

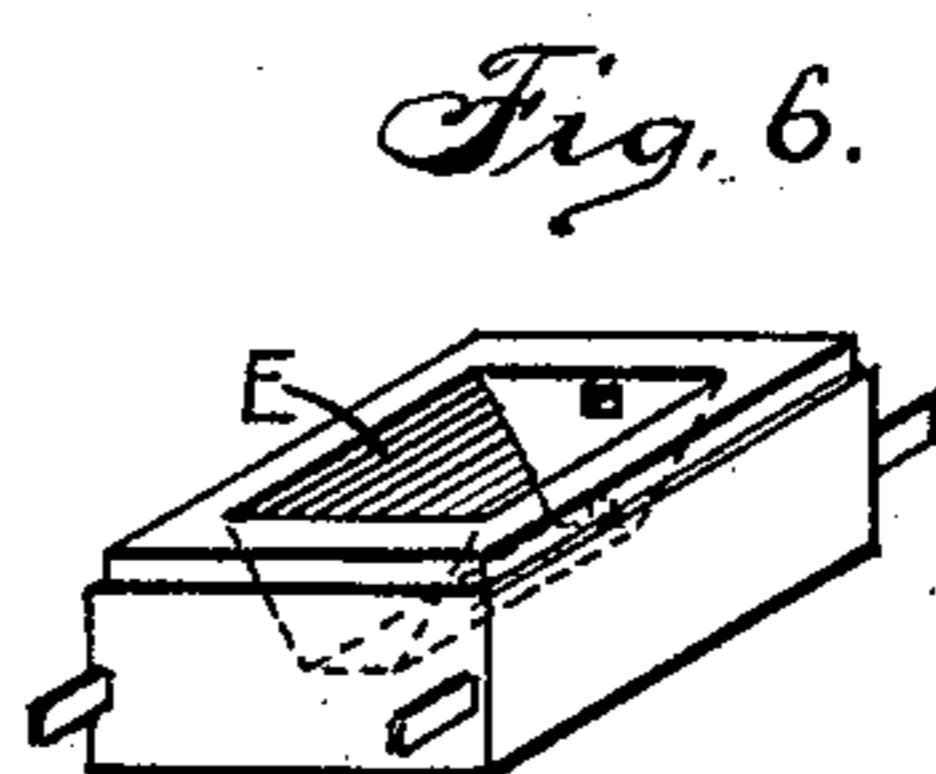
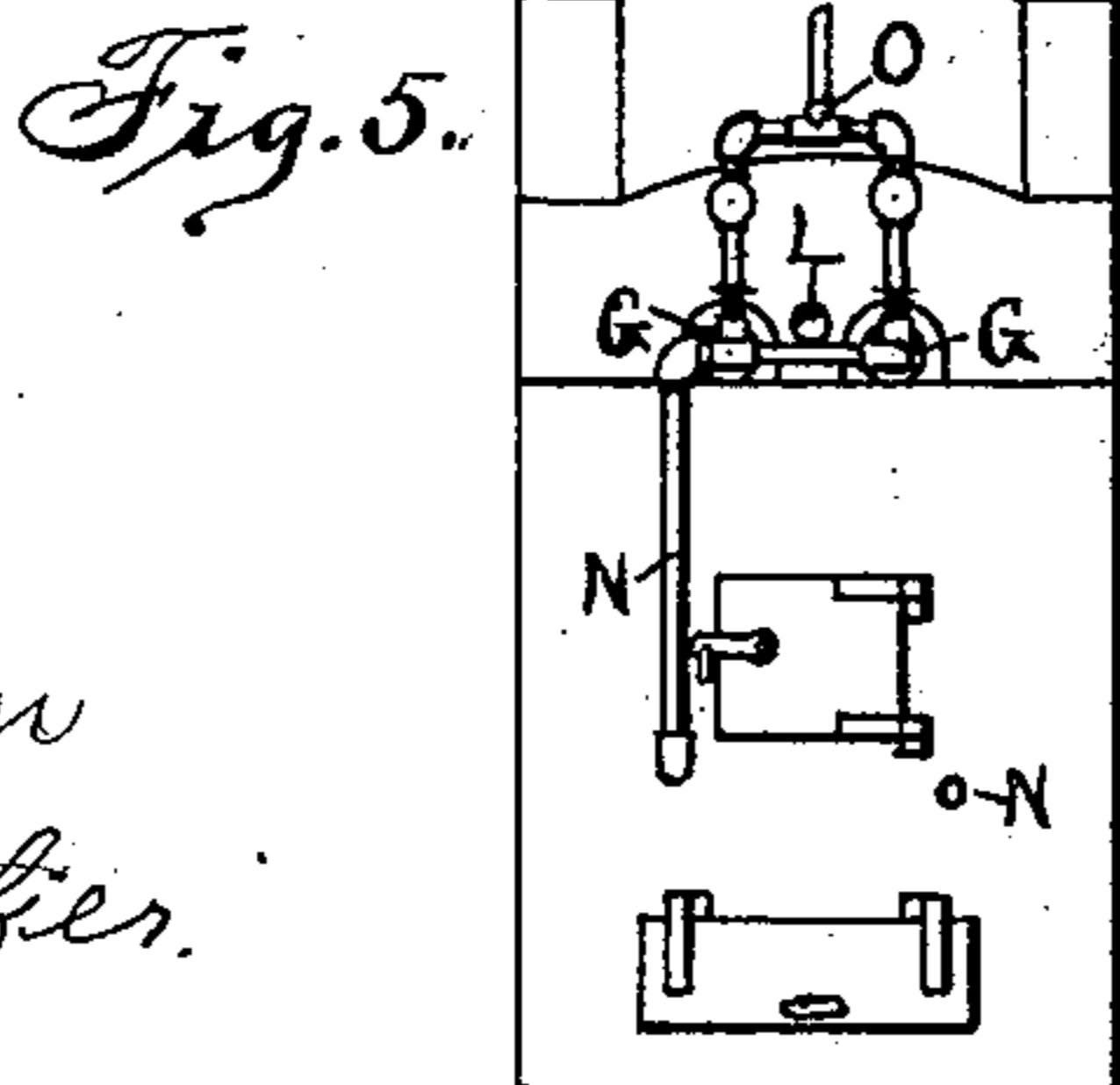
