

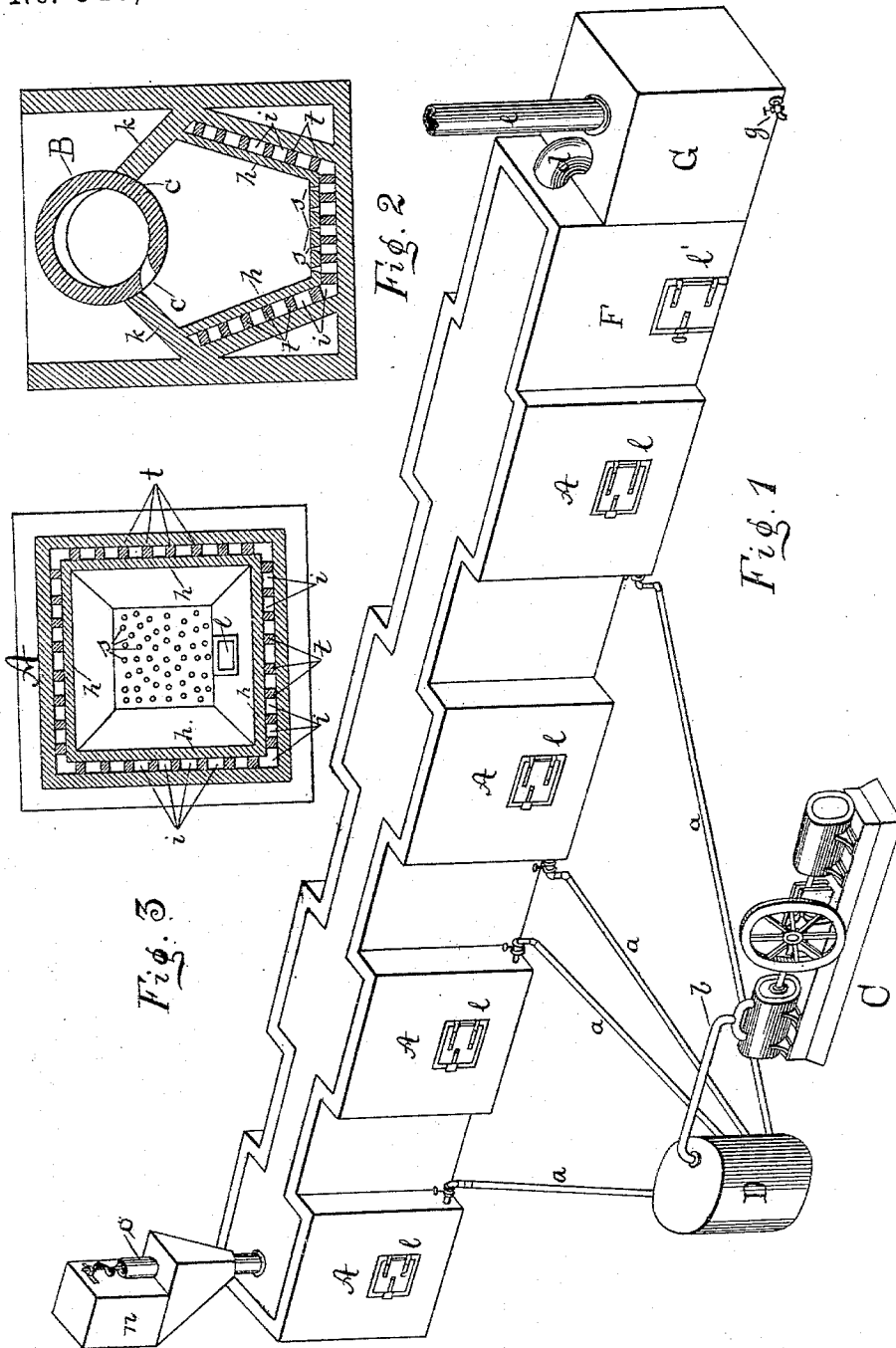
(No Model.)

