

(No Model.)

2 Sheets—Sheet 1.

W. LANGGUTH.

PROCESS OF REFINING GOLD AND SILVER MATTE.

No. 486,613.

Patented Nov. 22, 1892.

FIG. 1.

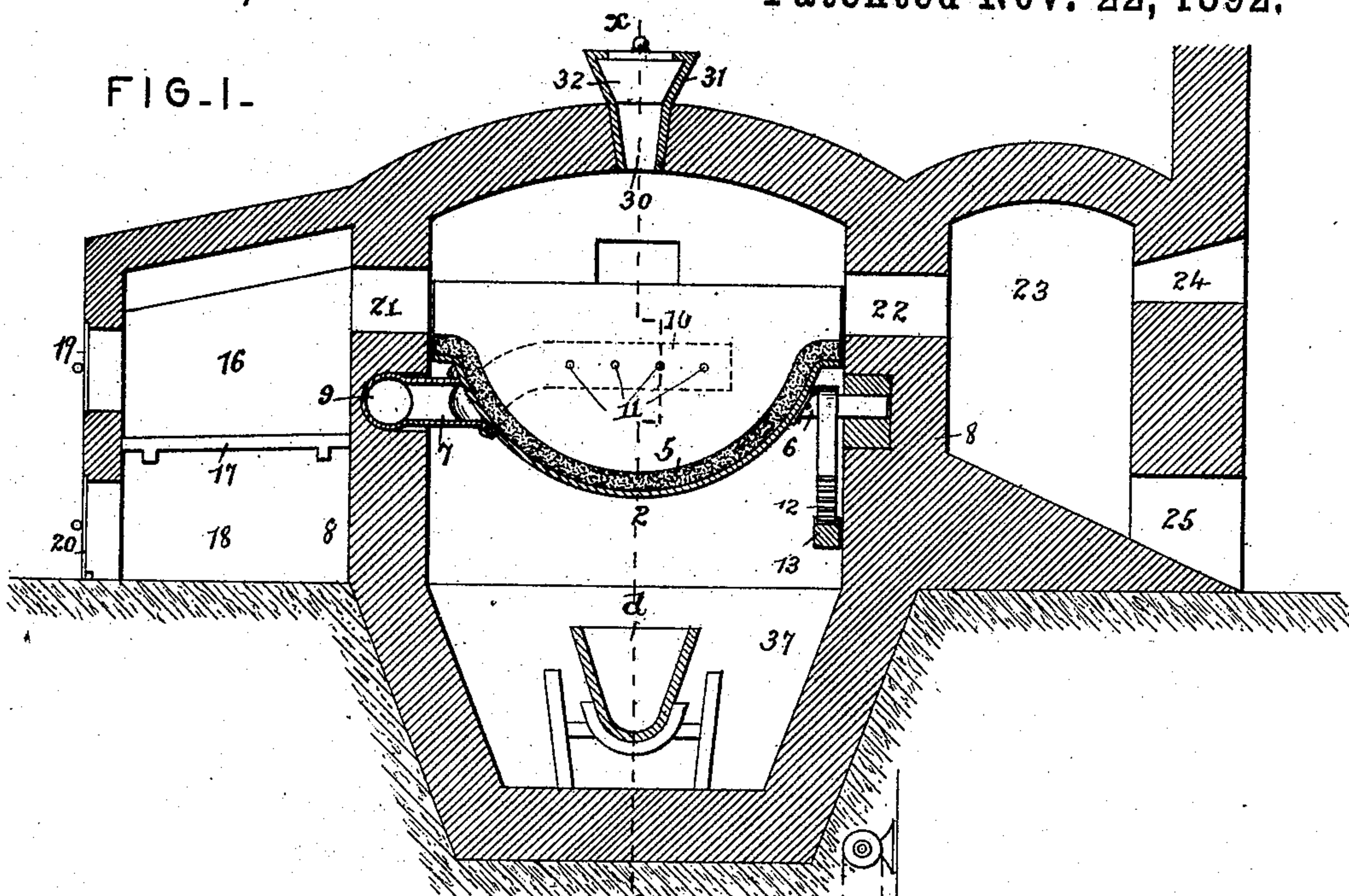
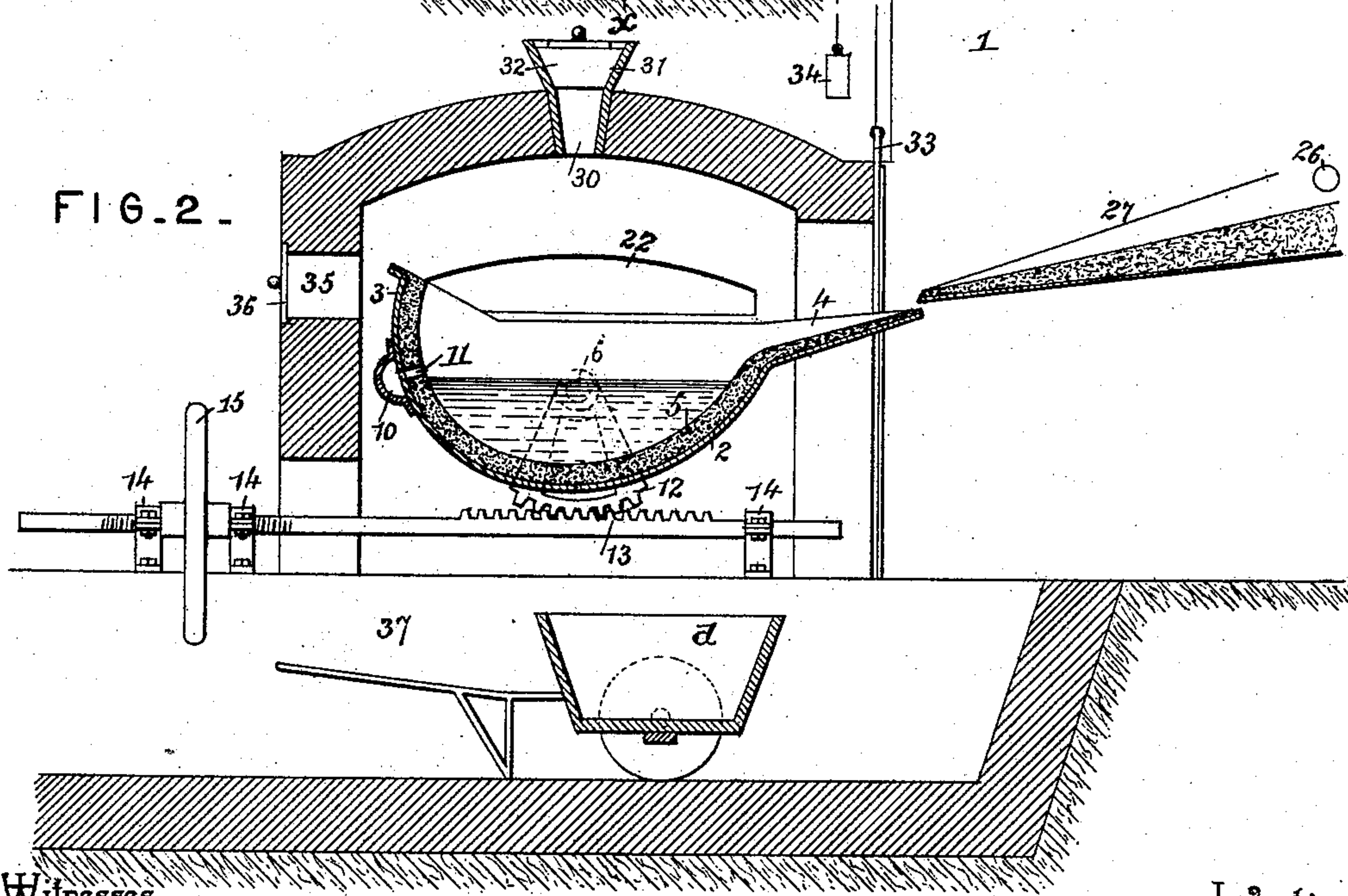


