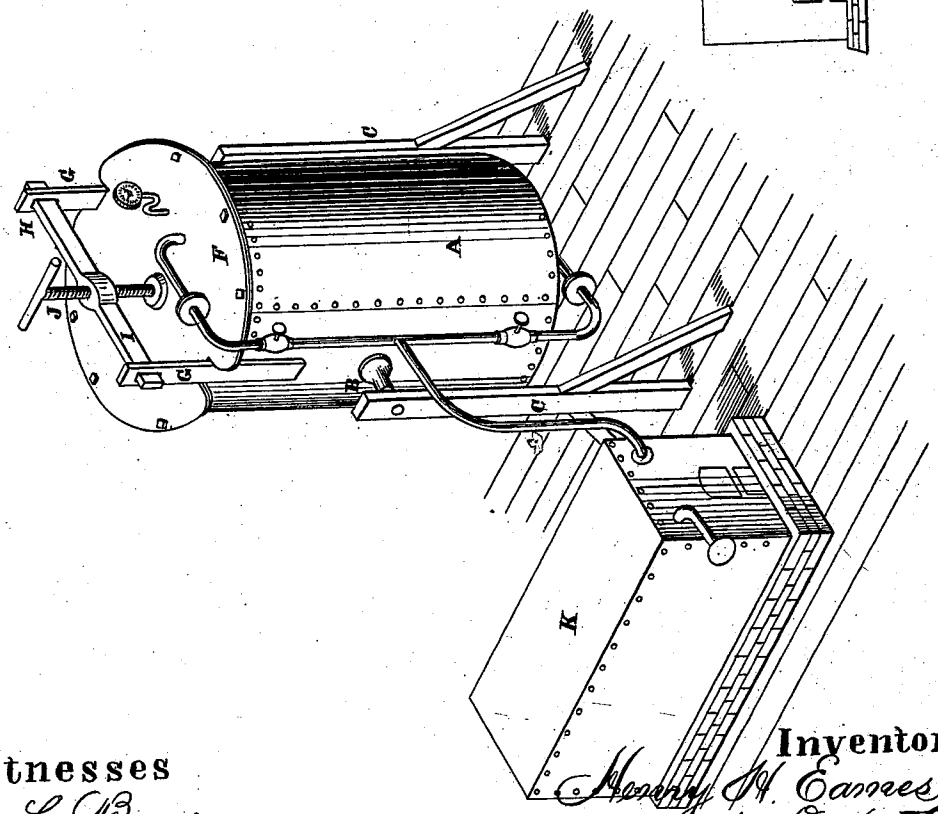


Fig. 1.



Witnesses

Jno. L. Boone

Geo. H. Strong.

Inventor

Henry H. Eames

by Dewey & Co.

attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY H. EAMES, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN APPARATUS FOR REFINING SULPHUR.

Specification forming part of Letters Patent No. **204,206**, dated May 28, 1878; application filed December 5, 1877.

To all whom it may concern:

Be it known that I, HENRY H. EAMES, of the city and county of San Francisco, and State of California, have invented an Apparatus for Reducing and Refining Sulphur; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved method and apparatus for reducing crude sulphur, and separating the sulphur from the foreign material with which it is intermixed in its native state, both the reducing and refining being performed in one operation in the manner hereinafter described.

There exist on the Pacific coast quite a number of mines or deposits from which free sulphur, intermixed with earthy and mineral matter, can be taken in almost unlimited quantities. The usual method employed for converting this crude sulphur into a merchantable article was to volatilize the sulphur in retorts and then condense the fumes. Attempts have been also made to separate the sulphur by a fusing process, by the direct application of fire underneath a vessel on which the crude material is placed. This is, however, dangerous, as the fumes arising from the heated sulphur are apt to take fire and fire the mass. Steam has also been used, but under conditions not altogether favorable for the rapid reduction or complete refining of the sulphur.

My invention consists in the employment of superheated steam for fusing the sulphur, by which means the material is more easily and rapidly reduced than by the use of wet steam direct from the boiler, and also in the use of a straining apparatus and material, by means of which the crude sulphur in the furnace is drawn out in a thoroughly-refined condition, all the dirt or earthy matter being completely separated from it.

Let A represent a metal tank, of any desired form and size. Usually I should make it cylindrical, but its shape is not material. A convenient manner of mounting the tank is to suspend it on trunnions B B, which bear on the upper ends of two uprights or standards, C C, one on each side, so that the tank can be tilted to empty the earthy matter left after the sulphur is drawn off in the manner herein described; or, if the tank is stationary, doors may be provided, which are made steam-tight by the use of rubber gaskets, through which the earthy matter may be removed after the sulphur is drawn off. The tank is provided with a cover, F, formed in such a manner that it can be made steam-tight when in place, and so that it can be readily removed when desired. A convenient form of cover is that shown in the drawings forming part of this specification.

On the upper rim of the tank, I make an outward-projecting flange, and the cover is made large enough to correspond therewith. The edge of the cover may then be secured to the flange by means of bolts and nuts placed at intervals around the rim. To brace the center of this cover and prevent its being bulged by inside pressure, two upright standards, G G, are secured to the tank and cover. In the upper end of each of these standards is made a hole or slot, H. One end of a strong cross-bar, I, is then slipped in each of these holes, so that the bar will pass across the cover. Through a hole in the middle of this cross-bar I, which is tapped with screw-threads, is a screw, J, which may be turned down against the center of the cover. Any other convenient method of properly securing the cover may, however, be employed.