2 Sheets—Sheet 1.

H. P. HOLLAND.
FURNACE FOR ROASTING ORES.

No. 546,450.

Patented Sept. 17, 1895.



Witnesses:
John J. Butler
George F. Schild

Inventor.
Henry P. Holland
for his attorney
G. M. Spruener

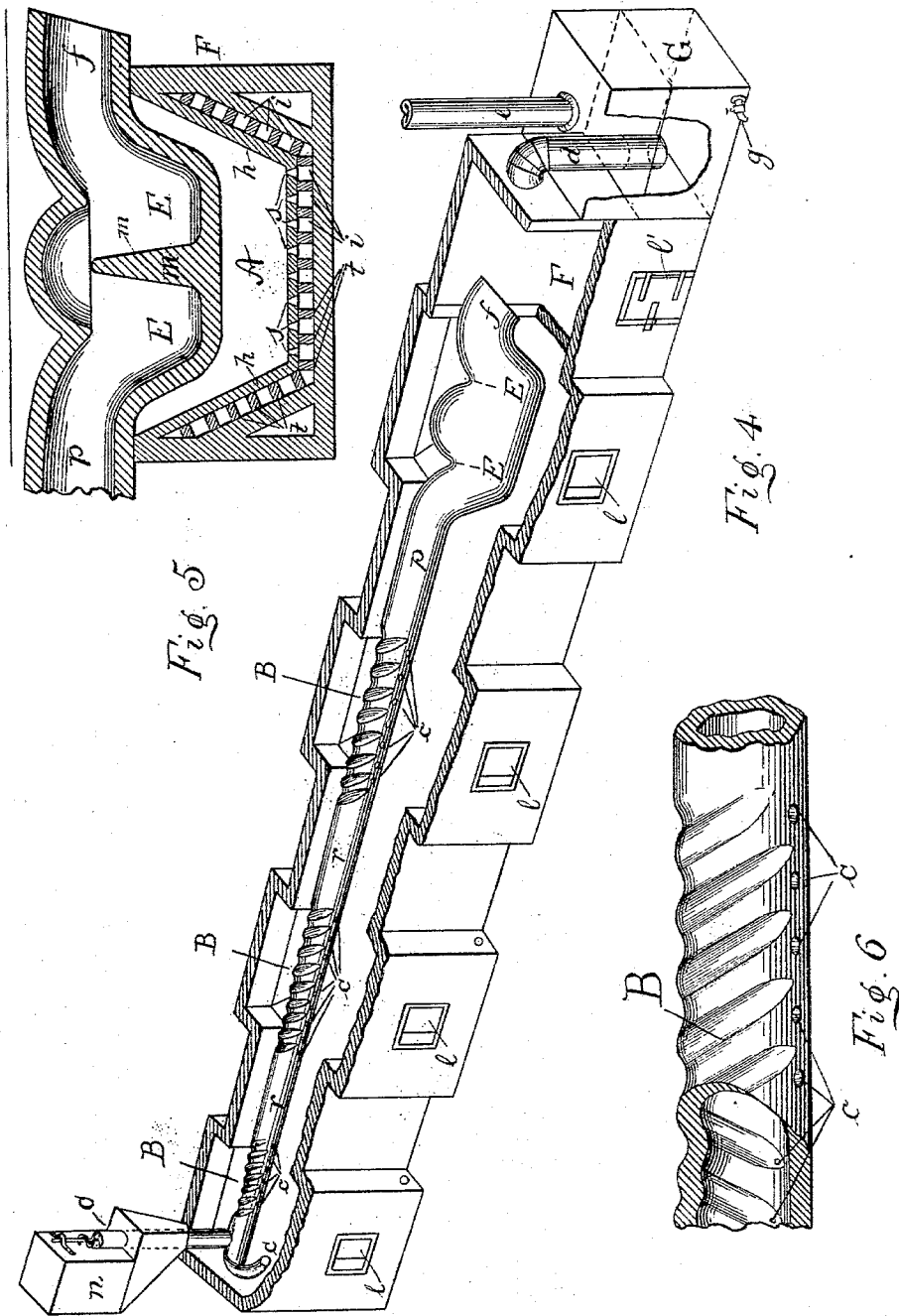
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UNITED STATES PATENT OFFICE.