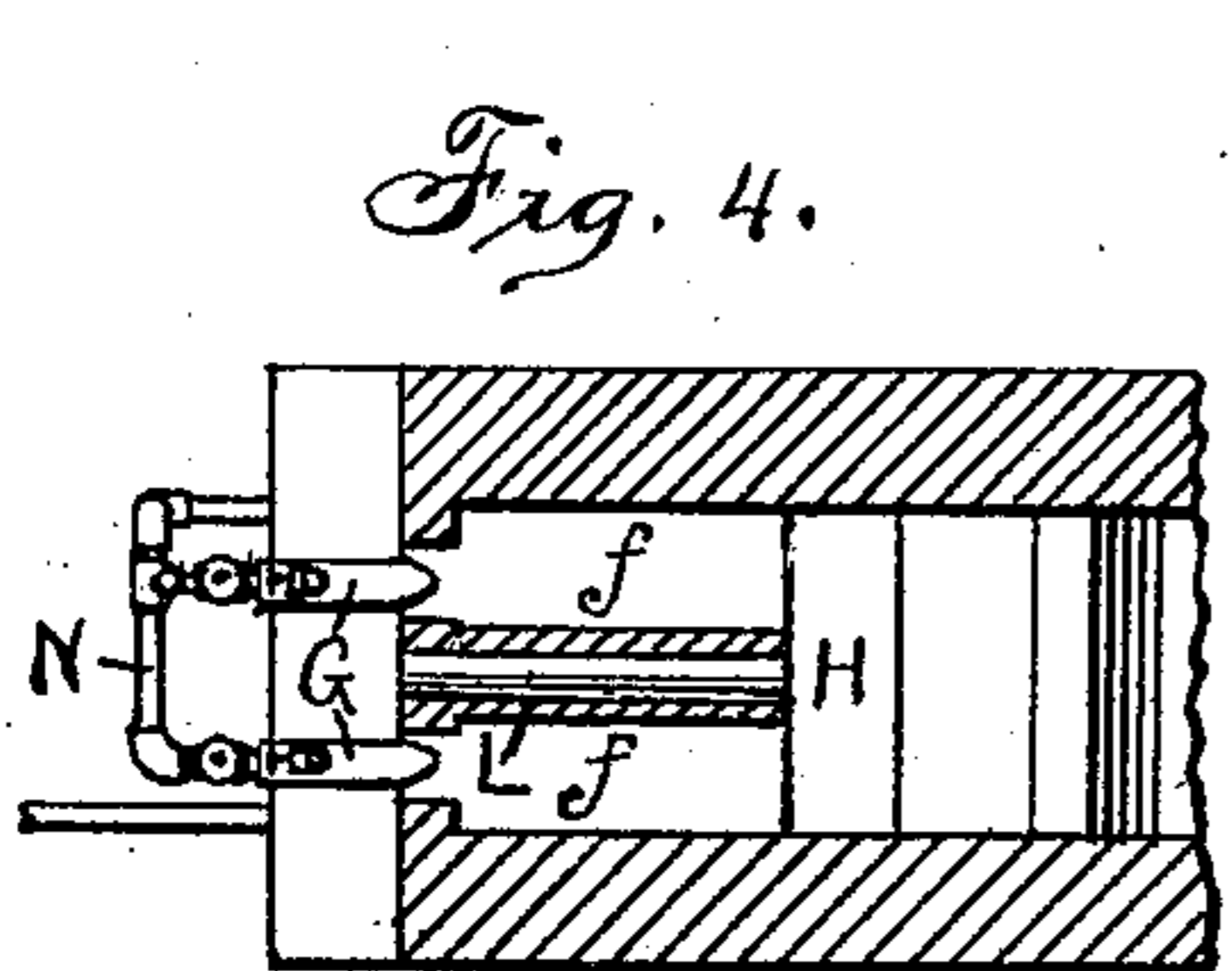
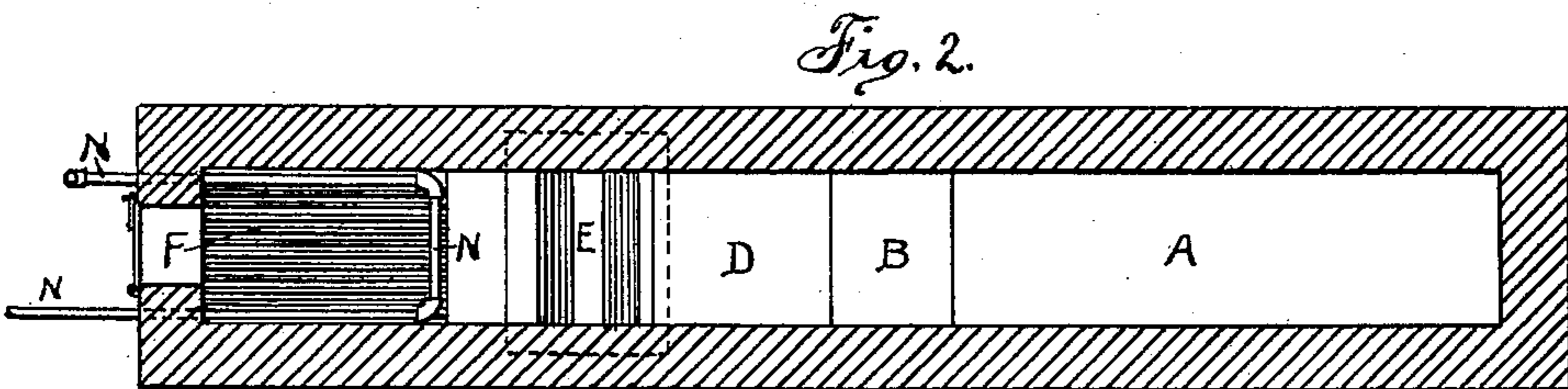
