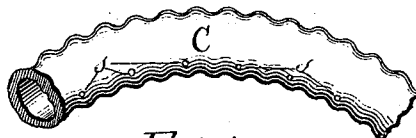
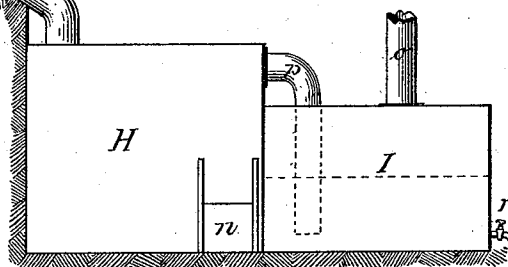
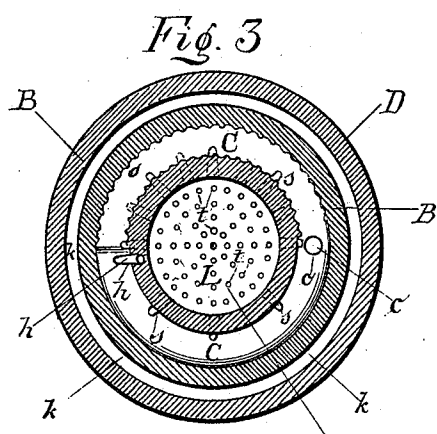
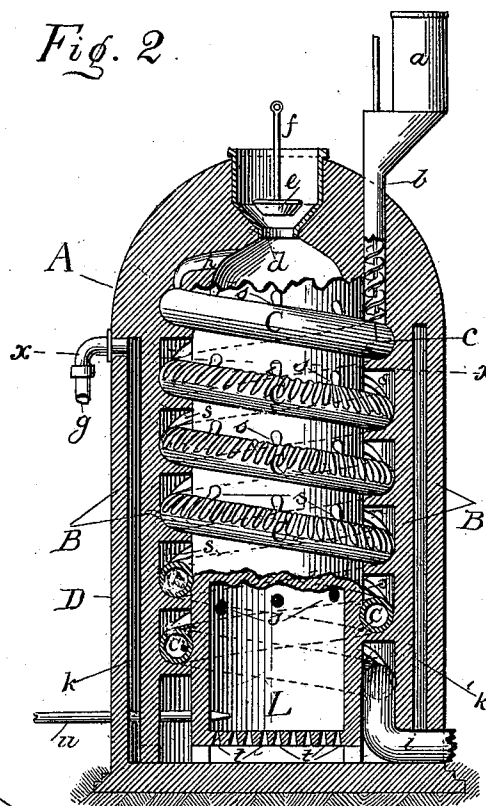
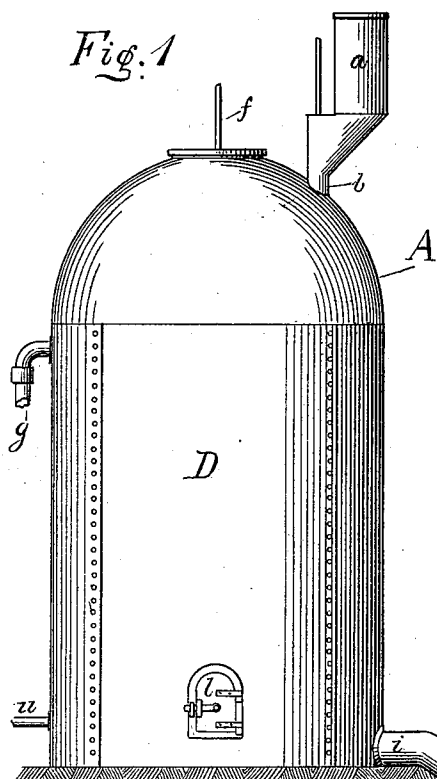


(No Model.)

H. P. HOLLAND.
ORE ROASTING FURNACE.

No. 544,761.

Patented Aug. 20, 1895.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY P. HOLLAND, OF SAN FRANCISCO, CALIFORNIA.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 544,761, dated August 20, 1895.

Application filed November 13, 1893. Serial No. 490,854. (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 Ore-Roasting Furnaces—viz., an upright blasting ore-roasting furnace—of which the following is a specification.

