

H. BRADFORD.

Roasting Ores.

No. 43,363.

Patented June 28, 1864.

Fig. 1.

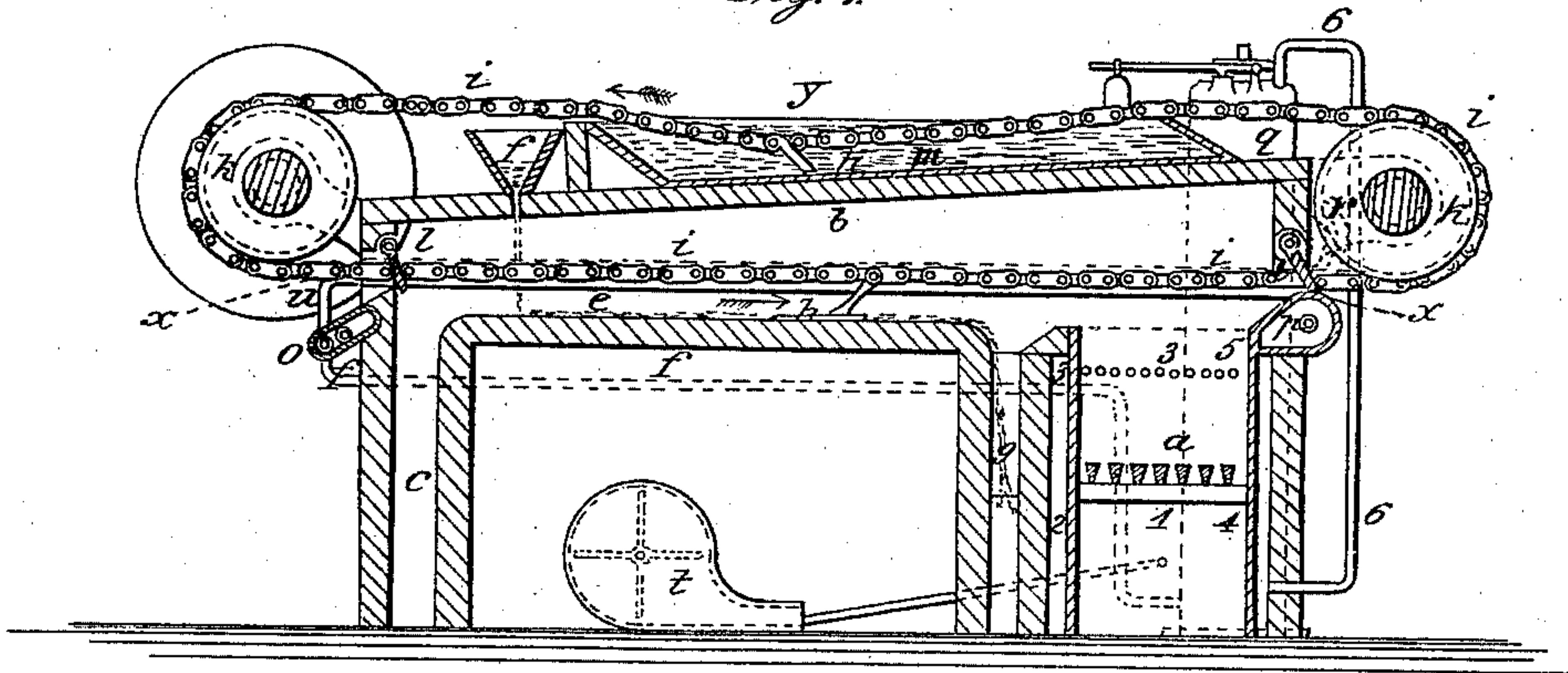


Fig. 2.

