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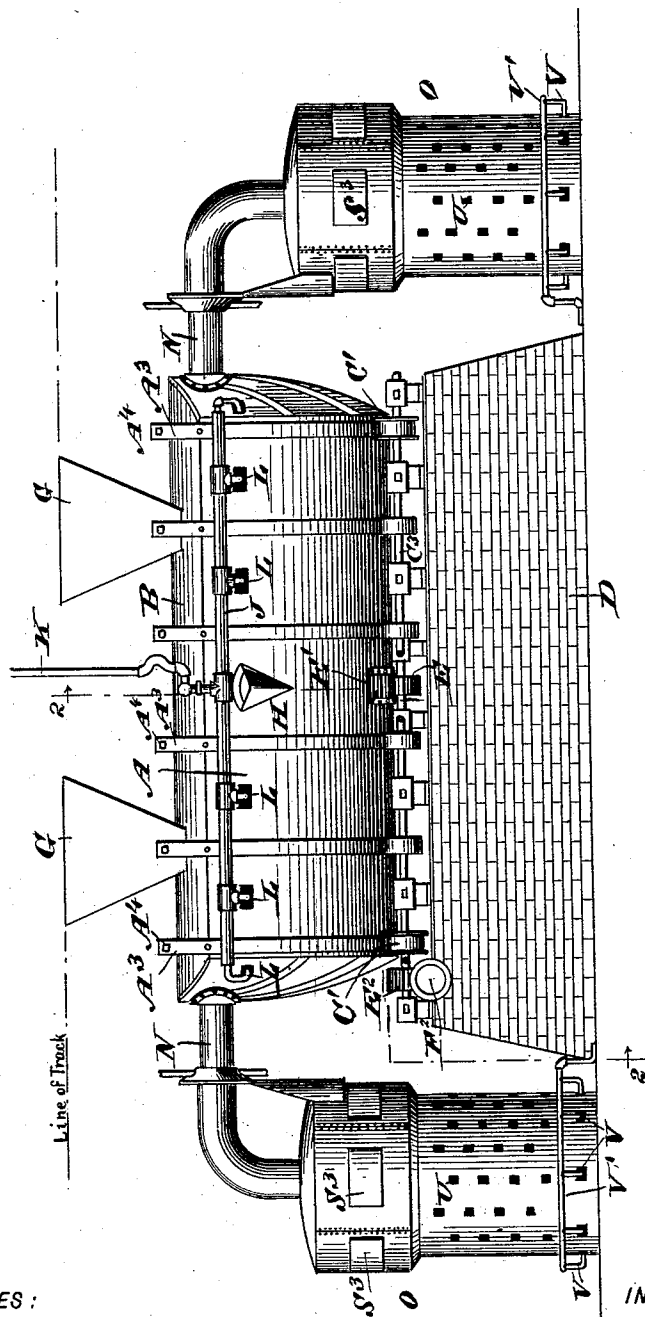
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I. J. & R. MONGER.
FURNACE.

No. 489,319.

Patented Jan. 3, 1893.

Fig. 1.



WITNESSES:

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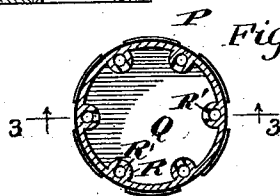
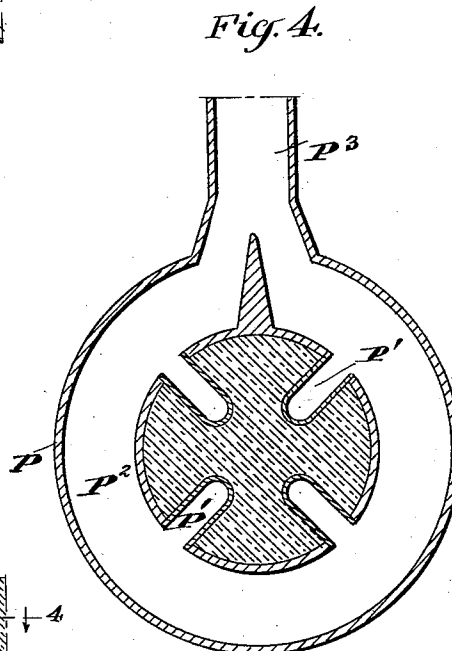
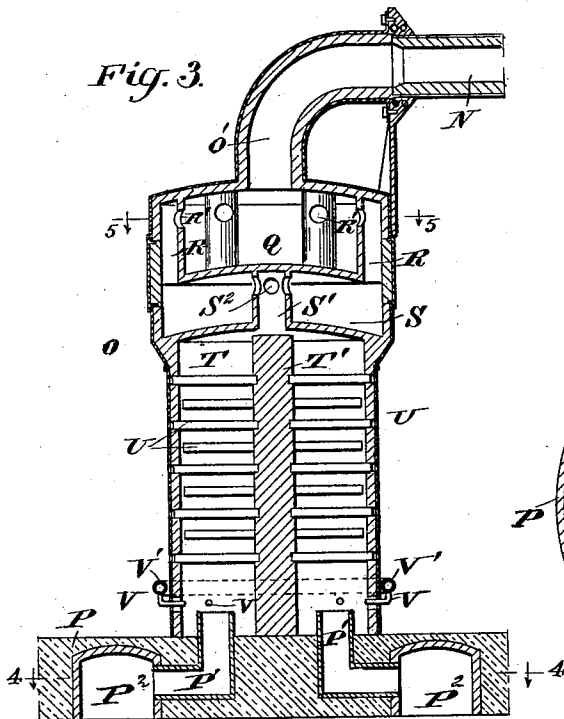
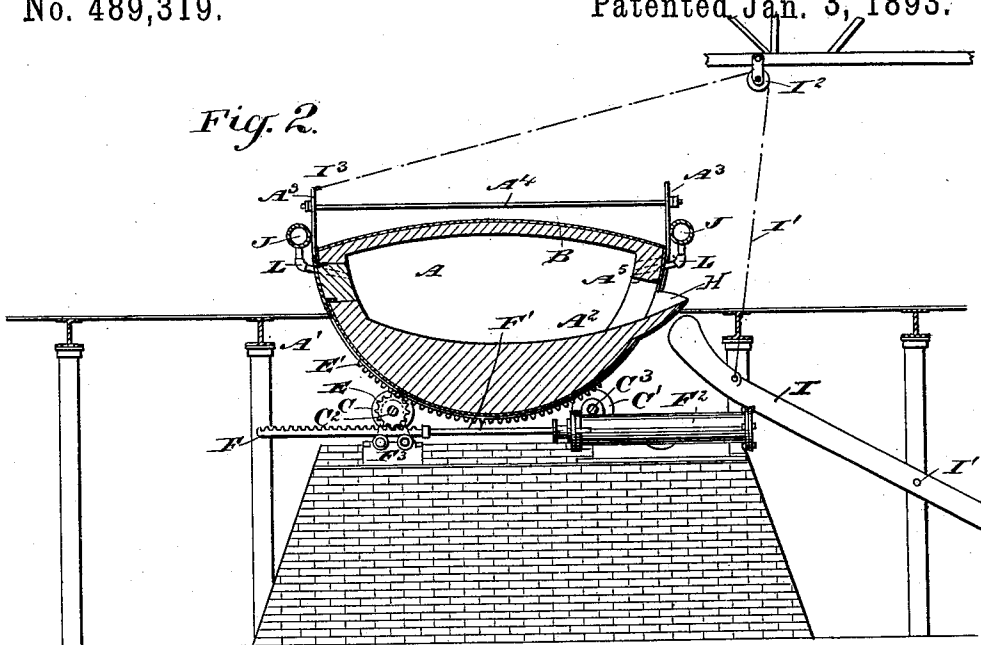
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2 Sheets—Sheet 2.

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FURNACE.

No. 489,319.

Patented Jan. 3, 1893.



WITNESSES :

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UNITED STATES PATENT OFFICE.

IVOR J. MONGER AND ROBERT MONGER, OF BALTIMORE, MARYLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 489,319, dated January 3, 1893.

Application filed May 17, 1892. Serial No. 433,299. (No model.)

To all whom it may concern:

Be it known that we, IVOR JOHN MONGER and ROBERT MONGER, of Baltimore, Maryland, have invented a new and Improved Furnace, of which the following is a full, clear, and exact description.

The invention relates to furnaces for smelting and refining copper, and its object is to provide a new and improved regenerative and reverberatory furnace which is simple and durable in construction, very effective in operation, and arranged to quickly reduce low grade matte without previously pulverizing and calcining the same, also rendering the tedious process of skimming and tapping unnecessary.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement; Fig. 2 is a transverse section of the same on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional side elevation of one of the regenerators on the line 3—3 in Fig. 5; Fig. 4 is a sectional plan view of the base of the same on the line 4—4 of Fig. 3; and Fig. 5 is a reduced sectional plan view of the upper part of the regenerator on the line 5—5 of Fig. 3.