My invention relates to improvements in blasting ore-roasting furnaces, the same being constructed in an upright position, having the fuel-charger of said furnace introduced through an opening in the top so constructed that it may be tightly closed by a stopper or plug fitting into said aperture, said furnace being provided with a pipe entering the fire-box at the top for feeding oil as fuel to the furnace-fires, having also an ore-feeder at one side of the fuel-charger through which the ore is fed into the upper end of a worm-shaped roaster constructed from the top to the bottom of the furnace, circling around the wall of the fire-box on its outside, having hot air and flame-tuyeres entering it from said fire-box, slanting downward into the same, through which flues and through one entering the mouth of the worm hot compressed air and flame are forced into the worm for roasting and carrying the ore in suspension through the same to an ore-receiver connected with said furnace, the fine particles of ore being lifted and carried by the whirling force of the compressed air. The fumes and smoke are conducted from the receiver into a water-tank, from whence they escape as gas through an air-escape pipe into the open air. Compressed air is conducted by a pipe leading from an air-receiver and air-compressor to the top of the furnace, where it enters the air-chamber, which is the space formed between the wall of the furnace and the wall of the fire-box and extending under the bottom of the fire-box, where are located the tuyere-holes opening into said fire-box, and through which the compressed air in the chamber is forced into and upon the fire for the purpose of intensifying the flame, and also for forcing hot compressed air and flame through the air and flame tuyeres into the worm for roasting and conveying the ore in suspension through the worm into the receiver. The ore from the ore-feeder is conducted into the upper end of the worm by

means of a revolving screw-shaped regulator operated by controlling the supply of ore in its passage to the mouth of the worm.

The object of my invention is to provide an upright ore-roasting furnace by means of which ore may be speedily moved and roasted while in suspension, being operated by means of compressed air. A great heat is produced by the tuyeres in the bottom of the fire-box, and as the hot compressed air and flame are forced through the flues into the worm the ore is roasted in a few seconds while being carried in suspension through it to the receiver. I attain these objects by the mechanism illustrated by the following drawings.

Figure 1 is an elevation of the ore-furnace, showing its connection with the ore-receiver and water-tank; Fig. 2, a section through the ore-furnace, showing the threaded worm around the fire-box, air-chamber between walls and under the fire-box, also the fuel-charger, ore-feeder, and air-tuyeres; Fig. 3, a horizontal section through the ore-furnace, showing the air-chamber between walls, the tuyeres, and mouth of worm, the ore-feeder, the threaded worm, the tuyere-flues entering the worm, and the tuyeres in the floor of the fire-box; Fig. 4, a section of the threaded worm, showing the tuyere-flues.

A represents the furnace; B, the brick-work; C, the worm, threaded, through which the ore is conveyed and roasted while in suspension; D, iron casing about the ore-furnace; *a*, ore-feeder; *b*, revolving screw regulating ore-feed; *c*, ore-aperture of worm; *d*, fuel-charger; *e*, stopper or plug closing fuel-charger; *f*, lift or handle to stopper; *g*, pipe conducting compressed air to air-chamber between the walls of the furnace; *h*, pipe conducting hot compressed air into the upper end of the worm; *i*, worm-discharge; *k*, air-chamber in furnace-walls; *l*, door at bottom of the furnace; *H*, ore-receiver; *I*, water-tank; *m*, discharge-pipe carrying ore, when roasted, from the worm into the receiver; *n*, ore-discharge door from the receiver; *o*, gas-escape pipe; *p*, pipe connecting ore-receiver with water-tank, conveying smoke and gas fumes into water-tank; *r*, faucet for drawing off water from the tank; *s s s*, fire and flame flues through which flame and hot air are forced into the worm; *t t*, tuyeres in the floor of the

furnace, through which compressed air is forced into the fire; *u*, pipe for feeding oil when used for fuel upon the fire; *L*, fire-box of the furnace.

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

1. An upright blasting ore roasting furnace consisting of the fire box *L*., the fuel charger *d*. and *u*. the latter for feeding oil as fuel to the fire box, the stopper or plug *e*. for closing the mouth of the charger, (having lift or handle *f*.) the worm *C*, in which the ore is roasted while being carried in suspension through it
15 by means of compressed hot air and flame forced therein; the ore aperture *c*., the ore feeder *a*., the revolving screw *b*., regulating the ore feed as it passes from the feeder to the ore aperture of the worm, the pipe *g*. conducting compressed air to the air chamber *k*. between the walls and extending under the furnace from whence the air is forced through the tuyeres in the bottom of fire box; the pipe *h*. conducting hot compressed air to the
20 ore aperture of the worm *c*, for carrying the ore in suspension and forcing it through the worm to the receiver, the flues *s. s. s.* through which hot compressed air and flame are forced into the sides of the worm for conveying and
30 roasting the ore in suspension in its passage to the receiver, the worm discharge *i*., the pipe *m*., conveying the roasted ore from the worm discharge into the receiver, the ore receiver *H*., the door *n*. through which the
35 roasted ore may be discharged from the receiver, the pipe *p*. connecting the ore receiver with water tank conveying the smoke and the fumes coming from the furnace fires and the roasting ore, into the water tank, the water
40 tank *I*. by means of which the furnace gases are washed or purified, the gas escape pipe *o*., conveying the gases from the water tank into the open air; and the tuyeres *t. t.* in the floor of the fire box, substantially as herein described and set forth.