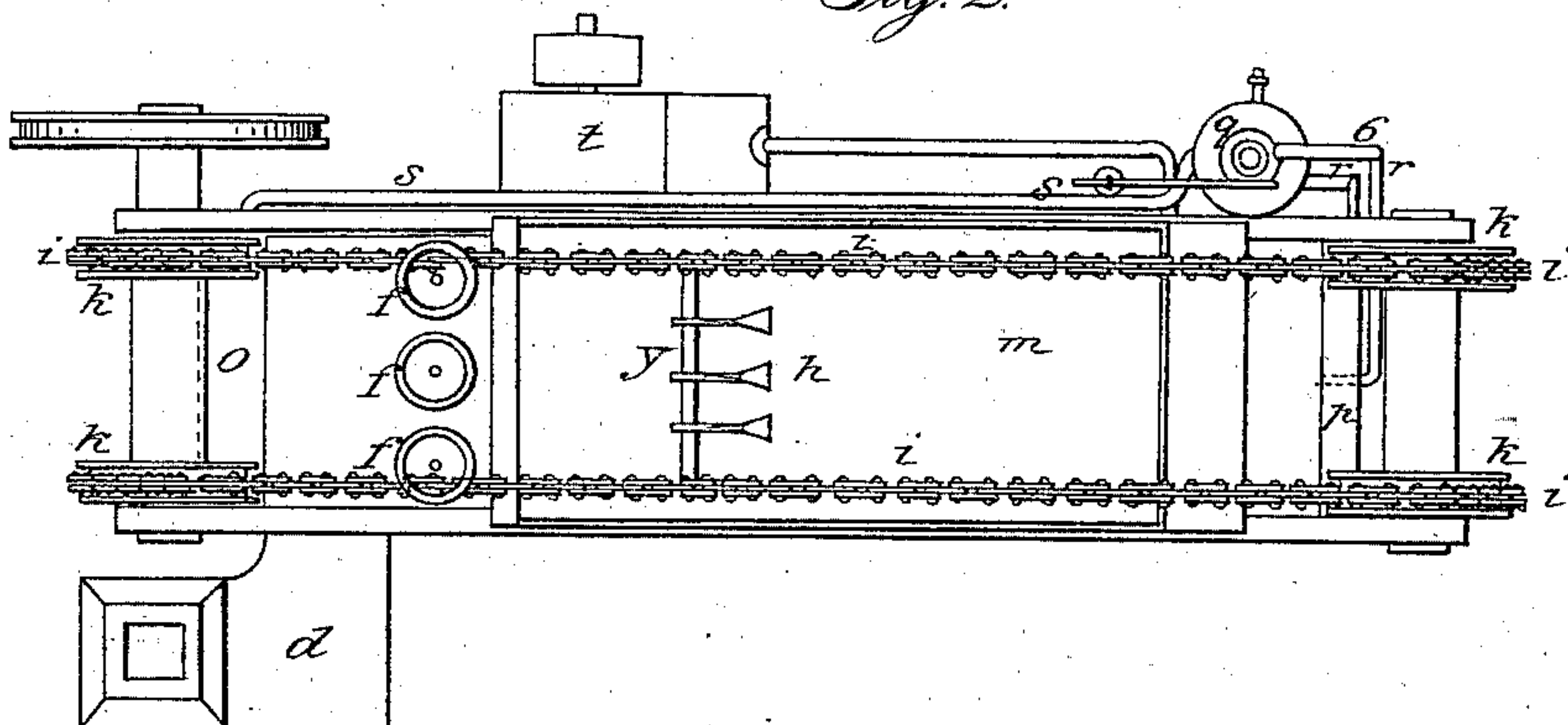
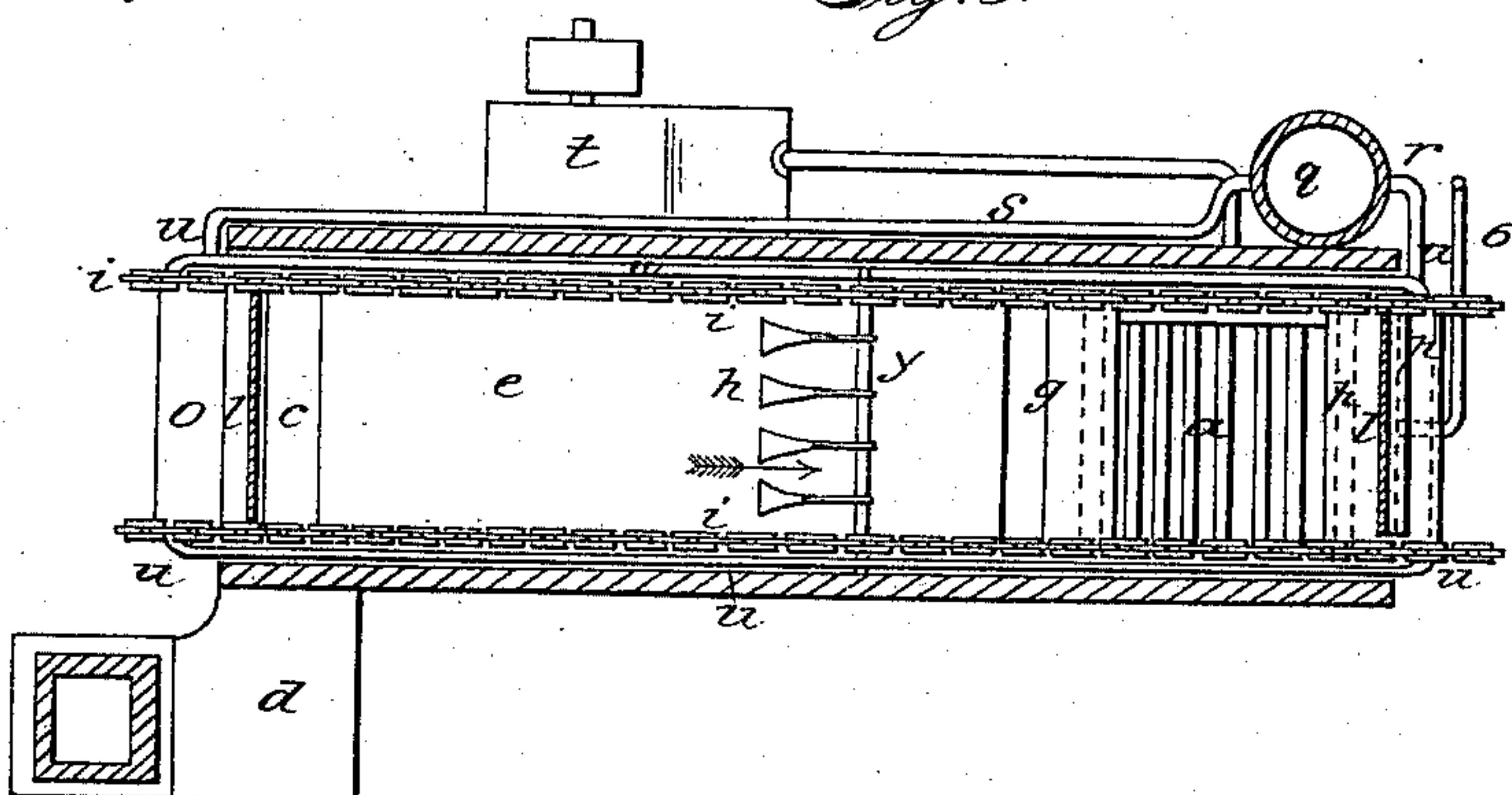