FIG. 2.



Witnesses

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By his Attorneys,
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(No Model.)

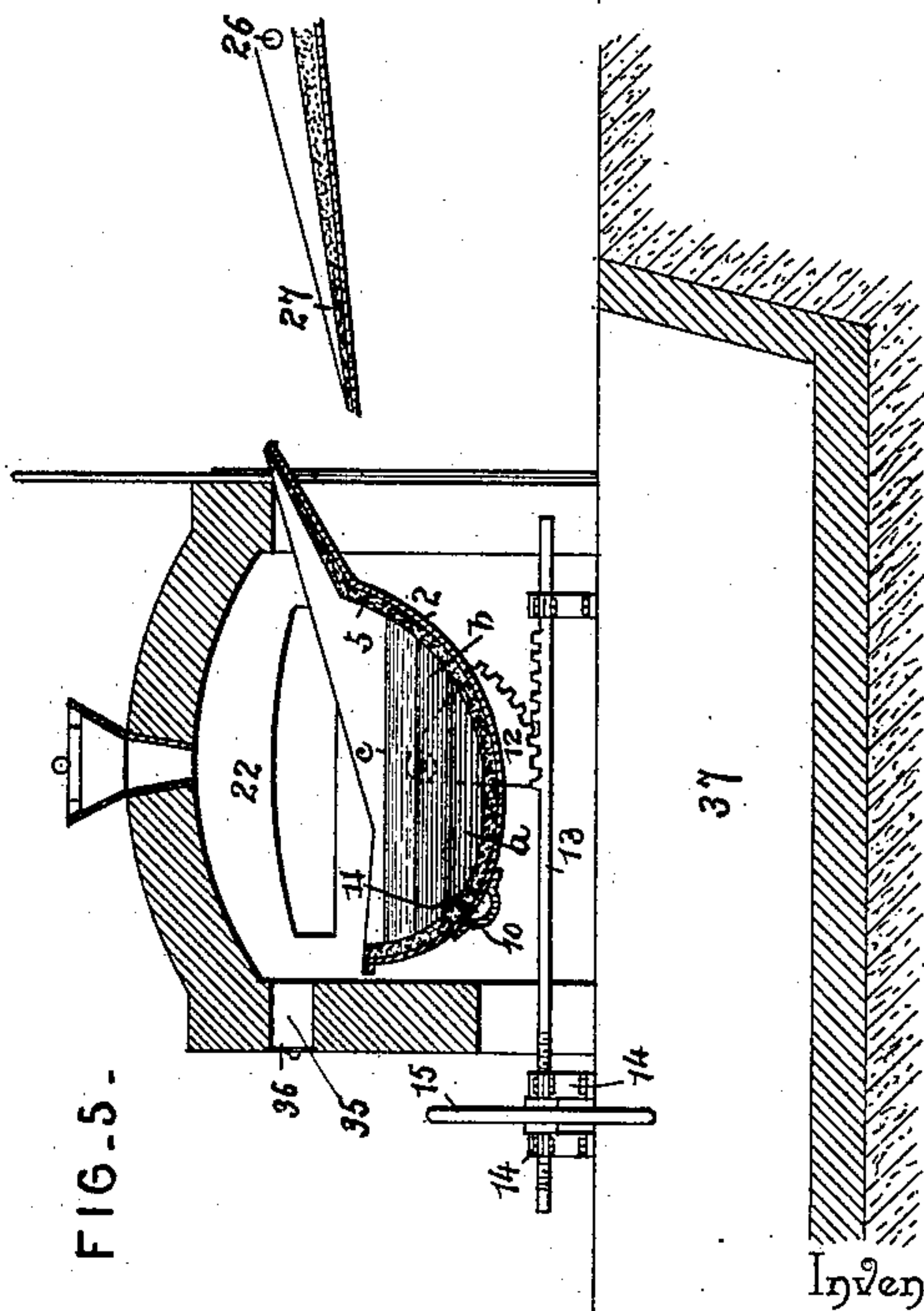
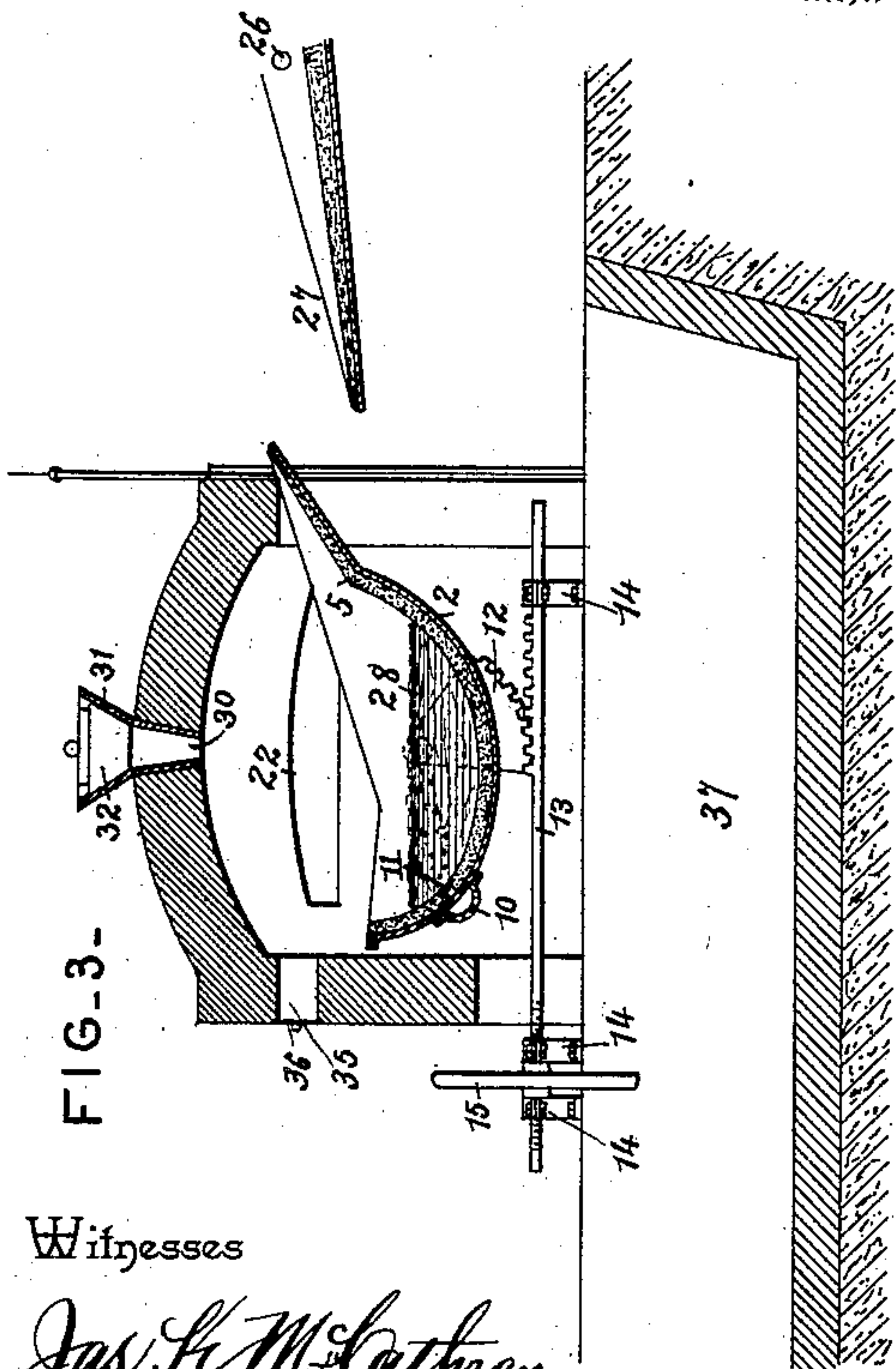
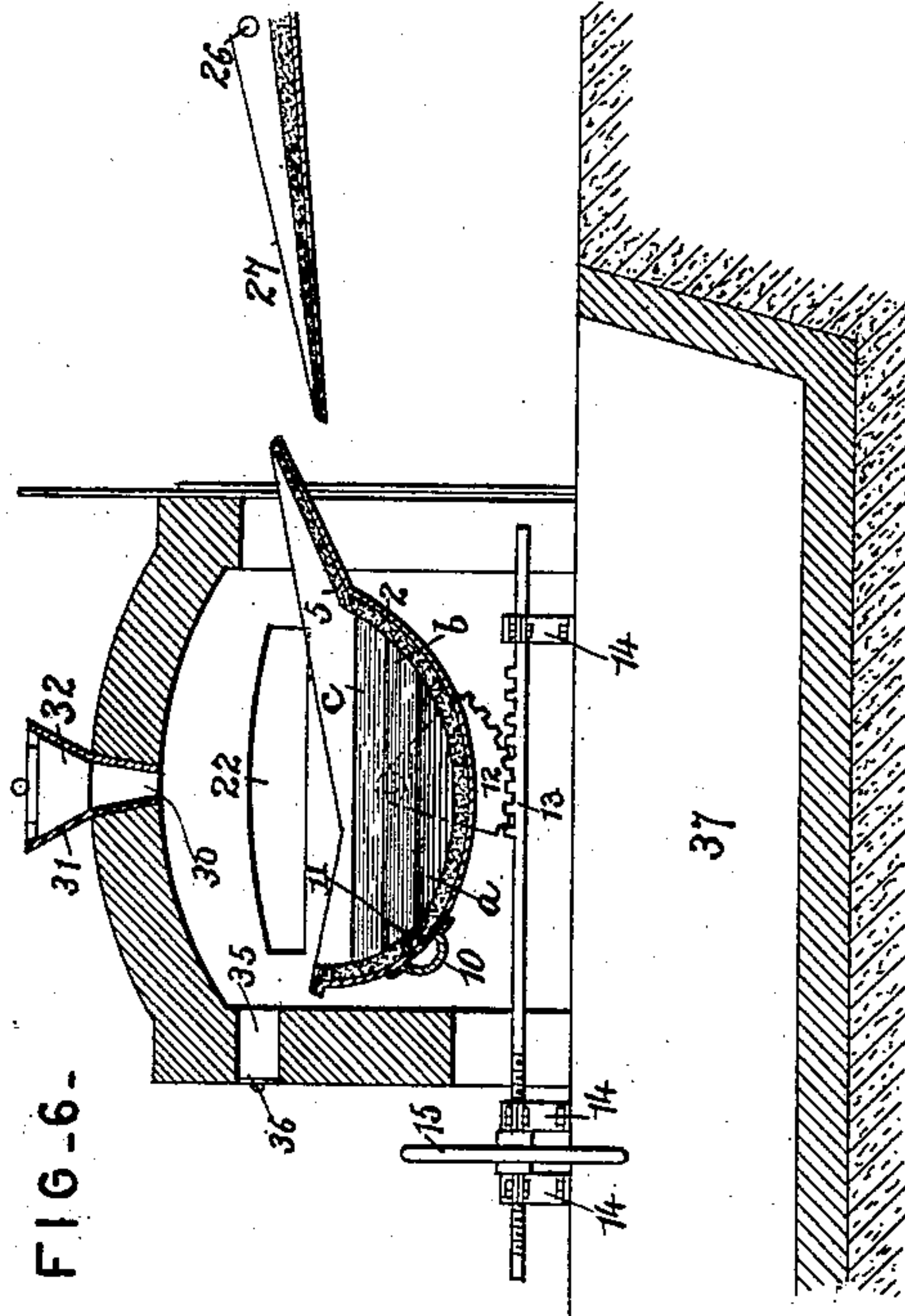