HENRY P. HOLLAND, OF SAN FRANCISCO, CALIFORNIA.

FURNACE FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 546,450, dated September 17, 1895.

Application filed October 9, 1893. Serial No. 487,699. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. HOLLAND, of San Francisco, county of San Francisco, and State of California, have invented a certain new and useful Improvement in Furnaces for Roasting Ores—viz., a blowpipe-roasting-furnace—of which the following is a specification.

My invention relates to improvements in furnaces for roasting ores, the same being operated by compressed air blown through pipes into the furnace-fires to intensify the heat, and also for moving the ore in suspension by means of compressed air forced into the worm, raising the fine particles of ore by the force of the compressed air and more or less separating them and carrying them in suspension, passing the ore through a worm construction extending from the ore-feeder through the furnace to a double kettle therein, said worm being so constructed in the inside of the furnace that it may be completely enveloped in flame, having a small flue entering the bottom part of each coil, into which the compressed air and flame filling the furnace is forced by the air-compressor or blower from outside, and by which means the ore in the worm is subjected to the intense heat of the flame, both from within and without the worm, and is carried forward by the force of the air from the flues through the worm into the double kettle at the end of it, where it is subjected still further to the intensest heat, and from there it is forced and carried forward into the receiver at the far end of the furnace, being thoroughly roasted from its passage through the worm and the double kettle. The worm through which the ore is carried by compressed air is constructed partly in coils and straight parts, for this reason: The coils of the worm prevent a too rapid passage of the ore through it, so as to give more time for roasting. The straight parts of the constructions are provided so as to give the ore a chance to get an impetus to aid in carrying it forward through the next coils. The ore is carried in suspension by the force of the compressed air, as sand is carried in the air in a sandstorm. It is caught up and carried with great force by the wind force. The smoke and gases as they pass into the water-tank are washed or puri-

fied and pass off from the tank through escape-pipes therein. The fire-boxes are surrounded by a double wall, and underneath them, providing an air-chamber, into which the air is forced by the air-compressor through air-receiver D and pipes *aaaa*. The double kettle is for the purpose of checking the ore in its passage to the receiver, that it may be subjected to greater heat, and is constructed with the division-wall, as seen, for a partial detention of the ore for that purpose. The receiver F is simply the receptacle for the ore when it arrives therein fully roasted. The ore is fed into the end of the worm at the front and upper end of the furnace through the feed-hopper, being regulated by a revolving screw-shaped carrier operated by belt connected with shafting.

The object of my invention is to provide an ore-roasting furnace that will roast ore rapidly, subjecting it to intense heat, by means of the air-compressor, air-receiver, and the blowpipes, by which the furnace-fires are intensified to a fierce heat for a rapid roasting of the ore, providing, also, for the speedy moving and handling of the ore by compressed air. I attain these objects by the mechanism illustrated by the following drawings:

Figure 1 is a perspective view of the roasting-furnace, showing the ore-feeder, the fire-boxes, the ore-receiver, the water-tank, the air-compressor, the air-receiver, and the air-pipes connecting it with the four fire-boxes. Fig. 2 is a section through one of the fire-boxes and the worm, showing the air-spaces in the hollow walls and under the bottom of the fire-boxes, the supports of the worm, and also the blow pipe-passages in the same. Fig. 3 is a horizontal section through one of the four fire-boxes, showing the double walls, the supports of the inner wall, the air-spaces between the walls, and the compressed-air passages in the bottom of the fire-boxes. Fig. 4 is a perspective view of the roasting-furnace with the top and part of the front wall broken away, showing whole length of the worm, the ore-feeder by means of which the ore enters the worm, the blowpipe-passages in the same, the double kettle, the ore-receiver, into which the worm discharges the ore, and the water-tank, into which the smoke

and gases enter and from which the gases escape into the air. Fig. 5 is a cross-section through the fourth fire-box containing the double kettle, showing the division wall. Fig. 6 is a section of the worm, showing its construction and the passages through which the compressed air and flames enter the worm.

