

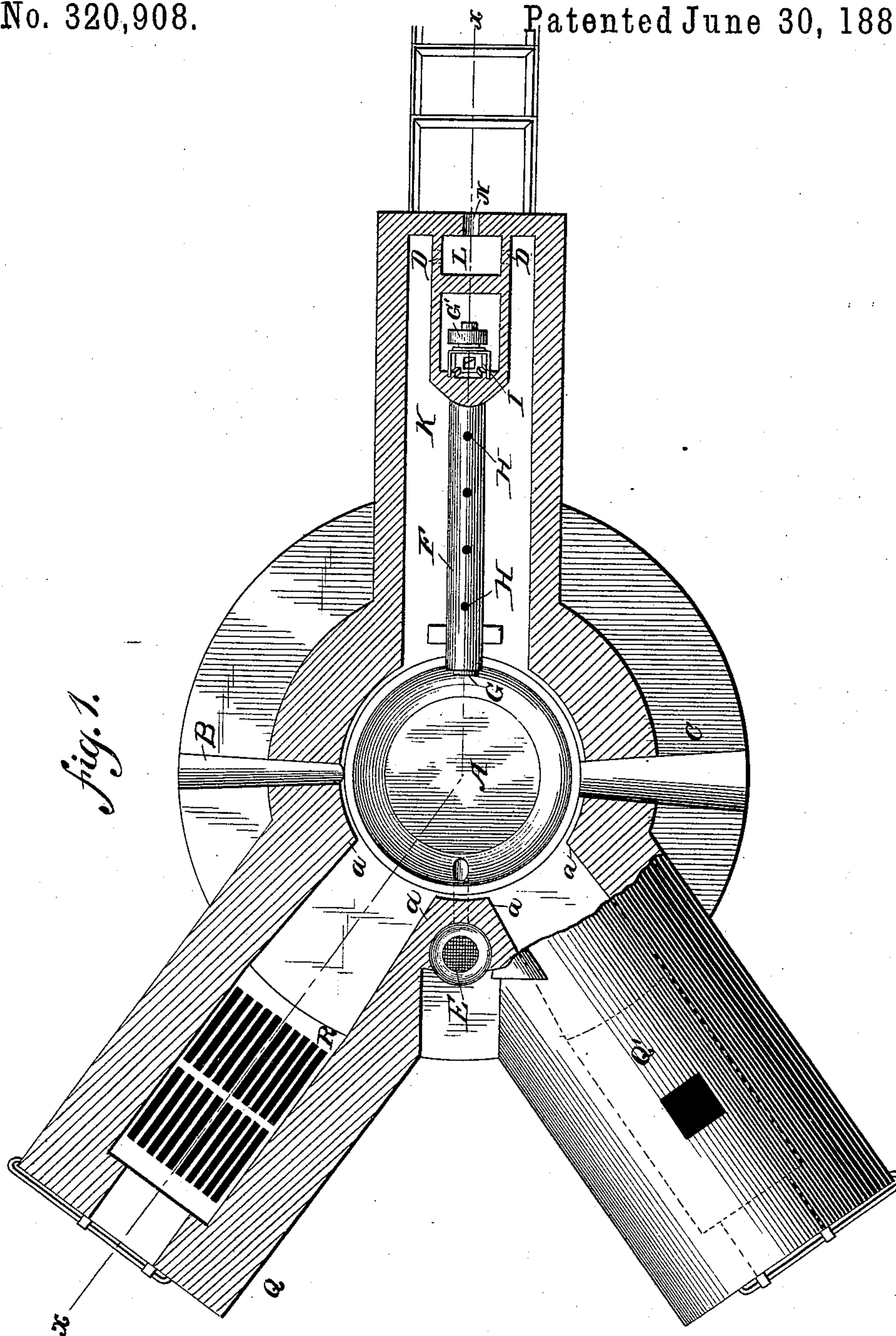
(No Model.)

2 Sheets—Sheet 1.

M. D. BRETT.
SMELTING ORES.

No. 320,908.

Patented June 30, 1885.



Witnesses:
John G. Hinkel
H. J. Jagers.

Inventor:
Matthew D. Brett.
By Foster & Thuman
attys.

(No Model.)