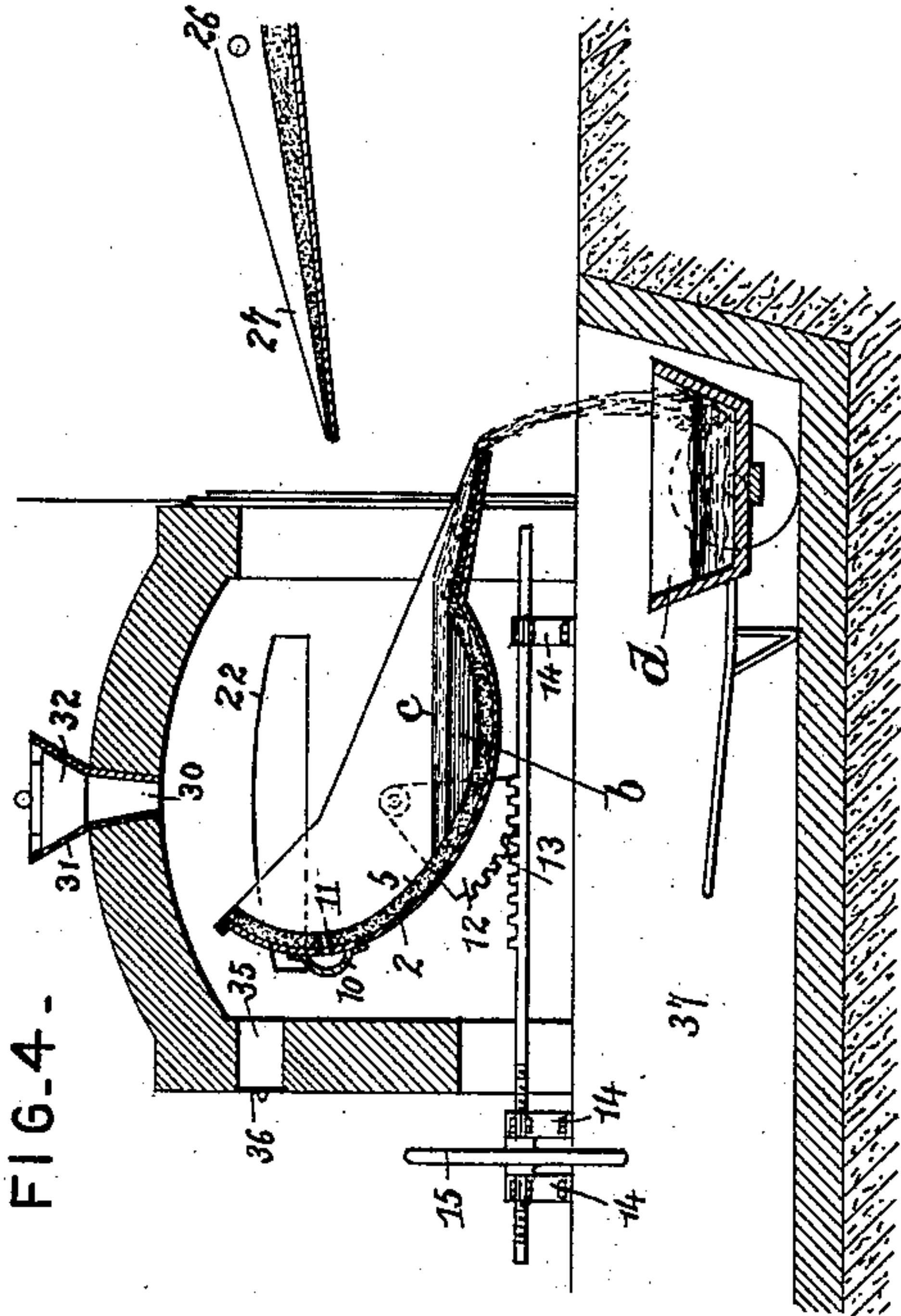
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UNITED STATES PATENT OFFICE.

