

(No Model.)

C. BISHOP.  
SMELTING FURNACE.

No. 578,963.

Patented Mar. 16, 1897.

FIG. 1.

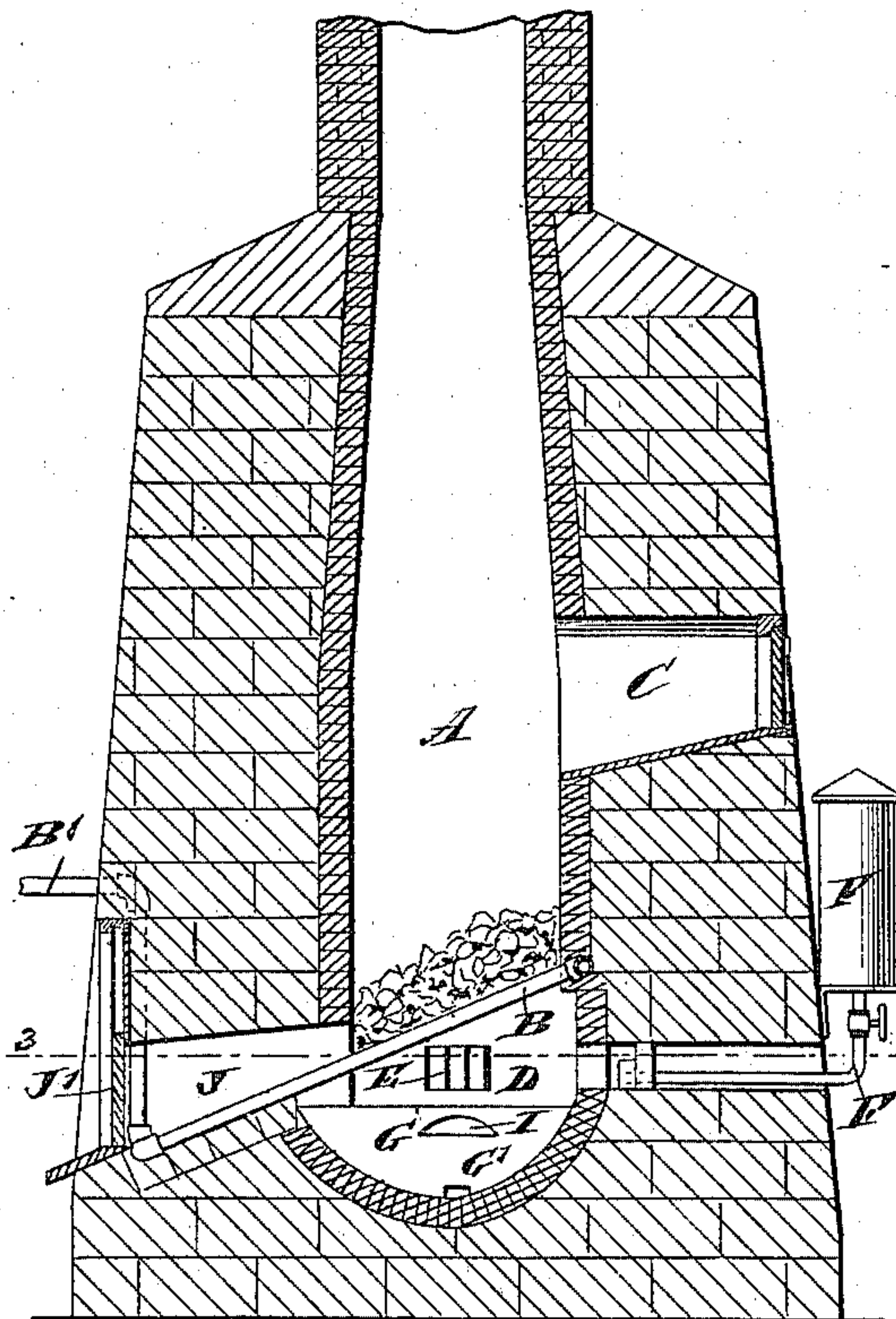


FIG. 2.

