

W. BUSHNELL.
 Improvement in Roasting and Desulphurizing Furnaces.
 No. 130,841. Patented Aug. 27, 1872.

Fig. 2.

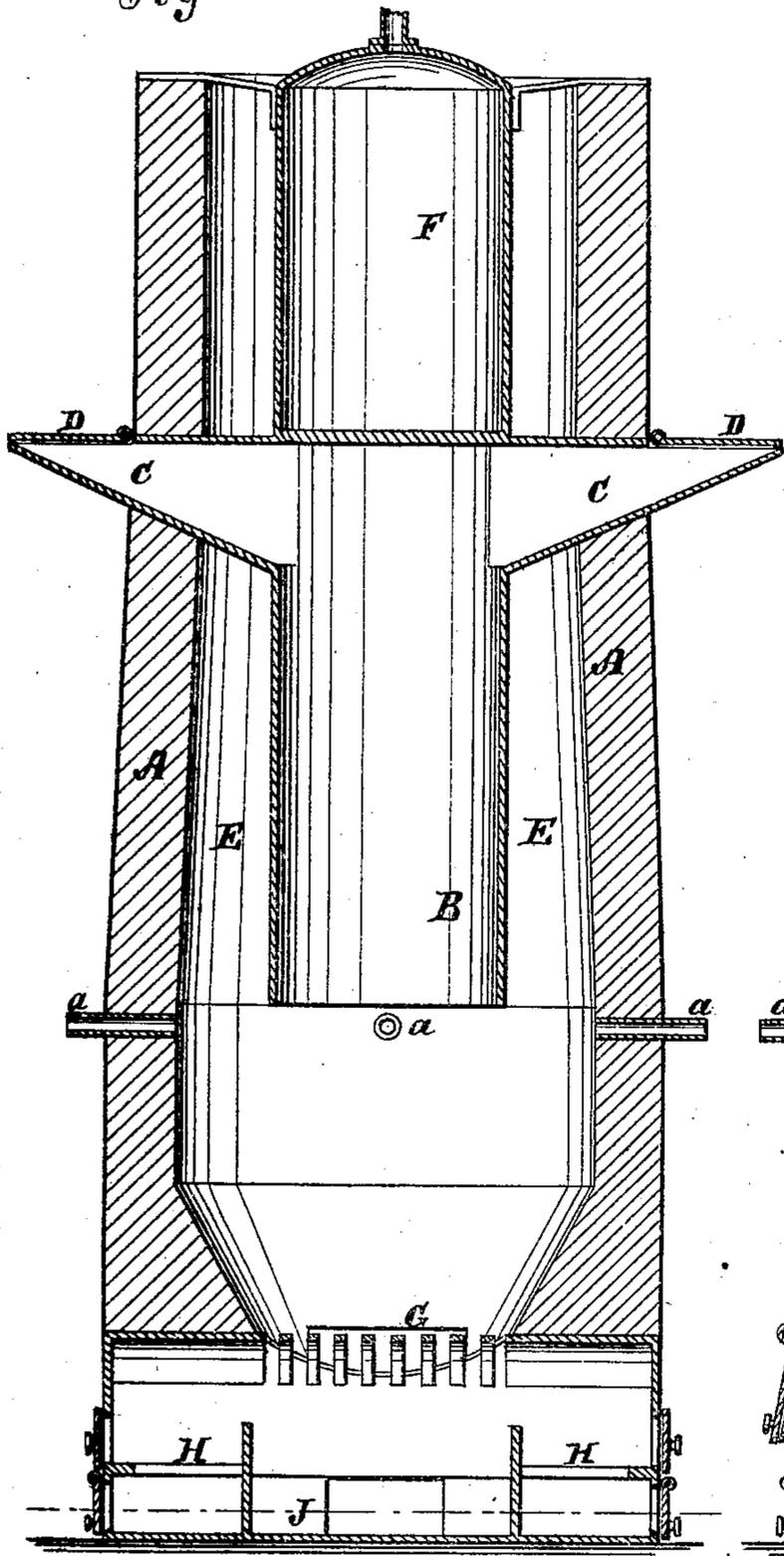


Fig. 3.