WERNER LANGGUTH, OF DEADWOOD, SOUTH DAKOTA.

PROCESS OF REFINING GOLD AND SILVER MATTE.

SPECIFICATION forming part of Letters Patent No. 486,613, dated November 22, 1892.

Application filed December 8, 1890. Renewed October 28, 1892. Serial No. 450,204. (No model.)

To all whom it may concern:

Be it known that I, WERNER LANGGUTH, a citizen of the United States, residing at Deadwood, in the county of Lawrence and State of South Dakota, have invented a new and useful Process of Refining Gold and Silver Matte, of which the following is a specification.

My invention relates to a process for the treatment and refining of a gold and silver matte containing sulphur, arsenic, antimony, or baser metals produced by melting of gold and silver ores in a suitable cupola or reverberatory smelting-furnace, the object being, first, to produce a matte richer in gold and silver than the original from the smelting-furnace; second, to produce an alloy, such as gold and silver with lead or gold and silver with copper, and, third, to produce a gold and silver bullion of more or less purity. These and such other objects as fairly fall within the scope of my invention I attain by the process to be hereinafter described, the points of novelty of which will be specifically pointed out in the claims.

In the accompanying drawings I have illustrated the mechanical means by which my improved process may be carried out; but I do not wish to limit myself to the construction herein shown and described, as I am aware that many modifications may be made in the details of construction without departing from the process and the spirit of my invention.

Figure 1 is a sectional view taken through the converter, fire-box, and dust-chamber of a furnace suitable for carrying out my invention. Fig. 2 is a sectional view taken on the line xx of Fig. 1. Figs. 3, 4, 5, and 6 are similar sectional views illustrating the process of my invention.