2 Sheets—Sheet 2.

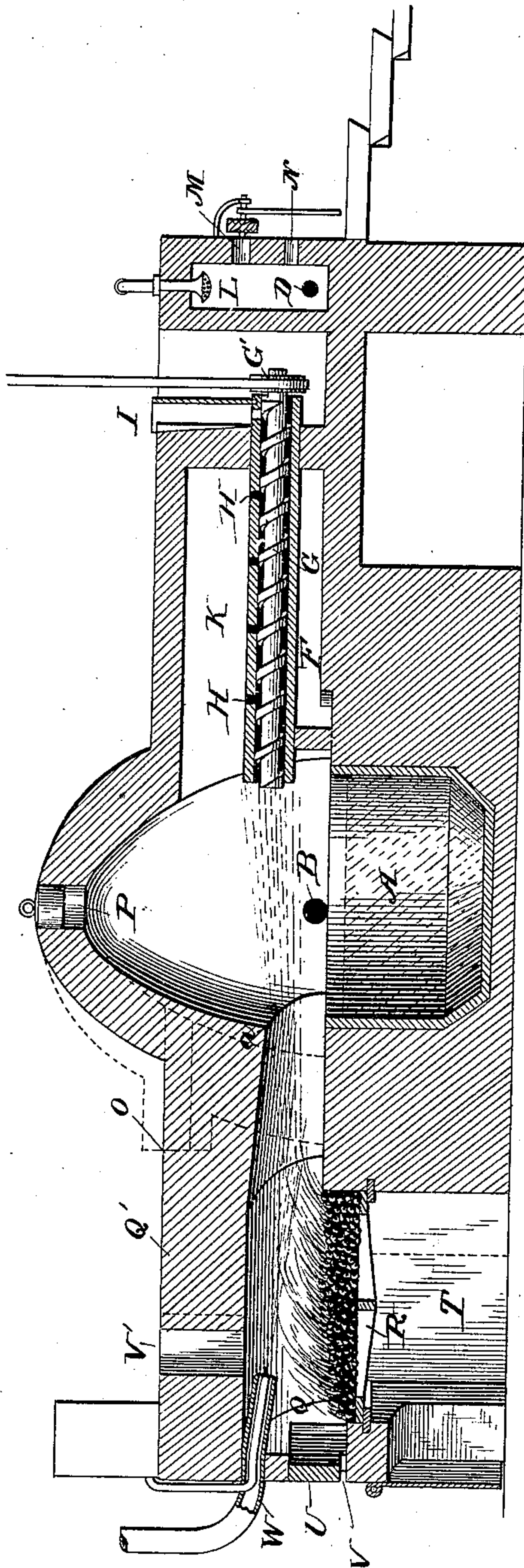
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Fig. 2.



Witnesses:

John G. Hinkel
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Inventor:
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UNITED STATES PATENT OFFICE.

MATHEW DAUSON BRETT, OF DENVER, COLORADO, ASSIGNOR OF ONE-FOURTH TO D'ESTAING S. COVERT, OF SAME PLACE.

SMEETING ORES.

SPECIFICATION forming part of Letters Patent No. 320,908, dated June 30, 1885.

Application filed September 2, 1884. (No model.)

To all whom it may concern:

Be it known that I, MATHEW D. BRETT, a citizen of the United States, residing at Denver, Arapahoe county, State of Colorado, have
5 invented certain new and useful Improvements in Smelting Ores, of which the following is a specification.

My invention relates to smelting ores, and has for its object to improve and simplify the
10 manner and means for smelting, so that all manner of ores carrying lead, gold, or silver, or a combination of any and all of them, may be economically treated; and to this end my invention consists in the methods and means
15 hereinafter pointed out for producing these effects.

In the accompanying drawings, forming part of this specification, Figure 1 is a plan view of the furnace, partly in section, and Fig.
20 2 is a longitudinal section on the lines *x x*, Fig. 1.

A sump or crucible, A, is formed in the shape of a basin or dish, and is made of common red or fire brick, and is surrounded by
25 the proper amount of masonry of the usual red-brick work. The interior of the sump may be lined with any usual or suitable material that will not contract or expand under the heat or allow the molten metal to penetrate or escape from it. At the side of the
30 sump, and connected to its bottom by a suitable passage, is arranged a lead-well, the top of which is of such a height as to allow the excess of lead to overflow and maintain the molten lead in the sump at a proper level. This
35 level is preferably about two inches from the top of the sump, and this space is occupied by a molten matte or blanket of fluxes and reagents, serving as a covering to protect the
40 bath of lead from scorification; also as a bed upon which to effect the final separation of the metallic constituents of ores from the gangue, matrix, or core contained therein. The sump is covered with an arch having suitable
45 able openings to connect with the fire-boxes and expansion-chamber. A slag tap-hole, B, and a matte tap-hole, C, are formed at the base of the arch, and a peep-hole, O, is located in a suitable position to allow the work-
50 man to watch the operations. Outside of the walls of the sump are located several fire-

