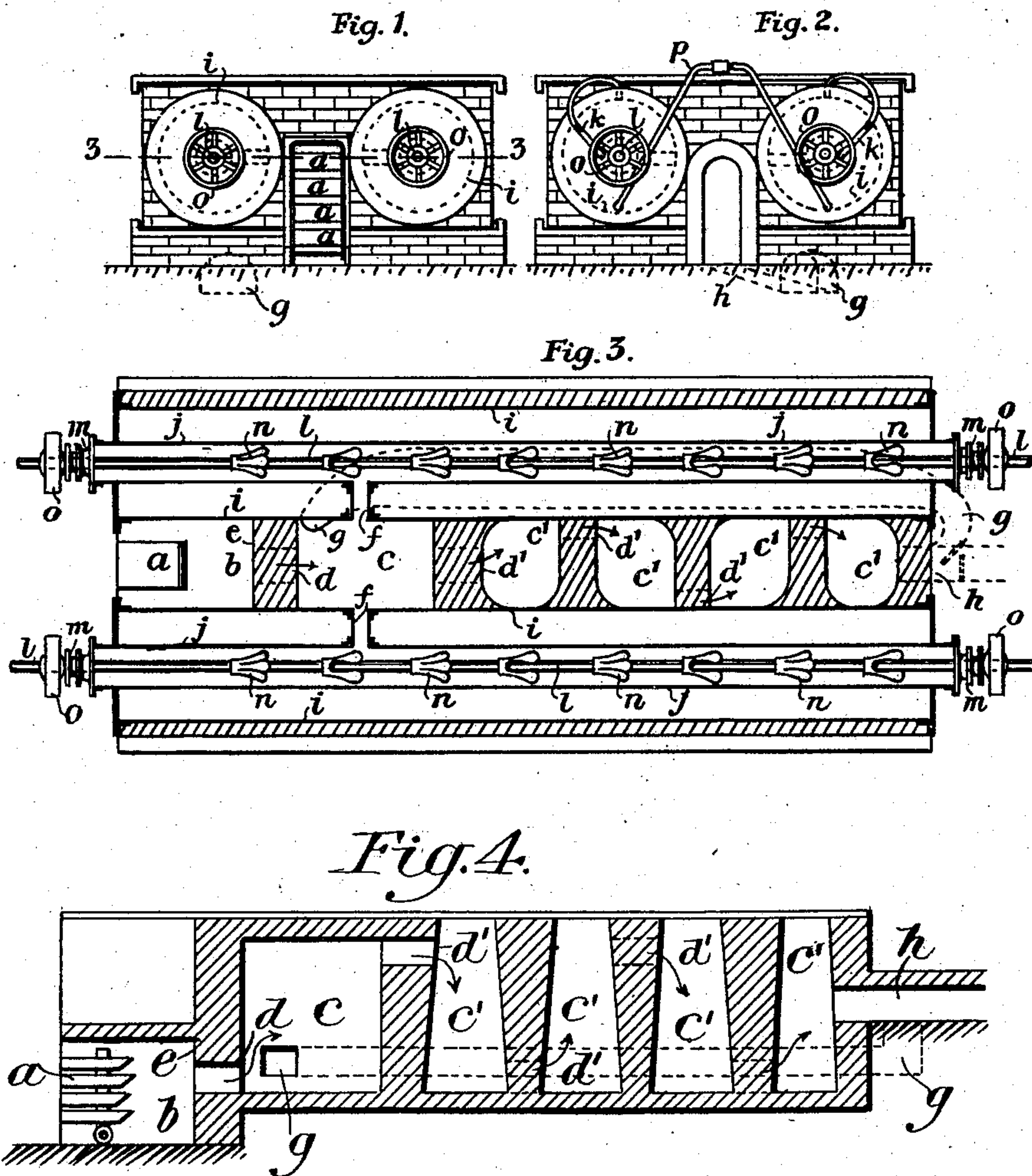


No. 741,727.

PATENTED OCT. 20, 1903.

J. T. SHADFORTH.
HIGH TEMPERATURE FURNACE.
APPLICATION FILED JULY 25, 1902.

NO MODEL.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN THOMAS SHADFORTH, OF WALKER-ON-TYNE, ENGLAND.

HIGH-TEMPERATURE FURNACE.

SPECIFICATION forming part of Letters Patent No. 741,727, dated October 20, 1903.

Application filed July 25, 1902. Serial No. 117,033. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMAS SHADFORTH, agent, a subject of the King of Great Britain, formerly residing at 9 Handel street, Westoe Lane, South Shields, in the county of Durham, but now residing at Progress Works, Walker-on-Tyne, in the county of Northumberland, England, have invented Improvements in High-Temperature Furnaces, of which the following is a specification.

My invention has for its object an improved furnace applicable for smelting and otherwise treating ores, metals, and other substances requiring high temperatures and constructed to burn petroleum or other suitable liquid hydrocarbon in conjunction with steam which is produced and superheated by the heat of the furnace itself.

I construct my furnace with a row or series of chambers, in the first of which the liquid fuel is burned, the flame of the ignited fuel passing to the second chamber, where it is mixed with the superheated steam and with part of the products of combustion tapped from the flue, the mixture producing a reducing-flame of intense heat, which then passes through the succeeding chambers, where the melting-pots or other open or closed receptacles are located.

In the accompanying drawings, Figure 1 is a front elevation of a furnace constructed according to my invention. Fig. 2 is a rear elevation of same, and Fig. 3 is a section taken on the line 3 3 of Fig. 1. Fig. 4 is a vertical section through the center of Fig. 3.