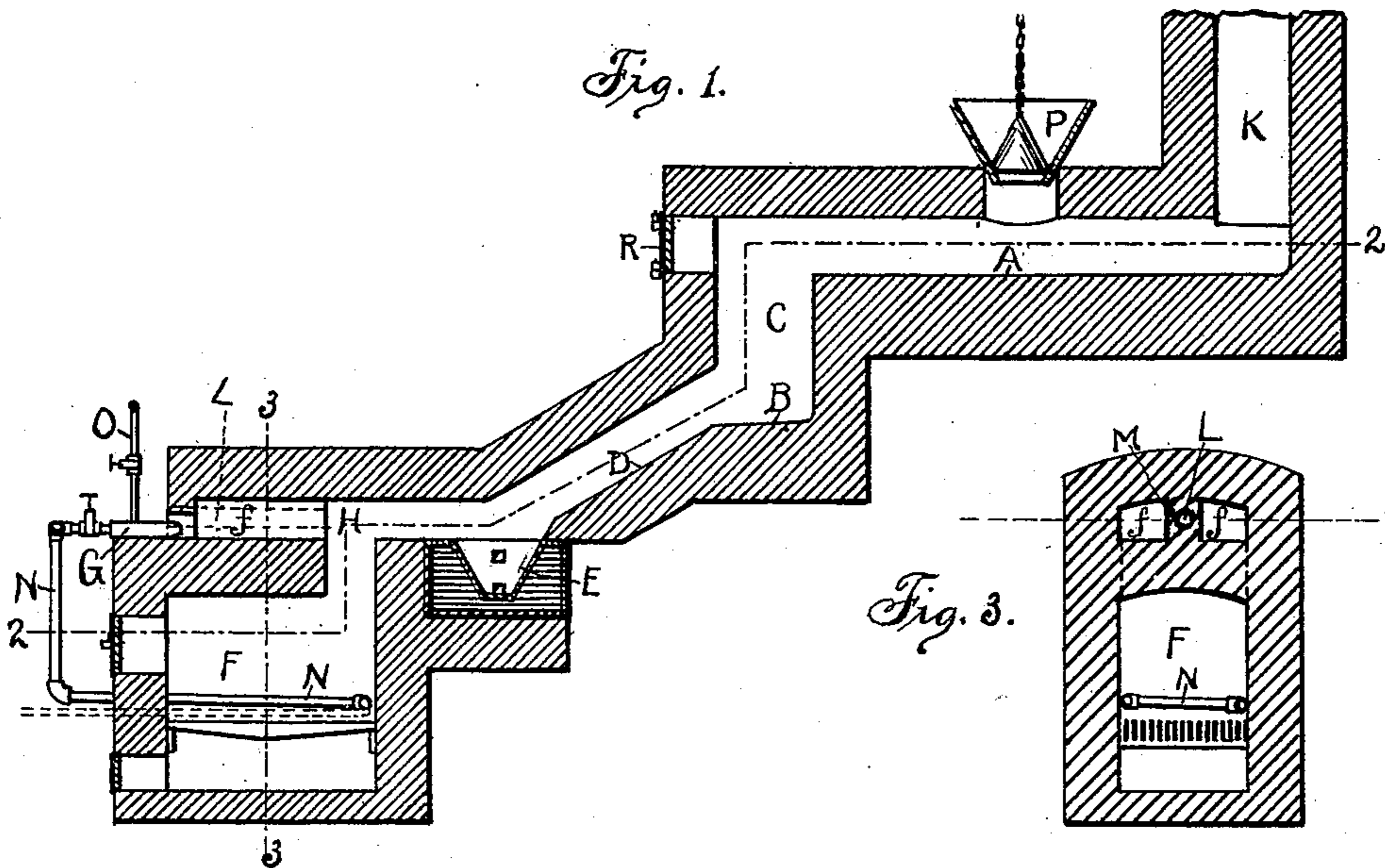
No. 613,868.

