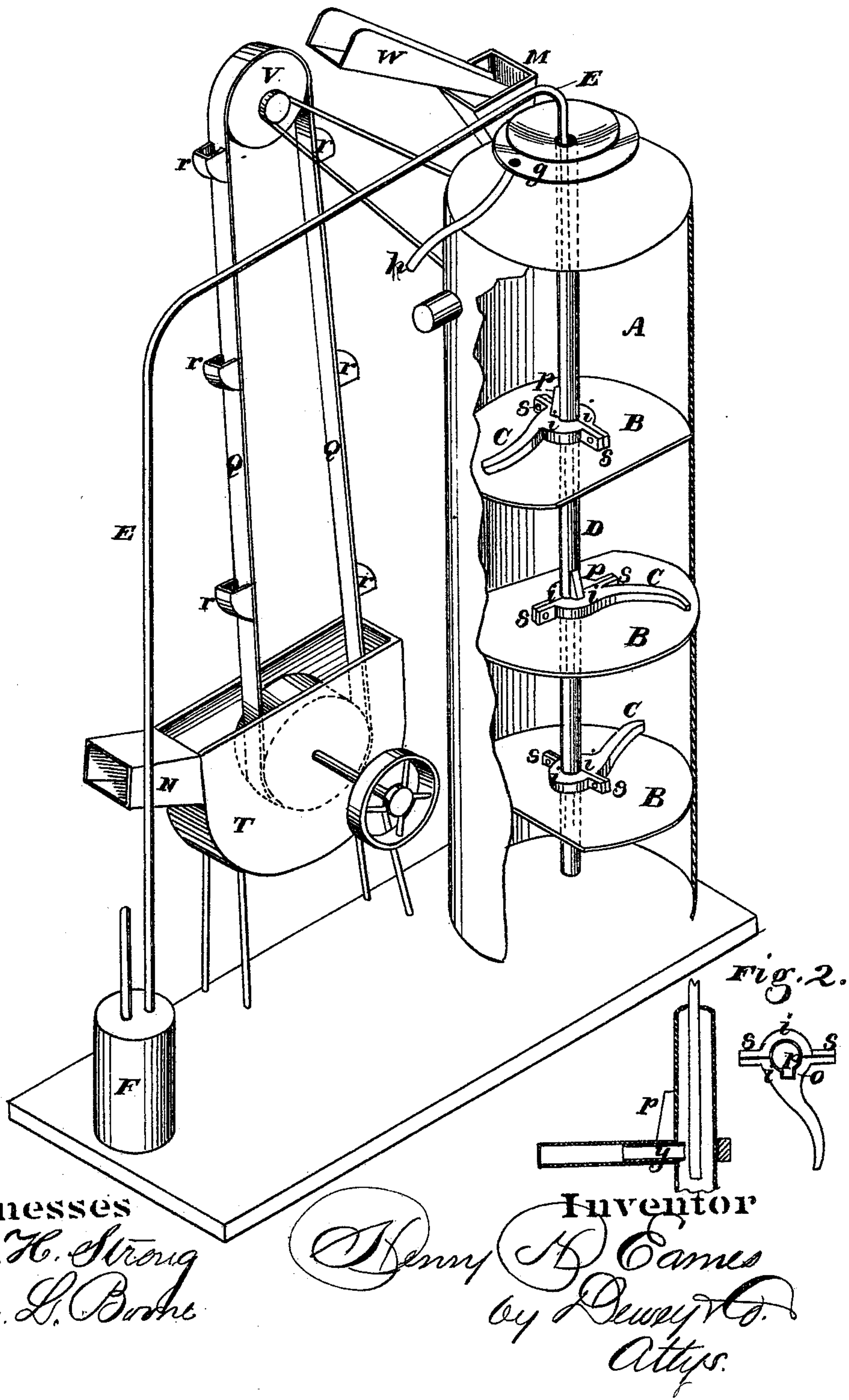


H. H. EAMES.  
ROASTING ORE FURNACE.

No. 180,856.

Patented Aug. 8, 1876.

*Fig. 1.*



Witnesses  
Geo. H. Strong  
John L. Borne

Inventor  
H. Barnes  
by Dewey & Co.  
Attys.



# UNITED STATES PATENT OFFICE.

HENRY H. EAMES, OF OAKLAND, CALIFORNIA, ASSIGNOR TO CAROLINE S. EAMES, OF SAME PLACE.

## IMPROVEMENT IN ROASTING ORE FURNACES.

Specification forming part of Letters Patent No. 180,856, dated August 8, 1876; application filed February 10, 1876.

*To all whom it may concern:*

Be it known that I, HENRY H. EAMES, of Oakland, Alameda county, State of California, have invented Improvements in Fine Ore Furnaces; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains, to make and use my invention, without further invention or experiment.

My invention relates to certain improvements in that class of furnaces for roasting fine or pulverized ore, in which a series of horizontal shelves or partitions are placed at intervals, one above another, inside of an upright stack or shaft, and in which the ore is caused to drop from one shelf or partition to another by arms or sweeps attached to an upright rotating shaft.