Similar numerals and letters of reference designate corresponding parts in the several views.

The cupola-furnace 1, of which only a part is shown, is of ordinary construction, and is therefore not described herein.

The converter proper is of an ovoidal or deep-spoon shape, as shown at 2 in Fig. 2, having a high back 3 and a spout 4. It is lined with a suitable substance 5 for resisting the intense heat and swings upon trunnions 6 7, which have bearings in the walls 8 8. One of

the trunnions 7 is made hollow, as at 9, and communicates with a suitable air-compressor, which is not shown, as it forms no part of the present invention. A hollow rib 10 extends from the trunnion 7, partially around the back of the converter, and communicates at one end with the air-passage 9, having its opposite end closed. A series of tuyeres or air-lets 11 11 open from the rib 10 through the back 3 into the converter. Upon the trunnion 6 is secured a toothed segment 12, which meshes with the teeth upon a rack-bar 13, arranged to slide in suitable bearings 14 beneath the said trunnion 6. The outer end of the rack-bar 13 is screw-threaded to receive the threaded hub of a hand-wheel 15, which is adapted to rotate between two of the bearings 14, and by reason of the screw-threads upon the rack-bar 13 will move the latter in a longitudinal direction, thereby turning the segment 12, and with it the trunnions 6 7 and the converter, as will be readily understood.

The fire-box 16 is provided with the usual grate 17, ash-pit 18, and doors 19 20, and also with an opening 21 through one of the walls 8, through which the flame from the fire-box will pass over the converter to heat the latter. An opening 22 is made through the opposite wall 8 for the products of combustion to pass into the dust-chamber 23, from which they will pass through an opening 24 into the main flue of the furnace. An opening 25 is formed through the wall of the dust-chamber at the bottom thereof for the purpose of removing dust, soot, &c., therefrom. An opening 30 is formed in the dome of the furnace directly over the center of the converter, said opening being provided with a flaring flange 31, like a funnel, and a suitable plug or lid 32 for closing the same when not in use. The object of the opening 30 is to provide means whereby any desirable substance may be introduced into the converter while the process of refining is going on. A sliding door 33 is arranged to close the opening in the walls of the furnace through which the spout 4 projects, said door being arranged to slide vertically above the said spout 4 and balanced by means of a weight 34, as shown in Fig. 2.

Openings 35 (only one of which is shown)

are made through the walls of the furnace just above the converter for the purpose of observing the operation, and when not in use the said openings are closed by doors 36. A
5 pit 37 is formed beneath the converter into which the molds or slag-boxes are placed to receive the molten metal or slag from the converter.

In carrying out my improved process the
10 molten gold and silver matte is tapped from the tap-hole 26 of the cupola-furnace 1, from which it will flow by means of a spout 27 into the converter, which may have been previously heated by means of a fire in the fire-
15 box 16, but in practice is heated during the entire period of blasting. During this operation the position of the converter is as shown in Fig. 2, the spout 4 thereof being lower than the back 3. The molten metal is allowed to
20 flow into the converter until the lower portion 2 thereof is filled, but is shut off before it rises high enough to flow into the tuyeres or air-vents 11 11. The compressed air or "blast," as it is termed, is then turned on, and the
25 hand-wheel 15 is rotated to depress the back 3 and elevate the spout 4 of the converter, bringing it to the position shown in Fig. 3, which brings the molten matte 28 over the tuyeres or air-vents 11 11, from which
30 the air forming the blast is caused to permeate therethrough. Oxidation of sulphur, arsenic, antimony, and zinc will commence immediately and the volatilized oxides escape through the opening 22, dust-chamber 23,
35 and opening 24 into the flue of the main chimney. The other elements present—such as iron, copper, lead, &c.—oxidize more slowly, and an addition of silica, lime, soda, borax, slag, or glass is made through the opening 30
40 to slag off these baser oxides. The results obtained will depend upon the length of time oxidation is allowed to continue. For instance, if it is desired to produce a matte richer in gold and silver than the original
45 from the smelting-furnace, the blast is shut off and oxidation discontinued before all sulphur, arsenic, antimony, zinc, iron, copper, or lead are oxidized. The converter is then turned by means of the segment and rack-bar
50 mechanism to pour off the slag *c* into a slag-pot *d*, placed in the pit 37, as shown in Fig. 4, while the pure heavier matte *b* will remain at the bottom and may be poured off into a mold afterward, or both the matte and slag
55 may be run off together into a mold and the slag knocked off from the matte when cool.