Patented Nov. 8, 1898.

J. H. ROSS.  
SMELTING FURNACE.

(Application filed Dec. 15, 1897.)

(No Model.)



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

JAMES HUGH ROSS, OF TACOMA, WASHINGTON.

## SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 613,868, dated November 8, 1898.

Application filed December 15, 1897. Serial No. 662,049. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES HUGH ROSS, a citizen of the United States, residing at Tacoma, in the county of Pierce and State of Washington, have invented a new and useful Smelting-Furnace, of which the following is a specification.

My invention relates to a furnace adapted to the combined use of coal, coke, wood, or other fuel with hydrocarbon gases produced by hydrocarbon-burners.

One object of my invention is to make a smelting-furnace of such form as to unite the substances of the ordinary fuel while in combustion with the substances of the hydrocarbon gases in such a manner that each will add to and aid the other in combustion and produce a maximum degree of temperature with a minimum quantity of the combined fuel substances.

Another object of my invention is to produce a furnace of such form as to combine an oven for heating the ore, a matting hearth or chamber, and an inclined runway to the smelting-chamber below, in which the bullion is finally separated from the slag.

The accompanying drawings, forming a part of this specification, illustrate the several parts of my invention.

Figure 1 is a vertical section lengthwise through the furnace. Fig. 2 is a horizontal section on the broken line 2 2. Fig. 3 is a cross-section through the fuel-furnace at 3 3. Fig. 4 is a partial top view of the front end of the furnace. Fig. 5 is a front end elevation of the entire furnace, and Fig. 6 is a perspective of the movable lead-well or smelting-chamber.

My furnace is designed to be of a medium size in order that it may be erected and used in remote mining districts, though it is not limited to any size or capacity. It is preferably to be erected on a hillside that will somewhat conform to the base of the structure to make its foundation. When built on level ground, the elevated parts of the furnace are to rest on suitable supports.

