No. 681,354. Patented Aug. 27, 1901.

S. M. TRAPP.

COMBINED ORE HEATING, ROASTING, AND SMELTING FURNACE.

(Application filed Aug. 22, 1900.)

(No Model.) 2 Sheets—Sheet 1.

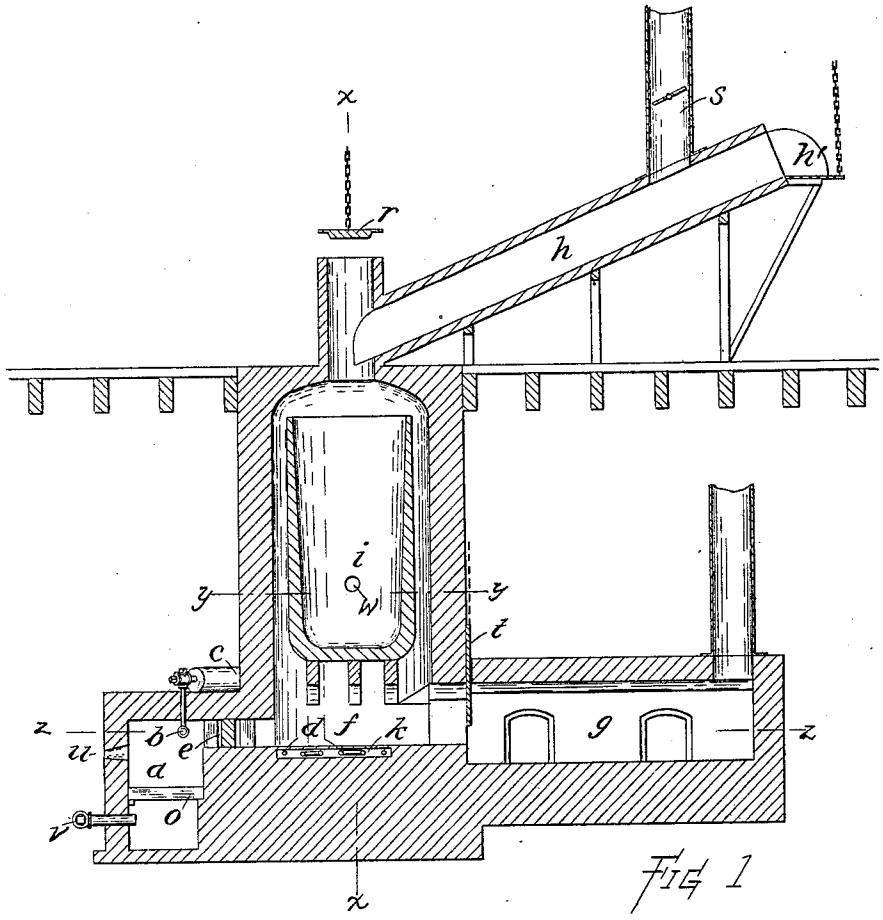

FIG 1

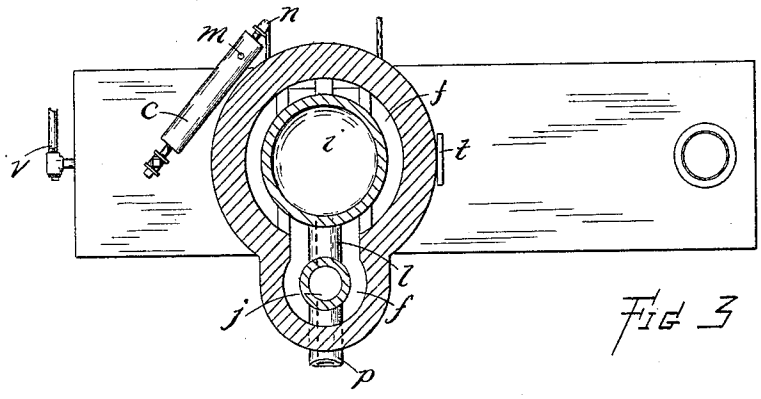

FIG 3

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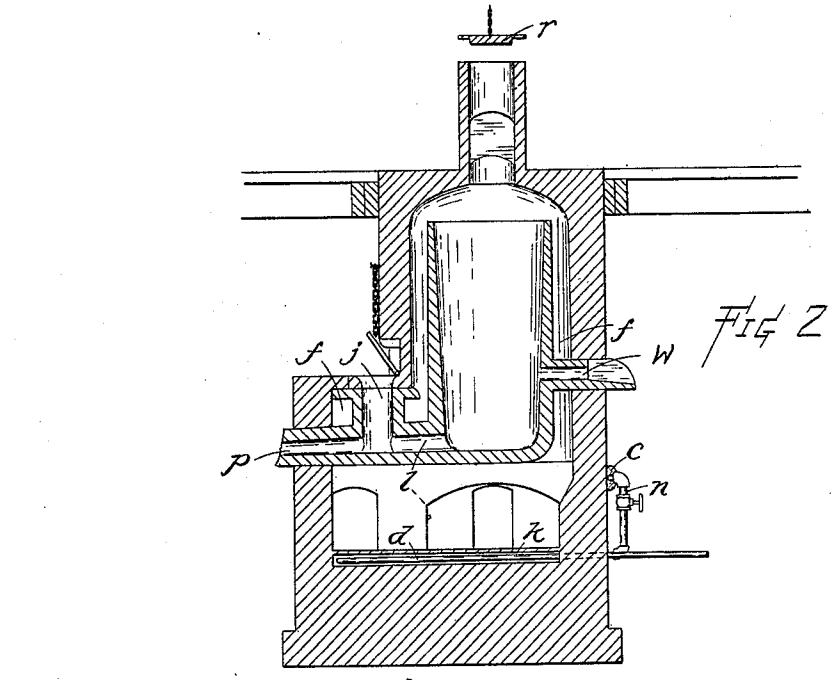

Fig 2

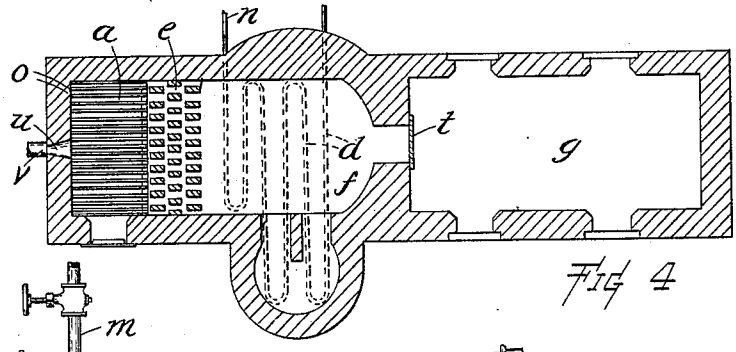

Fig 4

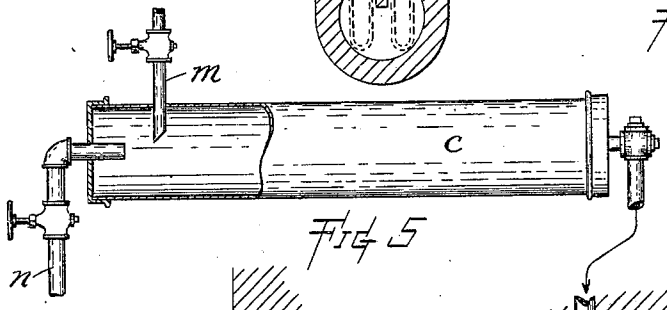

Fig 5

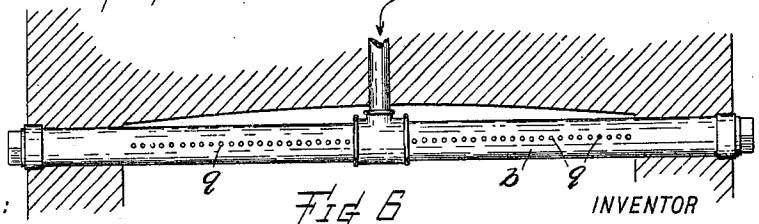

Fig 6

WITNESSES:

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UNITED STATES PATENT OFFICE.

SAMUEL M. TRAPP, OF SEATTLE, WASHINGTON.

COMBINED ORE HEATING, ROASTING, AND SMELTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 681,354, dated August 27, 1901.

Application filed August 22, 1900. Serial No. 27,687. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. TRAPP, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a certain new and useful Combined Ore Heating, Roasting, and Smelting Furnace, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to apparatus used for the treatment of ores, and has for its object to provide an improved apparatus for the roasting and smelting of ores.

The preferred construction and arrangement of my invention is shown in the accompanying drawings, in which similar letters refer to corresponding parts in all the views, and wherein—

Figure 1 is a central vertical longitudinal section. Fig. 2 is a vertical transverse section on line *x x*, Fig. 1. Figs. 3 and 4 are horizontal sections on lines *y y* and *z z*, respectively, in Fig. 1. Fig. 5 is an enlarged longitudinal view, partly in section, of the vaporizing retort-chamber *c;* and Fig. 6 is an enlarged view of the distributer *b*.