A represents the four fire-boxes under the worm; B, the worm construction through which the ore passes; C, air-compressor; D, air-receiver into which the air is forced from the air-compressor; E E, double kettle into which the ore is delivered from the end of the worm; F, ore-receiver into which the ore is discharged from the double kettle; G, a water-tank into which the smoke and fumes of the furnace pass through pipe *d* and escape in gas through gas-escape *e*; *a a a a*, air-pipes conveying compressed air from the air-receiver into the air-space in the double walls of the furnace and from there, after being heated, under the fire-boxes; *b*, air-supply pipe conveying compressed air from the air-compressor to the air-receiver; *c c c c*, air and fire flues entering the bottom of the coils of the worm; *f*, pipe connecting double kettle and ore-receiver; *h h*, inner wall of the furnaces; *i i i i*, air-spaces under fire-boxes and between the double walls of the furnaces; *k k*, supports under the worm; *l l l l*, furnace-doors; *m*, division of double kettle; *n*, ore-feeder at the upper end of the furnace; *o*, screw-carrier regulating ore-feed as it is fed into the worm; P, discharge end of worm into double kettle; *r*, straight parts connecting the worms; *s s s s*, blowpipes in the bottom of the fire-boxes through which the compressed air is forced under the fire after being heated between the double walls; *t t t t*, supports under fire-boxes and the inner walls of the furnaces; *u*, discharge of ore-receiver.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. An ore roasting furnace consisting of the ore feeder, *n*, for feeding the ore into the worm; the screw, *o*, for regulating the passage of the ore from the feeder to the worm; the worm B, having straight lengths, *r*, between the sections of the worm and extending from the ore feeder to the double kettle through which worm and straight lengths the ore is carried from the ore feeder to the double kettle by the force of the compressed air forced into said worm; the double kettle, E E, having division, *m*, into which the ore is delivered from the worm discharge, P, and is subjected therein to intense heat; the ore receiver, F, into which the roasted ore passes from the double kettle through pipe, *f*; the ore discharge, P, and pipe, *f*; the water tank, G, into which the smoke and gases pass and are washed; the gas escape pipe, *e*, for conducting off the gases from the water tank; the air and flame flues, *c c c c*, entering the lower part of the coils of the worm through which compressed air and flame are forced for car-

rying the particles of ore forward in suspension, and at the same time roasting them; the fire boxes, A; the inner walls of the furnace, *h h*, forming with the outer wall spaces for compressed air; the air spaces, *i i i*, under the fire boxes and between the walls; the supports, *k k*, under the worm, and *t t*, under the fire boxes; the air passages, *s s s s*, under the fire boxes, through which compressed air is forced into the fire boxes; the pipes, *a a a a*, conducting compressed air from the air receiver to the furnace; the air receiver, D; the air supply pipe, *b*, for conveying compressed air from the air compressor to the air receiver; and the air compressor, C; substantially as herein described and set forth.