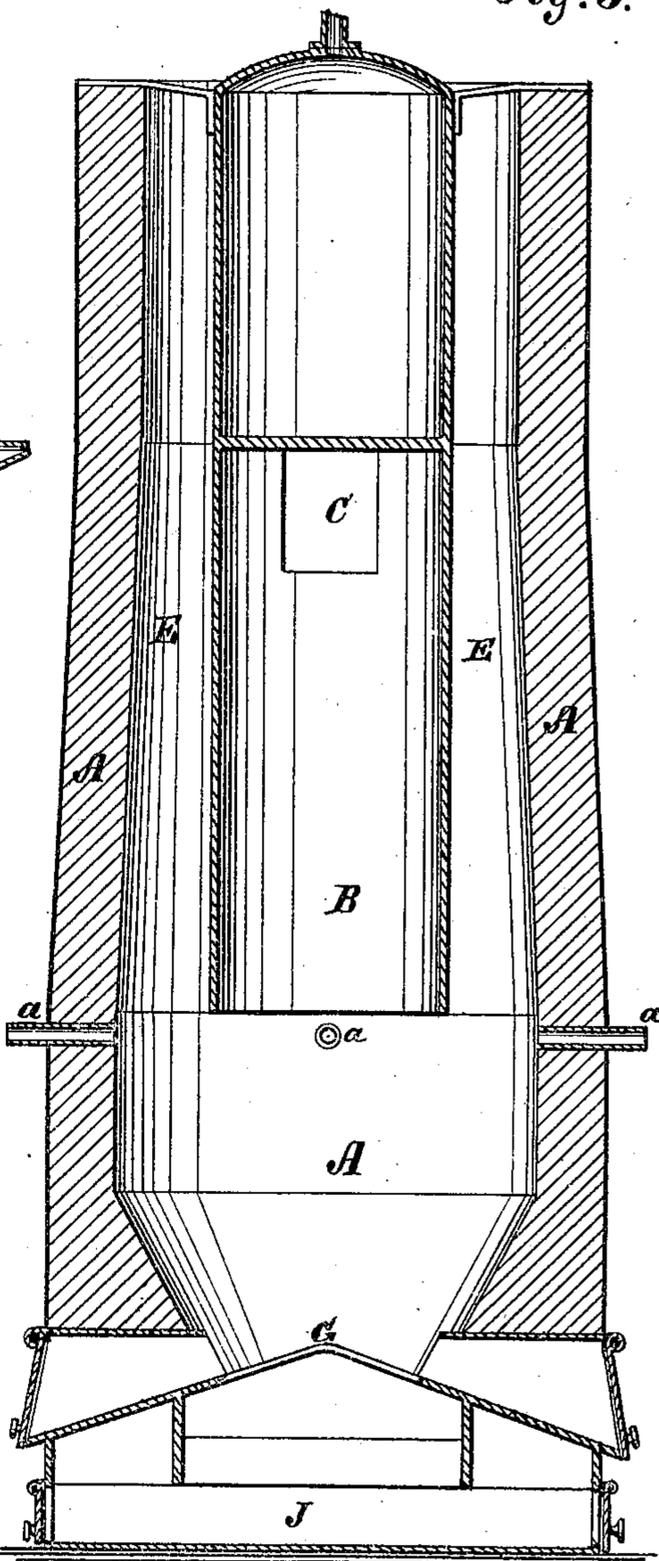
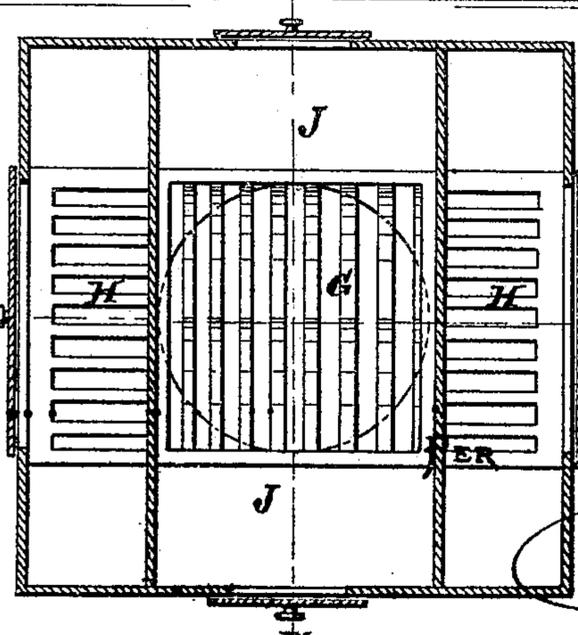


Fig. 1.



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UNITED STATES PATENT OFFICE.

WILLIAM BUSHNELL, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO HIMSELF
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IMPROVEMENT IN ROASTING AND DESULPHURIZING-FURNACES.

Specification forming part of Letters Patent No. 130,841, dated August 27, 1872.

Specification describing a new and useful Improvement in Roasting and Desulphurizing-Furnaces, invented by WILLIAM BUSHNELL, of Elizabeth, in the county of Union and State of New Jersey.