If it is desired to produce an alloy the blast is continued until all sulphur, arsenic, and antimony are oxidized and are driven off,
60 when the gold and silver alloy may be poured off into a mold placed in the pit 37.

When it is desired to make a gold and silver bullion, the oxidation is continued until all baser metals are oxidized and slagged off,
65 when the gold and silver bullion may be poured off into the bullion-mold.

In order to produce the best results, it is

necessary to add to the matte a suitable amount of lead or lead-containing substance, such as galena, litharge, or oxide, which ad-
70 dition may be made while the ore is in the cupola-furnace; but in carrying my process into operation I prefer to make this addition of lead to the matte while in the converter after the oxidation of the sulphur, arsenic,
75 antimony, and a part of the baser metals has taken place. In this way I can produce a slag, a matte, and a lead bullion at the same time. The lead being heaviest will remain at the bottom of the converter, as shown at *a* in
80 Fig. 5, and will be protected from oxidation by the matte *b* and slag *c*, which take their places above it in accordance with their specific gravity, the slag *c*, being lightest, floating
85 upon the top. When the proper stage of oxidation has been arrived at, the slag *c* may be run off into a slag-box and the matte and lead bullion into separate molds. By further oxidation a lead bullion only may be produced,
90 thus oxidizing the rest of the matte, slagging off a part of the baser oxides, and bringing the rest into the lead bullion. By a continuation of the oxidation all the lead may be oxidized, and the litharge thus produced, being lighter
95 than the metal, may be decanted off, leaving a refined gold and silver bullion, which may then be cast into suitable molds.

Should it be desirable to use the blast through the matte and slag without having it pass into the lead at the bottom, the converter
100 may be turned, as shown in Fig. 6, so that the tuyeres 11 11 will be below the matte *b*, but not low enough to come under the lead *a*, which lies at the bottom 2 of the converter, as will be readily understood.
105

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

1. A process for refining gold and silver matte, consisting in first smelting pyritic gold
110 and silver ores in a suitable furnace, then transferring the gold and silver matte into a converter, heating this converter during the entire process, tilting the converter to bring the molten matte over the tuyere-openings,
115 passing a blast of air through said matte to produce various stages of oxidation, adding lead or lead-containing substances, and finally adding a flux to slag off the baser metals which are not at first oxidized and volatilized
120 by said blast, substantially as set forth.

2. In an apparatus for refining gold and silver matte produced by smelting in a suitable furnace, a furnace having a side opening, a swinging spoon-shaped converter hav-
125 ing an elongated spout mounted on trunnions within the same, said spout being located and arranged within said side opening, a series of tuyere-openings in the wall of the converter, a hollow rib secured to the outside
130 of said converter and communicating with said tuyeres and with a suitable blast apparatus, and means for operating said converter, substantially as set forth.

3. In an apparatus for refining gold and silver matte produced by smelting in a suitable furnace, a furnace having a side opening, a spoon-shaped converter provided with an elongated spout located and arranged within said side opening and with tuyere-openings, said converter being suspended within said furnace on a hollow and a solid trunnion, a hollow rib secured to the outside of said converter and communicating with said tuyere-openings and said hollow trunnion, which latter connects with a suitable blast apparatus, and means for operating said converter, substantially as set forth.

4. In an apparatus for refining gold and silver matte produced by smelting in a suitable furnace, a furnace provided with a side opening, a converter-chamber, a fire-chamber and dust-chamber located on opposite sides of said converter-chamber and communicating therewith, a slag and bullion pit directly beneath the converter-chamber, a spoon-shaped converter provided with a series of tuyere-openings, and an elongated spout located and arranged within said side opening in the furnace, said converter being suspended within said furnace on a hollow and a solid trunnion, a hollow rib secured to the outside of said converter and communicating with said tuyere-openings and said hollow trunnion, which latter connects with a suitable blast apparatus, and means for operating said converter, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

WERNER LANGGUTH.

Witnesses:
R. H. DRISCOLL,
JOHN E. ROTHWELL.