2. In an upright blasting roasting furnace, the combination of the worm, *C*; the ore aperture of said worm, *c*; the fire and flame flues, *s s s*, entering the lower portions of the worm,
50 for conveying into it flame and compressed hot air, for moving and roasting the ore which is carried in suspension by the compressed hot air; the ore feeder, *a*, for conveying ore to the ore aperture of the worm *c*; the revolving
55 screw, *b*, for regulating the ore feed in its passage from the ore feeder to the ore aperture of the worm; and the oil feeding fuel pipe, *u*, for carrying oil to the fire-box; with the pipe, *g*, for conveying compressed air to the air chamber
60 about the fire box; the tuyeres, *t t*, in the bottom of the firebox through which compressed air is forced into the fire box; the firebox, *L*; the fuel charger, *d*, in the top of the furnace; the plug or stopper, *e*, for fuel charger, *d*,
65 having handle, *f*; the pipe, *h*, for conveying hot compressed air into the mouth of the worm; the air chamber, *k*, arranged between the walls

of the furnace and under the fire box; the pipe, *m*, at the end of the worm for delivering the roasted ore into the receiver; the receiver, *H*, into which the roasted ore is discharged as it comes from the worm; the discharge, *n*, in the ore receiver; the connecting
70 pipe, *p*, for conveying the fumes and smoke into the water tank for purifying the same; the water tank, *I*; and the gas escape, *o*, in said tank for conducting the gases therefrom, substantially as herein described and set forth.

3. In an upright blasting ore roasting furnace, the combination of the pipe, *g*, for conducting compressed air from the air compressor to the air chamber; the air chamber, *k*, between the walls of the furnace about the firebox; the tuyeres, *t t*, beneath the firebox,
80 through which compressed air from the air chamber is forced into the firebox; the firebox, *L*; the fuel charger, *d*, in the top of the furnace; and the oil feeding fuel pipe, *u*; the plug or stopper, *e*, for fuel charger, *d*, having
85 handle, *f*; with the ore feeder, *a*, for conveying ore to the ore aperture of the worm; the revolving screw, *b*, for regulating the ore feed in its passage from the ore feeder to the ore aperture of the worm; the worm, *C*, through
90 which the ore is carried in suspension by the hot compressed air forced into it; the mouth of the worm, *c*, at the entrance to the worm; the pipe, *h*, conducting hot compressed air into the mouth of the worm; the fire and
95 flame flues, *s s s*, entering the lower part of the worm for conveying into it flame and compressed hot air for moving and roasting the ore which is carried in suspension by the compressed air to the receiver; the worm discharge, *i*;
100 the pipe, *m*, conducting the roasted ore from the worm to the receiver; the ore receiver, *H*, for receiving the roasted ore; the discharge, *n*; the pipe, *p*, for conveying the fumes and smoke into the water tank for
105 purifying the same; the water tank, *I*, and the gas escape, *o*, in said tank, for conducting the gases therefrom,—substantially as herein described and set forth.

4. In an upright blasting ore roasting furnace, the combination of the worm, *C*, having ore aperture, *c*; the discharge, *i*; the pipe, *m*, for conducting the roasted ore from the worm to the receiver; the fuel charger, *d*; the oil feeding fuel pipe, *u*; the plug or stopper,
110 *e*, for fuel charger, *d*, having handle, *f*; the pipe, *h*, for conveying hot compressed air into the mouth of the worm; *c*; the ore feeder, *a*; and revolving screw, *b*, for conducting and regulating ore feed in its passage to the worm;
115 the compressed air pipe, *g*, for conducting compressed air from the air compressor to air chamber; the tuyeres, *t t*, in the bottom of the fire box through which compressed air is forced into the fire box; the fire box, *L*; the
120 air and flame flues, *s s s*, entering the lower portions of the worm for conveying into it flame and compressed hot air; the air chamber, *k*, arranged between the walls of the fur-

nace and the fire-box; the ore receiver, H; the discharge, *n*; the pipe, *p*, for conveying the fumes and gases into the water tank; the water tank, I, in which the gases and smoke are purified; and the gas escape, *o*, in said tank for conducting the gases therefrom,—substantially as herein described and set forth.

5. In an upright blasting ore roasting furnace, the combination of the fire box, L, having fuel charger, *d*; and the oil feeding fuel pipe, *u*; the plug or stopper, *e*; having handle, *f*; with the compressed air pipe, *g*, for conducting compressed air from air compressor to the air chamber; the tuyeres, *tt*, in the bottom of the fire box through which compressed air is forced into the firebox; the air chamber, *k*, arranged between the walls of the furnace and under the fire box; the air and flame

flues, *s s s*, entering the lower portions of the worm for conveying into it flame and compressed hot air; the worm, C, through which the ore is carried in suspension by the hot compressed air forced into it; the discharge, *i*; the pipe, *m*, at the end of the worm for delivering the roasted ore into the receiver; the ore receiver, H, into which the roasted ore is discharged; the discharge, *n*, in the ore receiver; the pipe, *p*, for conveying the fumes and smoke into the water tank; the water tank, I, and the gas escape, *o*, in said tank, for conducting the gases therefrom,—substantially as herein described and set forth.

HENRY P. HOLLAND.

Witnesses:

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