boxes, Q, two being shown in the drawings. These fire-boxes consist of proper masonry-work, forming the ash-pit T, the fire-place
having the grate-bars R supported in the walls, 55 an arched covering, Q', made to rest upon the walls, and provided with a suitable door, U, preferably having a slash bar-hole, V, for stirring the fire, an opening for the superheated steam and oil pipes W, and in the top of the
60 arch an opening supplied with any of the ordinary feeding devices for feeding the fuel directly into the middle of fire-place. The top of the arch is contracted at the end, as seen at
65 *a*, where it enters the sump-arch, for the purpose of concentrating in a blow-pipe manner the heat and flames, as more particularly set forth hereinafter. Suitable doors for regulat-
70 ing the draft and disposing of the ashes may be arranged in any desired manner. On the opposite side of the sump are arranged the ore-conveyer, desulphurizer, expansion and condensing chambers, and other appliances for completing the smelting process.

The ore-conveyer F consists of a long tube 75 or cylinder perforated at intervals throughout its length, as at H H, provided with a suitable hopper, I, and a screw-shaft, G, adapted to be rotated by suitable means, as pulley G'. The inner end of the tube or pipe extends
80 within the sump-arch and over the matte and lead-well. Around the conveyer is formed an expansion or dust chamber, K, through which the products of combustion are drawn, and from which they pass into the condensing-
85 chamber L through the inlet-holes D, where they are subjected to a spray or stream of water, whence the fumes and heat pass through the outlet-hole M, being drawn therethrough by suitable exhausting apparatus, as a fan. 90
Any precious metal that has been carried by the fumes into the condensing-chamber will be deposited by the spray or stream of water into the condensing-chamber, and, passing
95 through the hole N, will be carried into the settling-pans, where it is gathered in a manner well understood, and is preferably placed in a bag, when it is passed directly into the center of the combustion-chamber by being
100 dropped through the hole P in the top of the sump-arch.

The operation of my furnace is as follows:

The lead-well being filled and the matte being supported upon the lead, and the fires in the fire-boxes being kindled, the ore, and fluxes, when necessary, is fed into the hopper I of the conveyer pipe or tube, and the screw-conveyer being turned by proper means, the ore is slowly fed toward the interior of the sump. The products of combustion at the same time, passing through the smoke-chamber around the conveyer, heat the same and desulphurize the ore in the conveyer, the fumes escaping by the fume-holes H H, and pass through the dust and condensing chambers K L, being drawn therethrough by the exhausting apparatus. As the ore is slowly fed through the conveyer, the desulphurizing process is completed, and it passes out of the conveyer in a liquid or semi-liquid form, when it meets the flames and heat from the fire-boxes, the boxes being arranged and constructed, as before set forth, so as to direct the flames at this point, and the smelting takes place in the combustion-chamber of the sump-arch, the molten matte or blanket acting as a separating agent. The ore in its molten or semi-molten state falls upon this blanket, and in passing over it to the slag tap-hole precipitates its metals into the blanket, the precious metals, owing to their greater specific gravity, going through into the lead-well and to the dipping-cup, while the refuse or slag, being lighter than the matte, passes over the top of it out of the slag-holes. The vaporizable products of combustion are drawn by the exhaust apparatus through the smoke-space, heating the ore-conveyer and desulphurizing the ore; thence they pass to the dust or expansion chamber, thence through the openings D into the condensing-chamber L, where they come in contact with a spray or stream of water and pass through the outlet-hole M into the chimney. The precious metals contained therein, being deposited into the bottom of the condensing-chamber, pass through the water-discharge hole N into suitable separating-pans or settling-tanks, as before stated.

From the above the advantages of my improved furnace are apparent. I use but one hearth or sump, which acts as a crucible for holding the permanent bath of molten lead, which latter may be introduced into the sump prior to feeding the ores, or may result from the reduction of the metallic lead from the stock operated. This bath acts a medium for collecting and holding in alloy as base bullion any gold or silver contained in the stock treated, and which is reduced to a metallic state directly in contact with the matte and bath in the combustion-chamber of the sump. As the volume of the bath increases by the reduction of lead in the stock treated, it is dipped from the lead-well E or allowed to overflow into molds, and is ready to ship as base bullion; or it may be run over a series of refining-plates and the precious metals separated from the base or lead bullion.

A very important feature of my invention

is the molten matte or blanket contained in the sump above the lead. This blanket or matte is formed automatically from the various reagents fed with or found in the ores, and when once formed is permanent, its volume being sustained from the ores fed to the furnace, and any excess or surplus flowing off by the matte tap-hole, which is continuously open.