Fig. 3.



Witnesses:

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HEZEKIAH BRADFORD, OF NEW YORK, N. Y., ASSIGNOR TO HORATIO BOGERT, OF SAME PLACE.

IMPROVEMENT IN DESULPHURIZING ORES.

Specification forming part of Letters Patent No. 43,363, dated June 23, 1864.

To all whom it may concern:

Be it known that I, HEZEKIAH BRADFORD, of the city and State of New York, have invented, made, and applied to use a certain, new and useful Improvement in Desulphurizing Ores; and I do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawings, making part of this specification, wherein—

Figure 1 is a vertical section of said improvement. Fig. 2 is a plan of the same, and Fig. 3 is a sectional plan at the line *x x*.

Similar marks of reference denote the same parts.

The nature of my said invention consists in a hearth upon which the ore to be desulphurized is supplied, in combination with a series of agitators which cause a thorough stirring of the pulverized ore, and a gradual movement of the same from the supply end of the hearth to the delivery end, whereby the ore is moved along gradually and regularly from the cooler part of the hearth to the hotter portions, in order that the roasting and desulphurizing may be perfectly performed. I also make use of a water-vessel to cool the stirrers, chains, and parts moving the said stirrers, and prevent their being destroyed by the heat and sulphur; and I provide a means for preventing the metallic portions of the desulphurizing-chamber from becoming too much heated, and by that means obtain a supply of steam; and I superheat said steam and introduce it into the chamber containing the desulphurizing-hearth, to aid in the complete separation of the sulphur from the ores.

In the drawings, *a* is a fire-place or furnace, from which a horizontal chamber, *b*, passes, and *c* is a descending flue to the chimney *d*.

At the bottom of the chamber *b* is the desulphurizing-hearth *e*, upon which the ore is supplied through the hoppers *f*, and *g* is an incline or chute crosswise of the apparatus, by which the ores are delivered after they have been deprived of their sulphur or other foreign substances capable of sublimation.