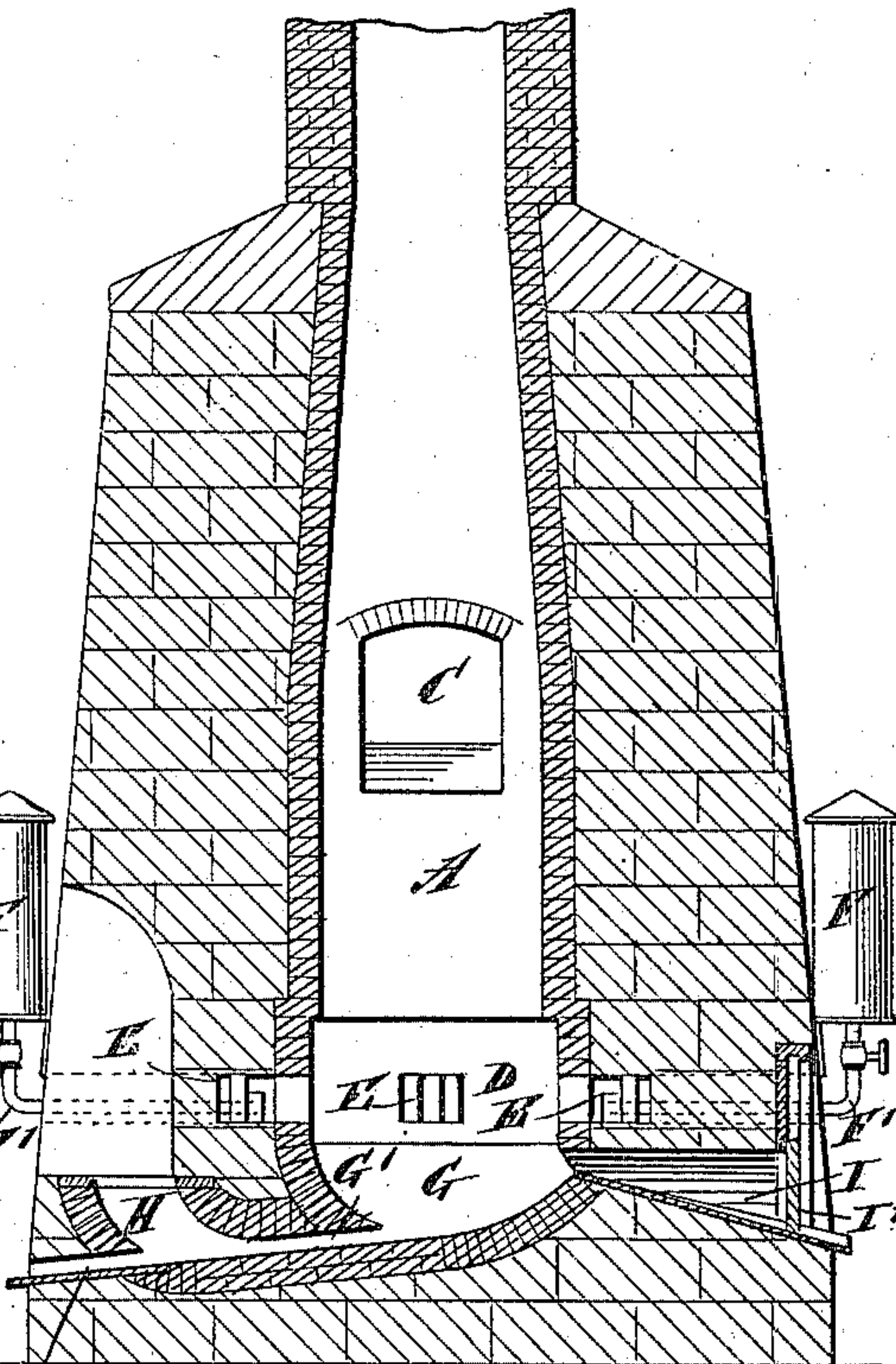


FIG. 3.