To extract a portion of the sulphur from iron ores containing a small per cent. thereof, and thus, in some degree, improve them for smelting, is comparatively an easy matter; but to do it thoroughly and cheaply has hitherto been found impossible. The principal obstacles encountered are: First, the difficulty of maintaining a heat in the furnace sufficient to eliminate and volatilize the sulphur without causing the ore to cement or loop, and of course the moment cementation or looping takes place that moment the elimination of sulphur ceases, and whatever portion is then remaining in the mass becomes indissolubly combined with the iron, and will cling to it through all its future uses and purposes; second, and probably the greatest difficulty is, in speedily conducting the volatilized sulphur out of the ordinary furnace after it has been set free from the lower stratum of ore, as in passing up through the cooler stratum it is again taken up and carried back to the hotter parts of the furnace; and thus a constant struggle is kept up between the upper and the lower parts of the furnace, delaying the process of desulphurization, wasting fuel, and enhancing the cost of the work.

To overcome these difficulties and to perform the service rapidly, thoroughly, and economically, is the aim and object of this invention, which I will now proceed to describe.

In the accompanying drawing, Figure 1 represents a horizontal section of the ground plan of the furnace looking upward, showing the location of the fire-grates used in starting the furnace in operation, (afterward to be dispensed with,) and also showing the grates supporting the ore and coal. Fig. 2 represents a vertical section of the interior of the furnace-stack through the center of the fire-grates, showing the in-walls and the charging-tube through which the ore and coal are charged into the furnace, together with the annular space or chamber surrounding the tube and boiler. Fig. 3 represents a vertical section of the interior of the furnace-stack through the

center of the opening for discharging or withdrawing the desulphurized and roasted ore. These two latter figures also show the pit or receptacle for receiving the small pieces of ore which chance to fall through the grate.

Similar letters of reference indicate corresponding parts.

In constructing my improved desulphurizing and roasting furnace I follow any of the ordinary and well-known plans adopted in building iron-works, making the wall of the stack of stone or brick, and properly banding them with iron bands, or using an outer casing or shell of boiler or flue plate and lining it with brick, &c. The charging-tube B I make of cast-iron in the similitude of a cast-iron pipe, with two or more branches or throats, C, through which the ore and coal are fed into the main tube. These branches or throats have doors or covers, D, whereby they may be kept closed, except while the feeding or charging is being performed. The tube I make of a length equal to about one-third the height of the stack, and of a diameter equal to about one-half the interior diameter of the stack, more or less, and suspend it by means of the branches or otherwise perpendicularly in the center of the stack, with its lower end on a level with the upper edge of the widest part of the interior of the stack, thereby creating an open annular space or chamber, E, between the in-walls of the furnace and the tube. The upper end of the tube I close tightly by placing upon it and properly fastening to it, in a vertical position, a plain cylinder boiler, F, of the same diameter as the tube, and of sufficient length to reach to or a little above the top of the stack, thereby extending the annular space or chamber formed around the charging-tube to the top of the stack, and thus securing, when the furnace is in operation, a highly heated, unobstructed, and direct outlet, through which the volatilized sulphur will flow rapidly and regularly as fast as it is set free from the ores in the lower part of the furnace, and at the same time provide the means for introducing the raw ore and coal into the very bowels or hottest part of the furnace, very greatly to the economy of fuel and the rapid and complete roasting and desulphurization of the ores. Or, instead of the cast-iron tube and the plain cylin-

dricul boiler, I use a charging-tube made of boiler-plate, in the similitude of a single-flue boiler, of the proper outer and interior diameter, with the necessary branches or throat, arranged as and for the purposes hereinafter described, and closing up the flue in the boiler just above the branches or throats so as to make that portion forming the charging-tube as nearly air-tight as possible. The object for which the boiler in either case is designed is to generate steam for injecting into the furnace-stack at the points *aa* to assist in the desulphurization of the ores, as well as for any other purpose requiring steam about the premises. *J* is the pit below for receiving the droppings through the grate *G*.

This invention is not confined to roasting and desulphurizing iron ores, but is especially adapted to and designed for treating any and all classes of ores containing sulphur.

In operating my desulphurizing and roasting furnace, I commence by charging carefully a layer of coal upon the grates *G* and placing upon it a layer of ore, and thus alternate with a stratum of coal and a stratum of ore, until the furnace is full up to the lower end of the charging-tube; and next I fill the charging-tube in same manner, graduating the quantity of coal in accordance with the character of the ore, being careful not to use too much coal. I then make fires in the fire-grates

H and keep them up until the coal in the stack is fairly ignited, when they are allowed to go out. The charging of the furnace is thereafter performed through the throats of the charging-tube, taking care to keep the tube constantly full. The gases generated in the lower part of the furnace pass up through the ore and coal, gradually intensifying until they reach the surface of the main body of the ore at the commencement of the annular chamber, when they burst into flame, and seizing upon the vaporized sulphur carry it speedily into the atmosphere—a result attained by the use of the charging-tube and the open annular chamber surrounding the tube and the boiler, and not reached by any other known plan.

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

1. The combination of a boiler with the charging-tube, substantially as and for the purposes described.

2. Both the charging-tube and the boiler, in combination with the stack of the furnace, for the uses and purposes substantially as described.

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