The essential features of my invention are the fuel and air chamber *a*, the distributer *b* within the fuel and air chamber, the vaporizing retort-chamber *c*, the steam-superheating coil *d*, the hydrocarbon-gas completing and mixing chamber *e*, the gas-combustion chamber *f*, the roasting-chamber *g*, the heating-chamber *h*, the smelting-chamber *i*, and dipping forehearth *j*.

The fuel and air chamber *a*, with the distributer *b* located therein, is designed to supply fuel to the mixing-chamber *e*, in which is arranged a checker-work of refractory material and where a hydrocarbon-flame is produced before being admitted to be completely consumed within the combustion-chamber *f*. The heat thus produced entirely surrounds the smelting-crucible *i* and dipping forehearth *j*, positioned therein, and the residual products of combustion supply a high degree of heat to the ores within the heating-chamber *h*, leading from the centrally-located outlet-flue *h'* to the stack *s*, and, further, any required amount of heat may be admitted into the roasting-chamber *g* by lifting the gate *t*. The steam-superheating chamber *k*, located immediately underneath the combustion-chamber, receives enough heat by downward radiation to highly superheat the steam from a boiler passing through coil *d* and thence through pipe *n* to the vaporizing retort-chamber *c*, where, mingling with oil received through pipe *m* from a tank provided, supplies the hydrocarbon to the distributer *b*, having within the fuel and air chamber *a* outlets *q* arranged along its length. The ore-heating chamber *h* is inclined, as shown, to more readily deliver the charge to the crucible *i*. The ore is fed through the charging-door *h'* and as it slides slowly down the inclined chamber becomes thoroughly heated prior to its delivery to the smelting-chamber, thus in no way interfering with the continuous smelting of the ore.

The smelting-chamber *i* consists of a crucible of suitable size to handle the material and sufficiently strong and durable to withstand the intense heat and wear of the ores passing therethrough. This crucible, located centrally within the combustion-chamber, receives heat from all directions to smelt the contained charge; but no combustion-gases are allowed to come in contact with the metal or to pass through the ores to produce upon precious metals those injurious effects concomitant to all other methods of smelting ores which have come under my observation. The dipping chamber or forehearth *j* is a chamber also surrounded by the heat and is communicatively connected to the said smelting-crucible by hollow tile *l* to allow the fluid metal to flow from the smelting-crucible and be dipped out or drawn off through the ordinary tap-hole *p* into molds.

w is a slag-hole provided for the removal of slag from the smelting-crucible.

u is a peep-hole, and *v* a pipe from an air-blower to supply air for combustion.

By means of suitable dampers and valves for regulating the draft and the fuel-supply the operator is enabled at all times to obtain the temperature required.

The fact that my furnace is constructed so as to prevent the flames or combustion-gases from coming into direct contact with the ore charge in the smelting operation is an im-

portant feature of my invention. Also the heating of the ore prior to its delivery to the smelting-crucible, absorbing heat in the flue that would otherwise be lost, raises the charge to a high temperature, and consequently the ore being smelted is not chilled, but maintained at a uniform fusing-heat, insuring the continual extraction of the contained metal.

I provide grate-bars *o* for use in the fuel and air chamber *a* that hydrocarbon fuel may be dispensed with and adapting it to the use of coal or wood and a manhole, with a cover-plate *r*, to give access to the interior of the smelter.

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

1. A smelting-furnace comprising a combustion-chamber, a stationary crucible located therein with its top open and its sides free from the walls of the combustion-chamber, a passage-way leading from the crucible and terminating in a tap-hole, and a forehearth connected with said passage-way and entirely located within the combustion-chamber, substantially as described.

2. A smelting-furnace comprising a combustion-chamber, a crucible located therein with its top open and its sides free from the walls of the combustion-chamber, an inclined ore and heating chamber connecting with the combustion-chamber directly over the crucible, a furnace-stack leading from the inclined flue, a roasting-chamber in communication with the combustion-chamber and a second stack leading therefrom, substantially as described.

3. A smelting-furnace comprising a combustion-chamber, a crucible located therein with its top open and its sides free from the walls of the combustion-chamber, a steam-pipe located beneath the floor of the combustion-chamber, a carbureting-chamber connected therewith, and a burner within the combustion-chamber and connected with the carbureter, substantially as described.

4. A smelting-furnace comprising a combustion-chamber, a crucible located therein with its top open and its sides free from the walls of the combustion-chamber, a flue of less diameter than the crucible leading from the combustion-chamber centrally above the crucible, and an ore-heating chamber discharging through the side of the flue, substantially as described.

5. A smelting-chamber comprising a combustion-chamber, a crucible located therein with its sides free from the walls of the combustion-chamber, and a forehearth connected with the crucible and contained within the combustion-chamber with its contents protected from contact with the furnace-gases, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL M. TRAPP.

Witnesses:
PIERRE BARNES,
C. D. EMERY.