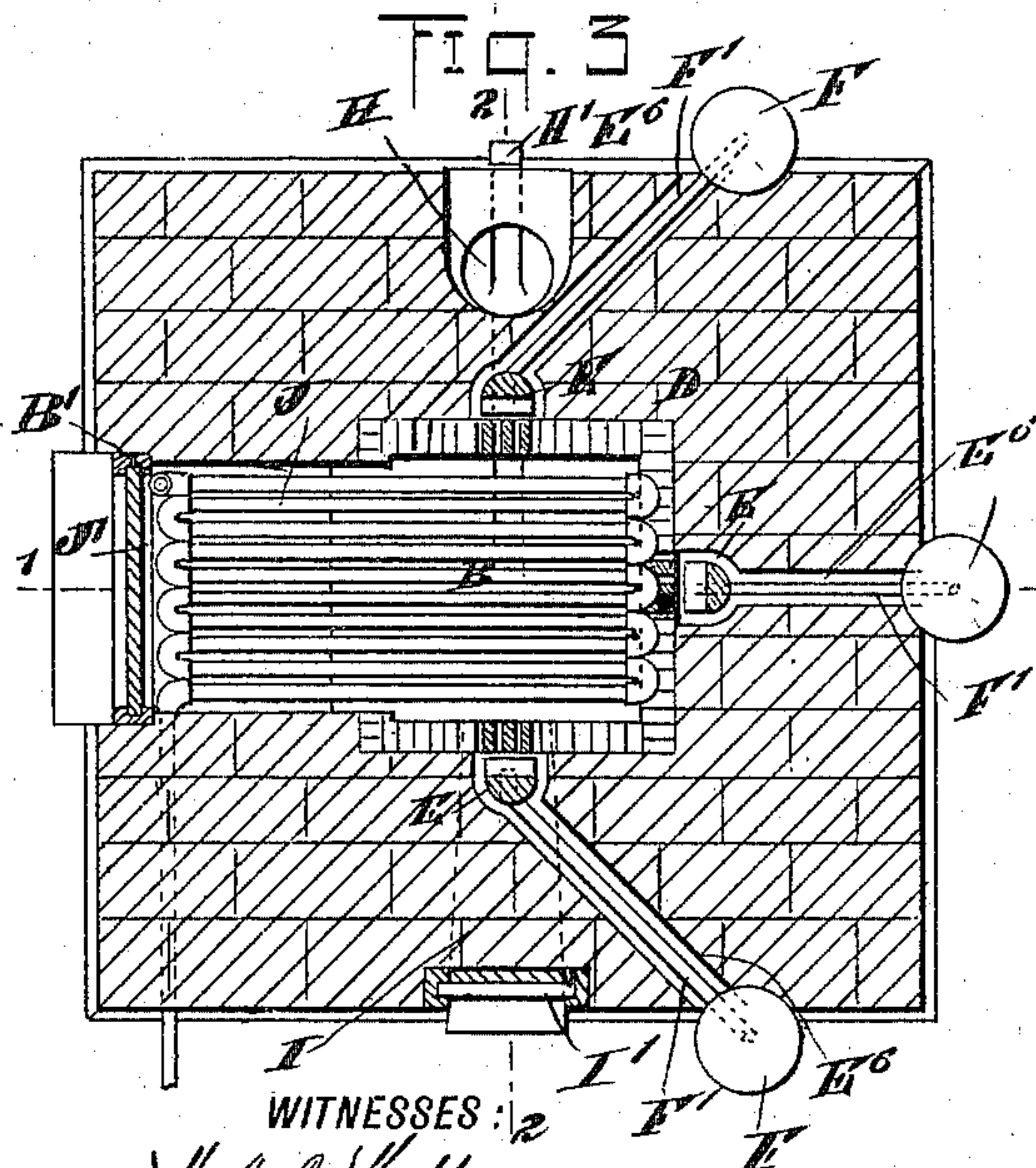


FIG. 4.