The furnace comprises a roasting-hearth A, a matting-hearth B, and chamber C, an inclined runway D leading therefrom, at the foot of which is the smelting-chamber or lead-

well E. The fire-box F is designed for the use of coal, wood, or other fuel for producing the required heat for smelting. Above the fire-box are combustion-flues *ff*, into each of which a hydrocarbon-burner G discharges a flame which meets and unites with the flames from F at H and produces a very high heat as they pass in combustion over the smelting-chamber E, the inclined runway D, through the matting-chamber C, thence over the roasting-hearth A, and finally the waste products of combustion pass out the smoke-stack K. The combustion-flues *ff* are separated by a partition M, in which is built a tubular air-hole L, which carries air from the outside and discharges it at H. The fresh oxygen thus supplied helps produce complete combustion at H and adds materially to the heat of the flames.

The hydrocarbon-burners are to be of any suitable manufacture for burning oil blown into a spray with steam under high pressure. The steam for the burners is to be generated with a boiler near the furnace and is to be supplied to the burners through the pipe N. This pipe, it will be observed, passes into and around the fire-box F, and thus highly superheats the steam before it reaches the burners. The oil used in the burners is supplied through the pipe O from a tank near by for that purpose. The burners each discharge through openings into the combustion-flues, as indicated in the several figures. These openings are sufficiently large to allow enough air to be drawn in for combustion. The supply of steam and oil for the burners is regulated by suitable valves on each pipe, as shown.

Having described the construction of my furnace, it is to be operated as follows: A fire is started in F and the furnace thoroughly heated, the hydrocarbon-burners being used simultaneously. The furnace is charged by depositing ore through the feed-hopper P onto the hearth A. By means of a long tool inserted through the door R the ore is spread evenly over A until it becomes thoroughly roasted, after which it is raked off into C, where it rests until fused. The hearth B is slightly inclined, thus allowing the mat to run off as fast as formed, and on running down D under the high heat of the flames into E

it readily smelts, after which it is drawn off and run into bullion. This operation may be kept up continuously for any length of time.

The smelting-chamber E is provided with  
5 suitable slag and tap holes for drawing off the slag and bullion. This chamber is made movable, being incased in an iron box that can be slipped in and out like a drawer. This is  
10 so designed that the chamber may be relined at any time. Fig. 6 represents the chamber removed.

The construction of the furnace is similar to that of other similar furnaces as far as general details of construction are concerned,  
15 thus rendering a minute description as to materials and details unnecessary.

It is to be observed that the furnace may be constructed with any width desired and that any number of hydrocarbon-burners and  
20 combustion-chambers may be added to meet the requirements of the width of furnace. Nor am I limited to length of hearths or other parts in the furnace construction, but reserve the right to so proportion them as to secure  
25 the best practical results.

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

1. In a smelting-furnace, the combination  
30 with the roasting-hearth, matting-chamber, runway and smelting-chamber, of a fire-box communicating with a space over the smelting-chamber, combustion-flues extending over the fire-box and opening into a space at  
35 H into which the flames pass from the fire-box on their way to the space over the smelting-chamber, hydrocarbon-burners discharging into said combustion-flues, an oil-supply

pipe to said burners, and a steam-supplying pipe leading from the fire-box to said hydro- 40 carbon-burners, substantially as and for the purposes described.

2. In a smelting-furnace, the combination with the roasting-hearth, matting-chamber, runway and smelting-chamber, of a fire-box 45 communicating with a space over the smelting-chamber, combustion-flues extending over the fire-box and opening into a space at H into which the flames from the fire-box pass on their way to the space over the smelting- 50 chamber, a partition separating said combustion-flues from each other and formed with an air-channel leading from outside of the furnace to the space at H, hydrocarbon-burners discharging into said combustion-flues, 55 an oil-supply pipe and a steam-supply pipe leading to said burners, substantially as and for the purposes described.

3. In a smelting-furnace, the combination with the roasting-hearth, matting-chamber, 60 runway, and fire-box in communication with the runway, of a smelting-chamber located at the lower end of the runway between it and the fire-box and beneath the channel or way through which the fire-box and runway com- 65 municate, said smelting-chamber comprising a removable box adapted to be moved into and out of a portion of the furnace, substantially as and for the purposes described.

In testimony whereof I affix my signature 70 in the presence of two witnesses.

JAS. HUGH ROSS.

Witnesses:

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G. W. BULLARD.