The same letters of reference where they occur are used to indicate the same parts in all the figures.

The liquid fuel is supplied from a suitable reservoir through ordinary supply-pipes to the trays *a*, located in the first or vaporizing chamber *b*, where it is ignited. The vaporizing-chamber *b* is connected with the second or combustion chamber *c* by means of a suitable flue *d* in the fire-brick or other partition *e*. Into this combustion-chamber *c* leads a branch flue *g* from the main flue *h* and a tube *f* conveying steam. The steam is produced in suitable vessels *i*, located adjacent to the furnace-chambers, so as to be heated thereby. In the drawings I have shown two

such vessels *i*, one on each side and made in the form of horizontal boilers, through the center of each of which is a steam-conduit *j*, connected to the vessel *i* by the steam-pipe *k* and fitted with a central shaft *l*, passing through suitable stuffing-boxes *m* at each end and provided with any convenient number of vanes or blades *n*. The steam-conduit *j* is connected by the tubes *f* with the combustion-chamber *c* for the purpose already described. Outside the stuffing-boxes *m* the shaft *l* is provided with a suitable pulley or other power-transmitting device *o*.

The vessels *i* are supplied with water from a suitable reservoir or constant service through the pipes *p*, and the heat of the furnace-chambers develops steam in the said vessels, which steam passes by the pipes *k* to the tubular steam-conduit *j*, where it is baffled by the vanes or blades *n* and superheated, and then passes to the outlet-tubes *f*. The vanes or blades *n* being fast on the shaft *l* will be rotated by the pressure of the incoming steam, and the power thus produced can be utilized from the pulley or other transmitting device *o*, if so desired. Instead of the shaft *l* and vanes or blades *n* any suitable arrangement may be used for baffling and heating the steam admitted from the vessel *i* to the conduit *j*, so as to insure the admission into the combustion-chamber *c* through the tube *f* of superheated dry steam only.

The flame produced by the ignited liquid fuel in the vaporizing-chamber *b* passes through the flue *d* into the combustion-chamber *c*. Here it meets with the steam issuing from the tubes *f* and with the flame or combustion-gases tapped through the branch flue *g* from the main flue *h* at the rear end of the furnace, said branch flue being fitted with a suitable damper or other supply-regulating device located at one or at both ends, as required.

In the combustion-chamber *c* the flame from the vaporizing-chamber *b* is intimately mixed with the flame or combustion-gases tapped from the main flue *h* and with the superheated steam issuing through the tubes *f*. The heat thus produced breaks the steam up into its constituent gases, which are then consumed, thereby producing a flame of great intensity

and of high reducing power. The flame produced in the mixing or combustion chamber *c* passes through suitable flues *d'* to the succeeding chambers *c'*, in which are located the melting-pots or other open or closed receptacles for the metal or other substance under treatment. The flues *d* and *d'* are arranged alternately at top and bottom and right and left sides, so as to cause the gases to pass all around the pots or other receptacles therein.

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

1. A furnace for producing a high-temperature reducing-flame, comprising a liquid-fuel-vaporizing chamber, a combustion-chamber, water vessels arranged one on each side of the vaporizing and combustion chambers, as described, connections between said vessels and the combustion-chamber, a main flue and a branch flue opening communication between the main flue and the combustion-chamber.

2. A furnace for producing a high-temperature reducing-flame, comprising a liquid-fuel-vaporizing chamber, a combustion-chamber, water vessels arranged one on each side of the said vaporizing and combustion chambers, as described, a steam-conduit in communication with each of the said vessels, a baffling device arranged in each of said conduits, a connection between each conduit and the combustion-chamber, a main flue and a branch flue opening communication between the main flue and the combustion-chamber.

3. A furnace for smelting ores and the like purposes, comprising a liquid-fuel-vaporizing chamber, a combustion-chamber, a steam-inlet to the latter, a main flue, a branch flue opening communication between the main flue and the combustion-chamber, a flue opening communication between the vaporizing and combustion chambers, a flue opening communication between the combustion-chamber and the first of a series of heating-chambers in which the smelting-pots or other open or closed receptacles are located, and flues arranged alternately at top and bottom and right and left sides and opening commu-

nication between the succeeding heating-chambers, substantially as described.

4. A furnace for smelting ores and the like purposes, comprising a liquid-fuel-vaporizing chamber, a combustion-chamber, a main flue, a branch flue opening communication between the main flue and the combustion-chamber, a flue opening communication between the vaporizing and combustion chambers, a flue opening communication between the combustion-chamber and the first of a series of heating-chambers in which the melting-pots or other open or closed receptacles are located, flues arranged alternately at top and bottom and right and left sides and opening communication between the succeeding heating-chambers, steam-generators arranged at the side of the furnace-chambers each having a central steam-conduit therethrough, a pipe connecting the steam-generator therewith, a shaft rotatably mounted in said steam-conduit, baffles or blades on said shaft, and a passage opening communication between said steam-conduit and the combustion-chamber, substantially as and for the purpose described.

5. A furnace for producing a high-temperature reducing-flame, comprising a liquid-fuel-vaporizing chamber, a combustion-chamber, water vessels arranged one on each side of the said vaporizing and combustion chambers, as described, a conduit arranged in each of said vessels, a connection between said conduits and the said vessels, a shaft arranged in each of said conduits, vanes carried by each of said shafts, connections between said conduits and the combustion-chamber, a main flue and a branch flue opening communication between the main flue and the combustion-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 7th day of April, 1902.

JOHN THOMAS SHADFORTH.

Witnesses:

THOMAS GEE,
HARRY BENSON.