As before stated, the lead in the sump is automatically maintained at the proper level, and the blanket or matte is also automatically maintained, and thereby the lead is always properly covered by the matte, preventing scorification, and the slag freely flows off at the open slag-hole.

By arranging the furnaces as above described the heat and flames from the fuel used, which may be of any desired character, are carried from the fire-boxes through the funnel-shaped throats into the combustion-chamber, where they meet, being concentrated upon the smelting-point, and crossing each other in the sump they produce a sort of rotary flame, which is practically confined within the sump-arch above the blanket, and I am thereby enabled to utilize the greatest amount of heat and at the most effectual point.

Another feature of my invention consists in using an exhaust or suction blower instead of a blast-blower, and by this means, while I am enabled to keep up the requisite amount of draft for the furnaces, the blanket or matte is not seriously disturbed or broken, as when the blast is used, and scorification and loss of the lead is prevented. Moreover, on account of the arrangement of the furnaces and sump-arch as above indicated, I am enabled to draw the waste products of combustion and the heat through the expansion-chamber around the ore-conveyer more in the form of heated gases, as very little, if any, flame escapes from the sump-arch. This I find is very advantageous in reducing or desulphurizing them in the conveyer. Where fluxes are necessary I mix them with the ores in the conveyer, and thereby avoid the necessity of feeding them separately to the reducing-point. The hole P in the top of the sump-arch enables me to feed rich stock—such as the tellurides, chlorides, &c.—without loss directly into the lead bath.

While I do not desire to limit myself to the precise details and construction set forth, as they may be varied without departing from the spirit of my invention, I have found the above-described arrangement forms a practical smelter of great capacity and applicable to the economical and complete reduction of all ores carrying precious metals, and producing the same in the form of base or lead bullion.

I am aware ore has been fed through a cylinder, where it was roasted in contact with hot air to charge it with oxygen, and then fed into another cylinder and roasted in direct contact with a flame, the sulphur being largely consumed and fluxes being added therein, and

then fed to the reducing-chamber, where the metals are precipitated in their order of gravitation, and I make no claim thereto.

5 I claim is—

1. The process of smelting ores, substantially as herein set forth, which consists in gradually feeding the ores through a conveyer, subjecting them therein to a temperature sufficient to desulphurize and reduce them to a semi-liquid state by the action of hot air, and concentrating the flames and heat from several sources directly upon the semi-liquid mass.

15 2. The combination, with a sump having an arched top or dome, of a series of fire-boxes, constructed and arranged substantially as described, and inclined concentrating-passages leading from the boxes to the interior of the sump, whereby the flames may be concentrated and confined in the sump, as and for the purposes described.

25 3. The combination, with a sump, of an ore-conveyer consisting of a tube having a suitable hopper and a screw-conveying rod and a series of perforations in the tube, the whole being arranged in the exhaust smoke-chamber leading from the sump, whereby the ores are desulphurized and delivered directly at the smelting-point in a liquid or semi-liquid state, substantially as described.

30 4. The combination, with a sump having an arched top or dome containing a lead bath and metallic matte, of a series of fire-boxes located at one side of the sump, having inclined passages adapted to concentrate the flames and heat at the mouth of the conveyer, and a conveyer adapted to deliver the ore into the concentrated flames and heat, substantially as described.

40 5. The combination, with an arched sump containing a lead bath and a metallic matte,

and provided with means for maintaining the same at a constant level, of a series of fire-boxes at one side of the sump, arranged to concentrate the heat and flames, an exhaust smoke-chamber at another side, and a conveyer located in said chamber, the arrangement being such that the flames and heat pass into the sump, are concentrated at the smelting-point without scorifying the lead bath, and are drawn through the exhaust-chamber, heating the ore in the conveyer, substantially as described.

6. The combination, with a sump and fire-boxes connected therewith, arranged to concentrate the flames and heat in the sump, of a smoke or dust chamber containing an ore-conveyer, a condensing-chamber connected therewith, an exhausting apparatus connected with the condensing-chamber, whereby the flames and heat are drawn into the sump and concentrated, and the products of combustion are drawn through the chambers, and means for supplying water to the condensing chamber, as and for the purpose set forth.

7. The combination, with the sump containing a lead bath and a metallic blanket, of fire-boxes connected to said sump and a sump-arch having an opening at the top and an ore-conveyer located in the smoke-chamber, whereby the ordinary ores may be conveyed to the sump in a semi-liquid state, and the rich ores may be dropped directly into the sump at the smelting-point, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MATHEW DAUSON BRETT.

Witnesses:

WILLIAM M. BROOKE,
MEREDITH B. CAMPLIN.