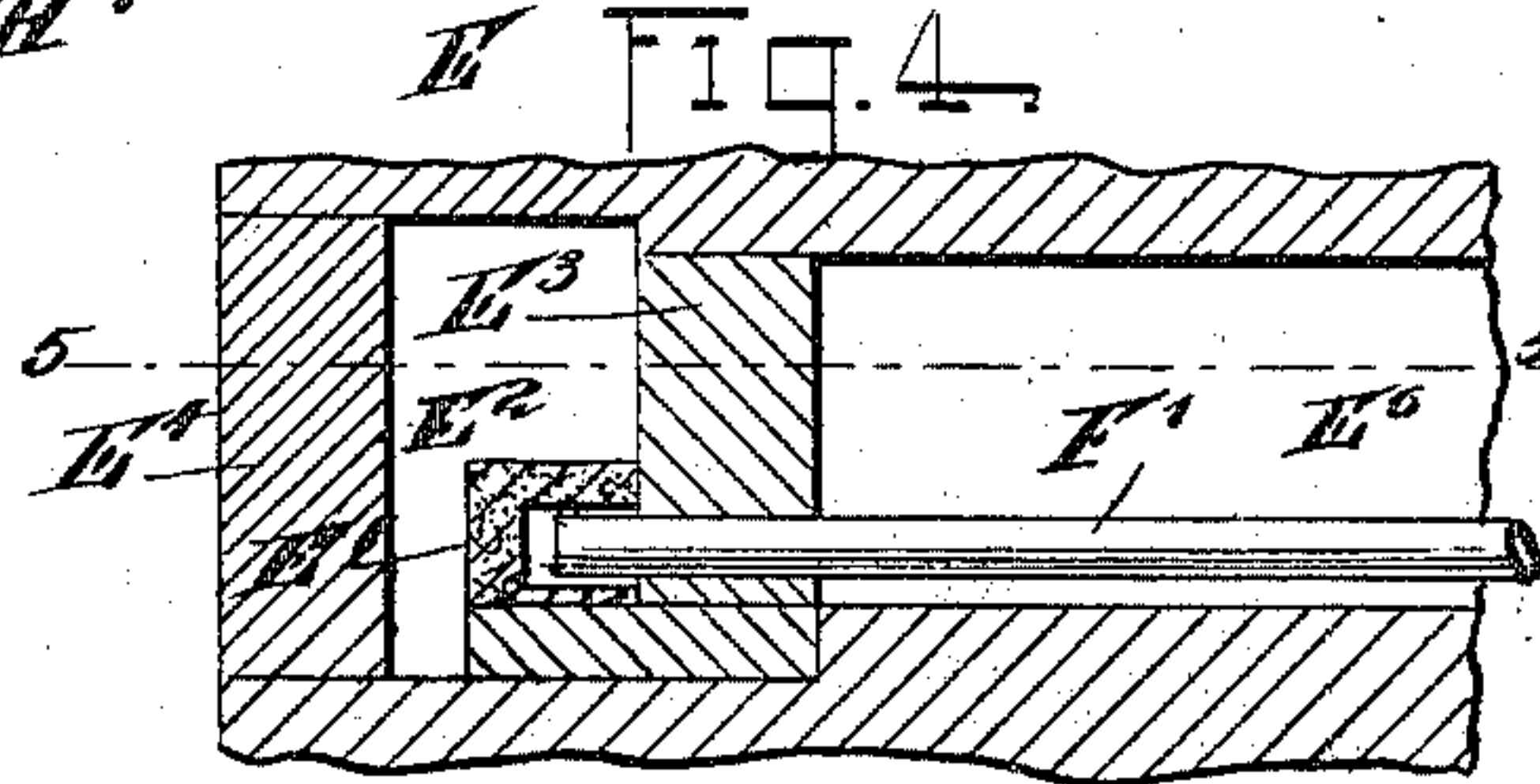
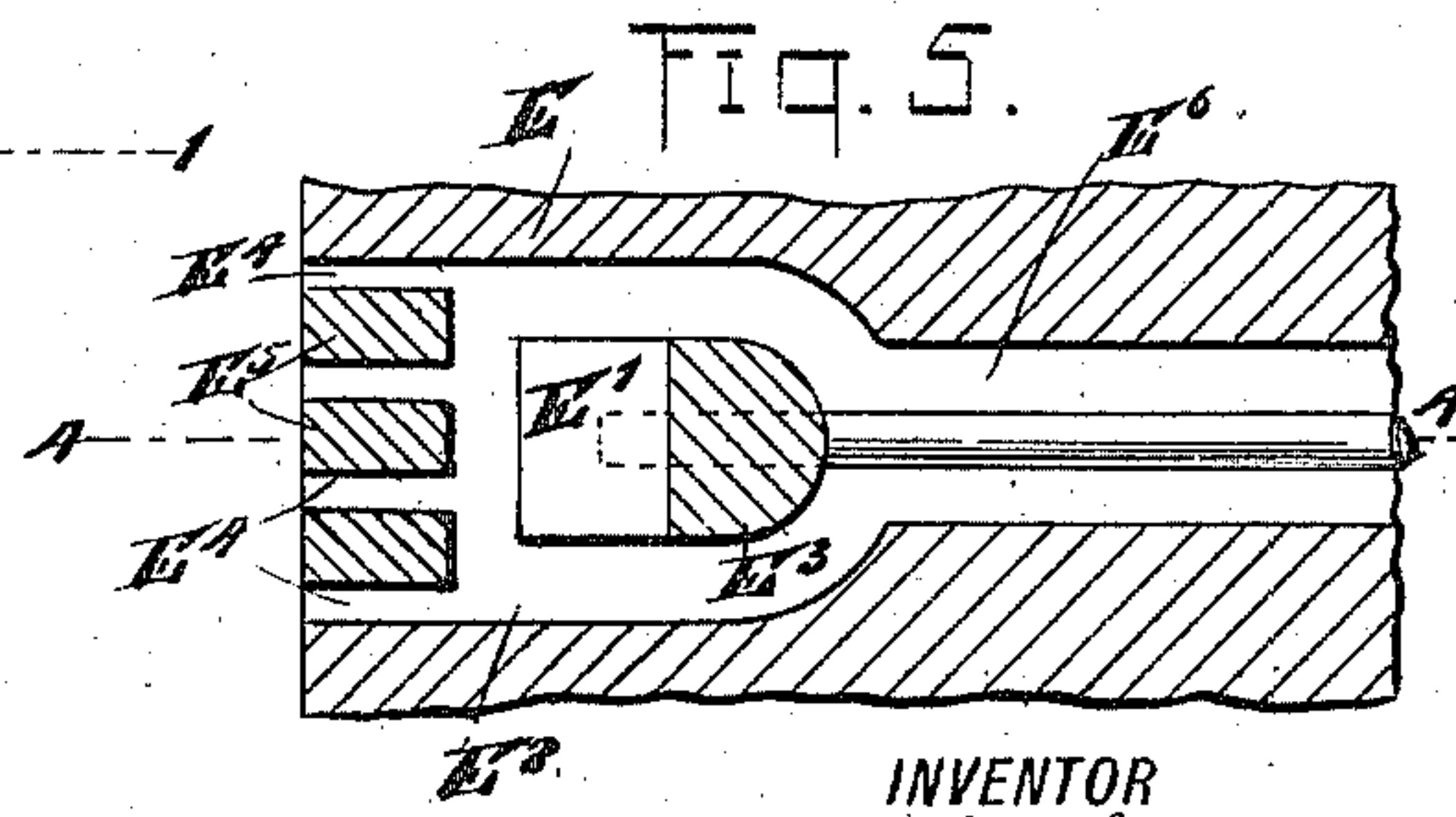