In order to stir the ores and cause their progression gradually from the supply to the delivery ends of the hearth, (for said hearth *e* may be any length desired,) I make use of se-

ries of stirrers *h*, hung upon cross-bars *y*, that are connected with and moved by chains *i i*, that pass around pulleys *k k*.

l l are swinging doors or flaps at the respective ends of the furnace, that allow the stirrers to pass in entering and leaving the chamber *b*, and falling close behind them and exclude cold air that would enter if said flaps were not employed. The stirrers *h* should be set so that one range passes through the ridges between the furrows formed in the ore by the passage of the previous range of stirrers, so as to thoroughly operate on the mass and expose all the particles of ore to the desulphurizing operation. The shape of each of the stirrers is to be varied as required. If a sharp narrow stirrer is used, the ores will not be drawn along over the hearth as quickly as when a wider or less acute stirrer is employed.

Above the top of the chamber *b* is a water-vessel, *m*, that is so placed that the chains *i i* and stirrers *h* may sag into and draw through the water in order to cool them. The ends of this vessel *m* are inclined, so as to prevent the stirrers *h* being caught or detained.

Above the edges of the hearth *e* are pipes *n n*—one on each side, passing from one end of the apparatus to the other—and *o* is a hollow water-vessel receiving the ends of these pipes at one end of the apparatus, and *p* is a similar hollow vessel at the other end, to which one or both said pipes are also connected. From this vessel *p* an ascending pipe or pipes, *r*, connect with the upper portion of a boiler, *q*, and a pipe, *s*, connects the vessel *o* with the lower portion of the same boiler, *q*, so that a circulation of water is maintained through the pipes *n n*, vessel *p*, and pipe *r* into the boiler *q*, and thence the water descends and rises through the circulating-pipe *s* into the vessel *o*. By this means water in the boiler *q* is heated, and the pipes *n n*, that form a protection to the brick-work at the sides of the hearth and supports for the outer ends of the sliding cross-bars *y*, are kept sufficiently cool to prevent their burning out.

I form the sides of my furnace hollow, as at 1 and 2, and introduce air into one or more of such chambers 1 and 2. Thereby the air becomes heated and passes into the desulphurizing-chamber above the fire by holes at 3 3,

in order that the combustion may be rendered perfect for saving fuel, and also preventing any injurious effects on the ores on the hearth from the presence of imperfectly-combined gases from the fire. The air may be forced in by the blower *t* or enter by the usual draft. I also introduce steam into the chamber 4 by the pipe 6, which becomes superheated and passes through the holes 5 into the desulphurizing-chamber, so as to combine with the sulphurous fumes and aid in the operation. The holes 5 should be higher than the holes 3, so that the air will commingle with the products of combustion before the steam.

It will be evident that the hearth might be raised up, so that the heat from the fire could pass below it instead of above, the heat being conducted through said hearth; and when so constructed the hearth may extend across over the furnace. In this case the steam or heated air, or both combined, can be introduced into the desulphurizing-chamber by extending those chambers 1, 2, and 4 up sufficiently to communicate through the sides or ends of the desulphurizing-chamber near the furnace. The hearth may be made of tiles, flat on the top, beneath which the flue or flues for the passage of heat are formed, and said tiles should be made with flat laps or tongues and grooves, so as to prevent the ore falling through the joints.

In this mode of applying my improvement the products of combustion can be excluded

from the desulphurizing-chamber when desired. I am also enabled to introduce air or steam, or both, into the desulphurizing-chamber and at any required temperature.

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

1. Moving the metallic ores gradually from the cooler to the hotter portions of a hearth, substantially as specified, so that the desulphurizing operation is gradually and thoroughly performed, as set forth.

2. The introduction of steam, or of steam and hot air combined, into a chamber over a hearth on which the ore is gradually heated, substantially as and for the purposes specified.

3. A series of stirrers moved by a chain, in combination with the desulphurizing-hearth, for the purposes set forth.

4. The flaps *l l*, in combination with the stirrers and desulphurizing-hearth, for allowing the stirrers to enter and leave the chamber, as specified.

5. The water-vessel *m* to cool the chains and stirrers, as set forth.

6. The arrangement of the circulating-pipes *n, r*, and *s* and vessels *o* and *p*, in combination with the boiler *q*, for the purposes set forth.

In witness whereof I have hereunto set my signature this 24th day of May, A. D. 1864.

HEZEKIAH BRADFORD.

Witnesses:

THOS. GEO. HAROLD,
CHAS. H. SMITH.