The improved reducing furnace is provided with the furnace proper A, made semi-circular in cross section and closed on top by an arched roof B, as is plainly shown in Fig. 2. The shell A' of the furnace A is preferably made of boiler plate having an interior lining A² of suitable material according to the metal under treatment; that is, either acid, basic or neutral, as required. The shell A' is bound by steel rails A³ extending above the top B, the outer ends being connected with each other by cross rods A⁴ which serve as braces to securely hold the several parts of the furnace together. The rails A³ are mounted on sets of rollers C and C', held on shafts C² and C³ respectively, journaled in suitable bearings attached to the foundation D of the furnace. The shafts C² and C³ ex-

tend longitudinally on opposite sides of the furnace A, as will be readily understood by reference to Fig. 2, and on the shaft C³ is secured a gear wheel E, in mesh with a segmental gear wheel E' attached to the shell A' at or near the middle of the furnace A, see Fig. 1.

On the shaft C², near its outer end, is secured a pinion E² in mesh with a transversely extending rack F formed on the end of the piston rod F' of a hydraulic cylinder F² of any approved construction, for imparting a reciprocating motion to the said rack F so as to rotate the pinion E² and consequently the shaft C² to cause the gear wheel E to impart a tilting motion to the furnace A, the latter traveling, by its rails A³, on the rollers C and C'. It is understood that on the outward movement of the piston rod F the furnace A is tilted to one side, and on the return stroke of the said piston the furnace is tilted to the opposite side, and this is repeated as long as the hydraulic cylinder F² is actuated. The bottom of the rack F is preferably supported on friction rollers F³ journaled in suitable bearings supported on the foundation D, the said friction rollers being located directly under the pinion E² so as to hold the rack F always in mesh with the said pinion.

On the top B of the furnace A are arranged the hoppers G for feeding the matte to be treated into the interior of the furnace A, near the ends of the same, the upper ends of the hoppers being in line with a suitable track for moving the raw material off the track to conveniently discharge it into the hoppers.

In one side of the furnace A, at the middle of the same, midway between the hoppers G, G, is arranged, in the lining A², an opening A⁵, leading to the discharge spout H, through which the slag or the metal is discharged into a trough I pivotally connected at I' to a suitable post or support erected on one side of the foundation D, see Fig. 2. Near the upper end of the trough I is connected one end of a cable I', extending upward and passing over a pulley I², fixed to a suitable support, the rope then extending transversely to the upper end of one of the rails A³, so that by the rocking motion of the furnace A an up and down swinging motion is given to the

trough I by the cable I'. Thus the upper end of the trough I is always held in close proximity to the spout H to discharge slag or molten metal.

5 On the sides of the furnace A, and at the upper edges of the same, are arranged the longitudinally extending blast pipes J, connected at or near the middle with blast supply pipes K, connected with a suitable source
10 of blast supply, said blast pipes J being connected with the tuyeres L, opening into the furnace A at the sides and ends thereof, as will be readily understood by reference to Fig. 1. The tuyeres L are inclined downward
15 and inward to direct the blast in a like direction within the furnace, so as to insure a proper action of the blast on the material under treatment.

The ends of the furnace A are connected
20 at their centers, by flues N, with the regenerators O which are alike in construction, and each of which rests on a suitable base P hereinafter more fully described. Each of the regenerators O is provided on top with
25 the inlet pipe O', extending from the respective flue N and leading to a compartment Q arranged in the upper end of the regenerator O, the said compartment being connected by openings R' with vertically extending pipes
30 R leading to a second compartment S arranged below the first compartment Q. The openings R' are arranged in the upper ends of the pipes R, so that in the lower part of the compartment Q heavy particles in the
35 gases coming from the furnace A may accumulate, while the lighter gases pass through the openings R' into the pipes R and to the second compartment S, to again serve for retaining heavy particles which may be pre-
40 cipitated. In the center of this compartment S is arranged a pipe S', formed near its upper end with openings S² through which the gases may escape from the compartment S into the
45 pipe S' and from the latter to the circulation compartment T located below the compartment S and extending to the base P. In this compartment T, which forms the main body
50 of the regenerator, is arranged a central column T', which forms a support for the inner ends of the fire clay bars U, supported at their outer ends in the wall of the regenerator, the
said wall being formed with suitable apertures for this purpose, to introduce the bars from the outside or remove the same from the
55 main body of the regenerator when necessary. Into the lower part of this compartment T extend gas burners V, connected with a supply pipe V' encircling the outer shell of the
60 regenerator O, and connected with a suitable source of gas supply. Into the lower end of the compartment T extend the pipes P' leading to a circular channel P² formed in the
base P and connected by an outlet pipe P³ either with a smoke stack or with the acid
65 chambers, as the case may be.