FIG. 5.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

CHARLES BISHOP, OF TACOMA, WASHINGTON.

## SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 578,963, dated March 16, 1897.

Application filed October 23, 1896. Serial No. 609,821. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES BISHOP, of Tacoma, in the county of Pierce and State of Washington, have invented a new and Improved Smelting-Furnace, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved smelting-furnace more especially designed for fusing all kinds of ore and arranged to permit of using oil as the fuel, with or without charcoal mixed in the ore.

The invention consists of certain parts and details 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 characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement on the line 1 1 of Fig. 3. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 3. Fig. 3 is a sectional plan view of the same on the line 3 3 of Fig. 1. Fig. 4 is an enlarged sectional side elevation of one of the fire-boxes, the section being taken on the line 4 4 of Fig. 5; and Fig. 5 is a sectional plan view of the same on the line 5 5 of Fig. 4.

The improved smelting-furnace is provided with a suitably-constructed stack A, in the lower end of which is arranged an inclined grate B, preferably made of hollow pipes, through which circulates water supplied by a pipe B', connected with a suitable water-supply. On the grate B rests the charge of ore, mixed, if desired, with charcoal, the charge being introduced into the stack by a charge-door C, built in one side of the brickwork a suitable distance above the grate, as shown in the drawings. Below the grate B is formed a combustion-chamber D, into which open a series of fire-boxes E, deriving their supply of fuel in the form of oil from oil-tanks F, arranged exteriorly of the stack and a suitable distance above the fire-box, so that the oil flows by its own gravity through a valved pipe F' into the fire-box to be burned therein, the flame passing into the combustion-chamber under the grate B to heat and melt the ore supported thereon. The bottom of the combustion-chamber D is formed into a basin or bowl G, adapted to receive the

molten metal dropping between the pipes or bars of the grate B through the combustion-chamber into the said bowl G. The latter is connected at its bottom by an inclined channel G' with a bullion-pot H, built in the brickwork of the stack A, and the bullion-pot is provided with an outlet H', usually closed by a plug, unless it is desired to run the bullion off very rapidly.

The upper end of the bowl or basin G is connected with a slag-discharge I, extending to one side of the furnace and having a bottom inclined downwardly and outwardly, to readily run off the slag accumulating on the top of the molten metal contained in the basin G. The slag-discharge I is closed near its lower end with a door I', opened from time to time to run off the slag.

The combustion-chamber D has its walls formed with offsets relative to the lower end of the stack A, so that the molten metal can drop through the combustion-chamber and accumulate in the bowl G, and the upper or inner end of the slag-discharge I is likewise set off, so as to cause the slag on the top of the molten metal to readily pass into the said slag-discharge without danger of the molten metal passing into the said discharge.