The tank A, I make preferably of wrought-iron. The lower portion or bottom of the tank is also made of wrought-iron. On this iron bottom I place an internal wooden bottom, made in a funnel shape, as shown. At the bottom of the funnel-shaped portion of this wooden bottom is a draw-hole, D, which also passes through the iron bottom of the tank, serving to draw off the refined sulphur.

At the point on the wooden sides of the bottom where the lower ends of the staves rest, and where the funnel shape commences, space is left to form a support or shoulder for a transverse perforated false bottom or strainer, E, which is also made of wood. On top of this transverse perforated false wooden bottom or strainer E, I lay a piece of ordinary gunny-cloth, such as is used for potato-sacks, &c. This gunny forms an additional filtering medium, through which the sulphur must pass before going through the perforations in this

false wooden bottom into the main bottom, from which it is drawn off. This gunny or filtering material effectually prevents any of the gangue or earthy matter from coming down through the perforations in the false bottom, and at the same time admits of the pure sulphur passing readily through its meshes, thus refining it in the operation of reducing. A pipe or tube, L, extends downward from the lower portion of the funnel-shaped bottom of the tank, so as to form a continuation of the discharge hole or opening, and a cock, M, serves to close the tube, when desired. This tube L passes through a box, N, for the purpose hereinafter described. K is a superheater, which is conveniently located with reference to the tank. The steam-pipe O from the boiler passes through the superheater, and then, extending upward to near the mid-height of the tank, is divided into two branches, P Q, each of which is provided with a cock, R. The upper branch, P, of the steam-pipe is connected by a suitable coupling at S with a short pipe, T, which leads into the top of the tank, while the lower branch, Q, is connected by a similar coupling to a short pipe, U, which terminates in the box N.

In operation the crude sulphur, as it comes from the mine, is dumped into the upright tank, so that the sulphur falls onto the gunny or filtering material resting on the perforated false bottom of the tank. The cover is then placed on the tank and securely fastened. The superheated steam is turned in by opening the cock R of the upper branch pipe. At the same time the cock R of the lower branch pipe is opened, so as to admit steam into the box N, surrounding the discharge-pipe L.

The superheated steam, being admitted at the top of the mass of the sulphur, makes a descending current of steam with the descending material. This dry superheated steam causes sulphur to melt at from sixteen to twenty-two pounds pressure on the tank, whereas the ordinary wet steam from the boiler will not melt the sulphur sufficiently to cause it to flow at less than from thirty to thirty-five pounds pressure. The superheated steam, admitted as described, soon fuses the sulphur, which flows down until in its fused state it reaches the filtering medium or gunny which is spread over the perforated false bottom. At this point the separation of the pure sulphur from the gangue is accomplished. The meshes of the gunny-cloth allow the fused sulphur to pass through, but retain the gangue or earthy matter. After the sulphur passes through the gunny-cloth it passes through the perforated false bottom and into the funnel-shaped bottom of the tank, where it is drawn off by the discharge-pipe L.

The discharge-pipe L is kept heated by the steam, which is allowed to enter the box N, so that the sulphur will flow freely, the whole pipe being surrounded by steam, to prevent the sulphur from chilling and the pipe from clogging. When all the sulphur has been melted and withdrawn the cover of the tank is removed, and, if a tilting tank, the gangue or earthy matter remaining may be dumped out; or it may be removed through doors, as stated. A steam-gage, V, is arranged to indicate the pressure on the tank.

It will thus be seen that I provide an apparatus for refining and reducing crude sulphur at one operation. The use of steam for reducing sulphur has previously been tried; but it was not superheated. The ordinary wet steam requires a greater pressure to accomplish the object, and its condensation and the consequent precipitation of water to the bottom of the tank causes trouble. However, where the wet steam has been used it has been introduced into the bottom of the tank, whereas I introduce the superheated steam above, and this causes a continuous flow of sulphur with the current of steam. By my method the mass never clogs, whereas with the wet steam introduced from below it does give trouble from clogging. By using the gunny-cloth as a filtering material, supported on a perforated false bottom, I am enabled to draw off the sulphur as pure as it is possible to refine it by mechanical means—a result not accomplished by the use of perforated plates alone, or by any other means heretofore employed.

I am aware that the jacketed discharge-pipe is not new, *per se*.

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

1. The reducing-tank A, provided with a wooden lining and wooden bottom, substantially as shown, and for the purpose herein described.

2. The reducing-tank A, having the funnel-shaped wooden bottom, with its exterior flat rim to receive and support the wooden lining, substantially as shown and herein described.

3. The funnel-shaped wooden bottom, having its flange or rim fitted to receive the wooden lining and to support the strainer E and filtering material, substantially as herein described.

4. The reducing-tank A, mounted on trunnions B B, and sustained by standards C C, provided near its bottom with sieve E, and connected by pipes T P Q U with superheater K, in combination with discharge-pipe L, provided with the surrounding jacket N, as set forth.

In witness whereof I hereunto set my hand and seal.

HENRY H. EAMES. [L. S.]

Witnesses:

GEO. H. STRONG.

A. MOORE.