The operation is as follows: The material filled through the hoppers G into the furnace A, is treated in the usual manner by the blast entering through the tuyeres, so that the
copper ores are smelted in a very short time, 70 it not being necessary to pulverize or calcine the ore. It will be seen that the gases arising in the furnace pass through the flues N into and through the regenerators O, in
which the dust or copper rain may accumu- 75 late and settle in the bottom of the first compartment Q or in the second compartment S, as above described, the metal, if necessary, being heated and allowed to run off into
molds or back into the furnace A, as may be 80 desired. In case the molten metal is to be run back into the furnace, the latter is connected by a small trough with the said compartments Q and S. The fumes and gases
finally passing from the compartment S 85 through the pipe S', pass through the compartment T and there come in contact with the bars U arranged in checker form, to regenerate the gases as completely as possible,
the necessary fuel being introduced through 90 the burners V connected with the gas supply. The remainder of the gases passing downward enter the base P through the pipes P', from which they pass through the channel P² to the
outlet P³, from which the gases, according to 95 their nature, either let into a stack or to the usual acid chamber. After the copper is smelted, the hydraulic cylinder F² is actuated to impart a tilting motion to the furnace A
so that the slag and molten metal are dis- 100 charged through the spout H into the trough I. The slag forming within the furnace A is first run off through the spout H into the trough I to one side of the furnace and in
like manner the metal is discharged from the 105 furnace A over the said spout H into the trough I to be run into a suitable mold.

Having thus described our invention, we claim as new and desire to secure by Letters
Patent:—

1. The combination with a semi-circular
furnace having an arched top and provided
in its sides with an outlet spout, of blast pipes
arranged on the sides of the said furnace,
tuyeres arranged at the upper edges of the 115
furnace, and extending into the interior of the same, whereby the blast may be directed upon the surface of the molten metal while and
means, substantially as described, for impart-
ing a tilting movement to said furnace, as set 120
forth.

2. In a furnace of the class described, a re-
generator comprising a top compartment con-
nected with the outlet flue of the furnace, a
second compartment arranged below the first 125
named compartment and connected with the same by pipes having openings in their tops leading into the first named compartment, and a main chamber arranged below the sec-
ond compartment and connected therewith, 130

the said main chamber being provided with checker bars, substantially as shown and described.

3. In a furnace of the class described, a re-generator comprising a top compartment connected with the outlet flue of the furnace, a second compartment arranged below the first named compartment and connected with the same by pipes having openings in their tops leading into the first named compartment, a main chamber arranged below the second compartment and connected therewith, the said main chamber being provided with checker bars, and gas burners arranged in the lower end of the said main compartment, substantially as shown and described.

4. In a furnace of the class described, a re-generator comprising a top compartment connected with the outlet flue of the furnace, a second compartment arranged below the first named compartment and connected with the same by pipes having openings in their tops leading into the first named compartment, a main chamber arranged below the second compartment and connected therewith, the said main chamber being provided with checker bars, gas burners arranged in the lower end of the said main compartment, and a base having an outlet and provided with a circular

channel connected by pipes with the lower end of the said main compartment, substantially as shown and described.

5. The combination with a furnace connected at its ends with regenerators, of means, substantially as described, for imparting a tilting movement to the said furnace, a spout arranged on one side of the said furnace, and a trough mounted to swing and having its upper end in close proximity to the said spout, as set forth.

6. The combination with a furnace connected at its ends with regenerators, of means, substantially as described, for imparting a tilting movement to the said furnace, a spout arranged on one side of the said furnace, a trough mounted to swing and having its upper end in close proximity to the said spout, and means, substantially as described, for connecting the upper free end of the said trough with the said furnace so that the movement of the latter imparts a swinging motion to the said trough, as set forth.

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ROBERT MONGER.

Witnesses:

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W. M. ARMSTRONG.