The chief feature of my invention relates to a novel arrangement for supplying a constant stream of cold water through a hollow shaft, one end of which is permanently closed so as to terminate inside of the furnace.

Such a shaft is used for carrying the arms or sweeps in the class of furnaces above mentioned, of which the furnace described in the Letters Patent numbered 152,943, which were issued to Eames and Walbridge, July 14, 1874, is a sample.

When a simple iron shaft is used for this purpose, the intense heat to which a portion of it is subjected causes it to warp and soon become useless.

It is therefore necessary to devise some means for keeping the shaft cool, when the furnace is in operation, in order to work the furnace successfully. If the shaft passes entirely through the furnace it can be made hollow, and a stream of cold water passed through it as has frequently been done heretofore; but as it terminates inside of the furnace, some special device must be used for cooling it. This I do by extending the water-pipe into the hollow shaft from the outside of the furnace, until its extremity is close to the closed bottom of the hollow shaft.

The stream of water will then be discharged into the bottom or closed end of the shaft, and will flow back through the annular space be-

tween the two pipes to the outside, where it is discharged.

My invention also relates to an improved device for protecting the shaft, and its arms or sweeps, from the corroding action of the fumes of sulphur, which are generated in the furnace, including also an improved device for securing the arms or sweeps upon the shaft, and an improved arrangement for feeding the fine ore to the furnace, so as to render its operation continuous and automatic.

In order to more fully illustrate and explain my invention, reference is had to the accompanying drawings, in which—

Figure 1 is a perspective view of my device with the front broken away. Fig. 2 shows enlarged views of parts of the machine.

Let A represent the shell or inside wall of a stack or shaft furnace, inside of which two or more shelves or partitions, B B, are placed at intervals apart, one above another, so that the ore can be dropped from one shelf to the other by arms or sweeps C C, which are secured to an upright rotary shaft, D. The lower end of this shaft D terminates inside of the furnace, while its upper end extends above its top, as shown. In order to protect the shaft D and its arms C C, from the corroding action of the sulphurous fumes generated in the furnace, I coat or cover them with enamel or other material or substance, which will resist their action. For the purpose of keeping this rotary shaft cool, I lead a pipe, E, from the pump F, or other source of water-supply, and pass it down inside of the hollow shaft until its extremity is near the closed lower end of the shaft. This pipe E must be smaller than the hole in the shaft, so that an annular space will be left around it, through which the water can pass upward and be discharged from the upper end of the shaft into a dish, g, which surrounds its upper end, and from which it is conducted away through a waste-pipe, h. In the present instance I have represented a dish attached to the upper end of the shaft, which overflows into the dish g, but the upper dish is not necessary, if the shaft passes directly up through the middle of dish g.

I thus provide a constant stream of water inside of the shaft E, which will keep it cool,



and prevent the unequal expansion arising from the difference in temperature between the lower and upper ends of the shaft.

The arms or sweeps *cc* I secure to the shaft by means of a sectional hub composed of the two parts *ii*, to one of which the arm or sweep is attached. One of these parts has a groove, *O*, in it, which engages with a rib, *p*, on the shaft, while the two parts of the hub are secured together by means of lugs *SS*, and bolts or rivets. This arrangement permits me to remove and replace either of the arms without disturbing the shaft.

In order to keep these arms or sweeps cool, I make them hollow, and in securing them to the shaft, I have a small nozzle, *y*, projecting from the hollow shaft, which enters each hollow arm, so that a circulation of water is kept up in the arm. Cement is used to make a tight joint, and prevent leakage.

My device for feeding the ore to the furnace consists of an endless belt, *Q*, which is provided with buckets *r*, similar to an ordinary elevator-belt, the lower end of which passes around a drum inside of a box, *T*, while its upper end passes around a drum, *V*, a little above the hopper *M*, which feeds the furnace. A spout, *N*, at one side of the box *T*, directs the fine ore which is deposited in it into the box. The elevator-belt raises it, and deposits it into a spout, *W*, which conducts it into the feeding-hopper *M*, from which it passes to the furnace.

It will be seen that this device is especially adapted for feeding fine ore to furnaces of this construction, as it will raise and feed the ore slowly and uniformly, so as to deliver it to the shelves as fast as they may require it.

All of these improvements are important in this class of furnaces, as I have demonstrated by their practical application.

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

1. In combination with the hollow shaft *D*, supplied with a constant stream of water, and provided with the projecting nozzle *y*, the hollow arms *cc*, substantially as and for the purpose described.

2. The furnace *A*, having the shelves *B B*, in combination with the hollow shaft *D*, with its arms or sweeps *C C*, pump *F*, water-pipe *E*, dish *g*, and waste-pipe *h*, all combined and arranged to operate, substantially as above specified.

3. The arms or sweeps *C C*, having the two parts or sectional hub *ii*, arranged to be secured in place by means of the groove *O*, lugs *SS*, and bolts or rivets, substantially as and for the purpose described.

HENRY H. EAMES.

Witnesses:

GEO. H. STRONG,  
JNO. L. BOONE.