2. In an ore roasting furnace, the combination of the worm, B, having the straight lengths, *r*, through which the ore is carried and roasted; the fire and flame flues, *c c c c*, entering the lower parts of the coils of the worm through which compressed air and flame are forced for carrying the particles of ore forward in suspension, and at the same time roasting them; the ore feed, *n*; the screw, *o*, for regulating the passage of the ore from the ore feeder to the worm; the double kettle, E E, at the end of the worm for subjecting the ore to greater heat, having division, *m*; the ore receiver, F, into which the roasted ore is discharged from the double kettle; the connecting pipe, *f*; the water tank, G, in which the smoke and gases are washed; the gas escape pipe, *e*; with the air compressor, C; the air supply pipe, *b*; the air receiver, D; the air conductors, *a a a a* for conveying compressed air to the furnace; the air passages, *s s s s*, through which the compressed air is forced into the fire boxes; the fireboxes, A; the air spaces, *i i i*, under the fire boxes; the inner walls of the furnace, *h h*; the supports, *k k*, under the worm, and *t t* under the fire boxes,—substantially as herein described and set forth.

3. In an ore roasting furnace, the combination of the worm, B, having straight parts, *r*; and the air and flame flues, *c c c*; the discharge, P; the double kettle, E E, into which the ore is discharged from the worm and subjected to intense heat; the ore feeder, *n*; the screw, *o*, for regulating the passage of the ore from the ore feeder to the worm; the receiver, F, for receiving the roasted ore from the double kettle; the ore discharge, P, and pipe, *f*; the air compressor, C; the supply pipe, *b*; the air receiver, D; the air passages, *s s s*, under the fire boxes through which the compressed air is forced into the fire boxes; the fire box, A; the inner wall *h h* the air spaces, *i i*, under the fireboxes and between the walls of the furnace; the supports *k k*, under the worm, and *t t* under the fire boxes; with the water tank, G; and gas escape pipe, *e*,—substantially as herein described and set forth.

4. In an ore roasting furnace, the combination of the passages, *s s s*, in the bottom of

the fire boxes through which compressed air is forced therein; the inner wall *h h* the air spaces, *i i* under said fire boxes and between the inner and outer walls of the furnace; the supports, *k k*, under the worm and *t t* under the fire boxes; the air pipes, *a a a*, conveying compressed air from the air compressor to the furnace; the air receiver, D; the air supply pipe, *b*, conveying compressed air from the air compressor to the air receiver; with the compressed air and flame, *c c c*, entering the lower part of the coils of the worm, through which compressed air and flame are forced into the worm, roasting the ore and moving the particles of ore in suspension through the worm; the worm, B, through which the ore is conveyed by compressed air, and at the same time roasted therein; the ore feeder, *n*; and the screw, *o*, for conveying and regulating the ore being fed into the worm; the discharge, P; the double kettle E E, into which the ore is discharged from the worm; the receiver, F, into which the ore is discharged from the double kettle; the connection *f*, the water tank, G, and the gas escape, *e*, for conducting off the gases from the tank, substantially as herein described and set forth.

5. In an ore roasting furnace, the combination of the double kettle, E E, through which the ore is carried by compressed air as it is discharged from the worm; with the ore receiver, F, for receiving the roasted ore from

the double kettle; the water tank, G; the gas escape pipe, *e*, for conducting off the gases from the water tank; the kettle connection, *f*; the division, *m*, in the double kettle for the purpose of retarding and retaining the ore in its passage to the receiver in intense heat; the ore feeder, *n*, and screw regulator, *o*, for conveying the ore feed to the worm, and regulating the same in its passage thereto; the worm, B, through which the ore is conveyed in compressed air and roasted; the air and flame flues, *c c c*, entering the lower part of the coils of the worm through which compressed air and flame are forced for moving the particles of air forward in suspension, and at the same time roasting the ore; the air spaces, the inner wall *h h i i*, under the fire boxes, and between the walls of the furnace; the fire boxes, A; the supports, *k k* under the worm, and *t t* under the fire boxes; the air pipes, *a a a*, conducting the compressed air from the receiver to the furnace; the air receiver, D; the air supply pipe *b*, conveying compressed air from the air compressor to the receiver; and the air compressor, C,—substantially as herein described and set forth.

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Witnesses:

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