The lower portion of the grate B extends into the bottom of a discharge-chamber J, normally closed by a door J' and adapted to receive the residue or slag of the ore sliding down the grate B after the metal has been extracted from the ore. It will be seen that by the arrangement described the substances contained in the ore and not forming part of the metal are separated from the molten metal by passing down the grate B into the chamber J, from which the waste slag or residue can be removed from time to time through the door J'.

Each of the fire-boxes E is preferably of the construction shown in detail in Figs. 4 and 5, that is, the end of the pipe F' discharges upon porous fireproof brick E', so that the oil saturates this brick and the latter evaporates the oil, the vaporizing being done in a chamber E<sup>2</sup>, built in the brickwork of the furnace.

In order to prevent the flame from passing backward, I erect in the rear of the brick E' a reflecting-bridge E<sup>3</sup> to cause the burning



gases to pass through openings or slots E<sup>4</sup> in the front of the chamber E<sup>2</sup> into the combustion-chamber D, the said slots or openings E<sup>4</sup> being formed by bricks E<sup>5</sup>, set at suitable distances apart. Air passes to the chamber E<sup>2</sup> by a channel E<sup>6</sup>.

Now it will be seen that by the arrangement described the heat from the burning oil readily passes into the combustion-chamber D and upward between the bars of the grate B to the charge, so as to heat and melt the metal contained therein, the molten metal dropping between the bars of the grate into the basin or bowl G, in which the slag is separated and discharged by the slag-discharge I. The pure molten metal runs through the channel G' into the bullion-pot H, from which it is removed from time to time, the said bullion-pot being open at the top by a niche built in the side of the furnace, as plainly indicated in Figs. 2 and 3. If the molten metal runs very fast into the bowl G, it can be run out directly by removing the plug from the outlet H'.

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

1. A smelting-furnace, comprising a stack, a combustion-chamber having its bottom formed into a basin to receive the molten metal, a slag-discharge chamber, an inclined grate, the lower end of which projects into the said slag-discharge chamber, and a plurality of fire-boxes connected with an oil-supply and discharging into the combustion-chamber, substantially as described.

2. A smelting-furnace, comprising a stack, a grate at the lower end of the stack and arranged in an inclined position, a combustion-chamber under the grate, a slag-discharge chamber, into which the lower end of the grate projects a series of fire-boxes discharging into the said combustion-chamber from the sides thereof and each formed with a vaporizing-chamber, and a basin forming the bottom for the said combustion-chamber and adapted to receive the molten metal dropping through the grate and combustion-chamber, substantially as shown and described.

3. A smelting-furnace, comprising a stack, a grate at the lower end of the stack and arranged in an inclined position, a discharge-chamber into which one end of the grate projects, a combustion-chamber under the grate,

a series of fire-boxes discharging into the said combustion-chamber from the sides thereof and each having a vaporizing-chamber, a basin forming the bottom for the said combustion-chamber and adapted to receive the molten metal dropping through the grate and combustion-chamber, a bullion-pot connected with the said basin, substantially as shown and described.

4. A smelting-furnace, comprising a stack, a grate at the lower end of the stack and arranged in an inclined position, a combustion-chamber under the grate, a series of fire-boxes discharging into the said combustion-chamber from the sides thereof and each formed with a vaporizing-chamber, a basin forming the bottom for the said combustion-chamber, and adapted to receive the molten metal dropping through the grate and combustion-chamber, and a slag-discharge leading from the upper end of the said basin to the outside of the furnace and into which the lower end of the grate projects, substantially as shown and described.

5. A smelting-furnace, comprising a stack having a charge-door located a suitable distance above the lower end of the stack, an inclined grate arranged in the bottom of the said stack and leading to a slag-chamber, a combustion-chamber under the grate, a series of fire-boxes opening into the said combustion-chamber from the sides thereof, a basin forming the bottom for the said combustion-chamber and having a metal-discharge channel in its bottom and a slag-discharge at its upper portion, and a bullion-pot connected with the said basin, substantially as shown and described.

6. A smelting-furnace, provided with a fire-box comprising hollow porous brick, an oil-feed pipe discharging into the said brick and connected with an oil-tank, a reflector for the said brick and located in the rear thereof, and a chamber connected with an air-supply and containing the said brick and reflector, the said chamber having a series of openings leading from the chamber to a combustion-chamber, substantially as shown and described.

CHARLES BISHOP.

Witnesses:

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GEORGE TRUST.