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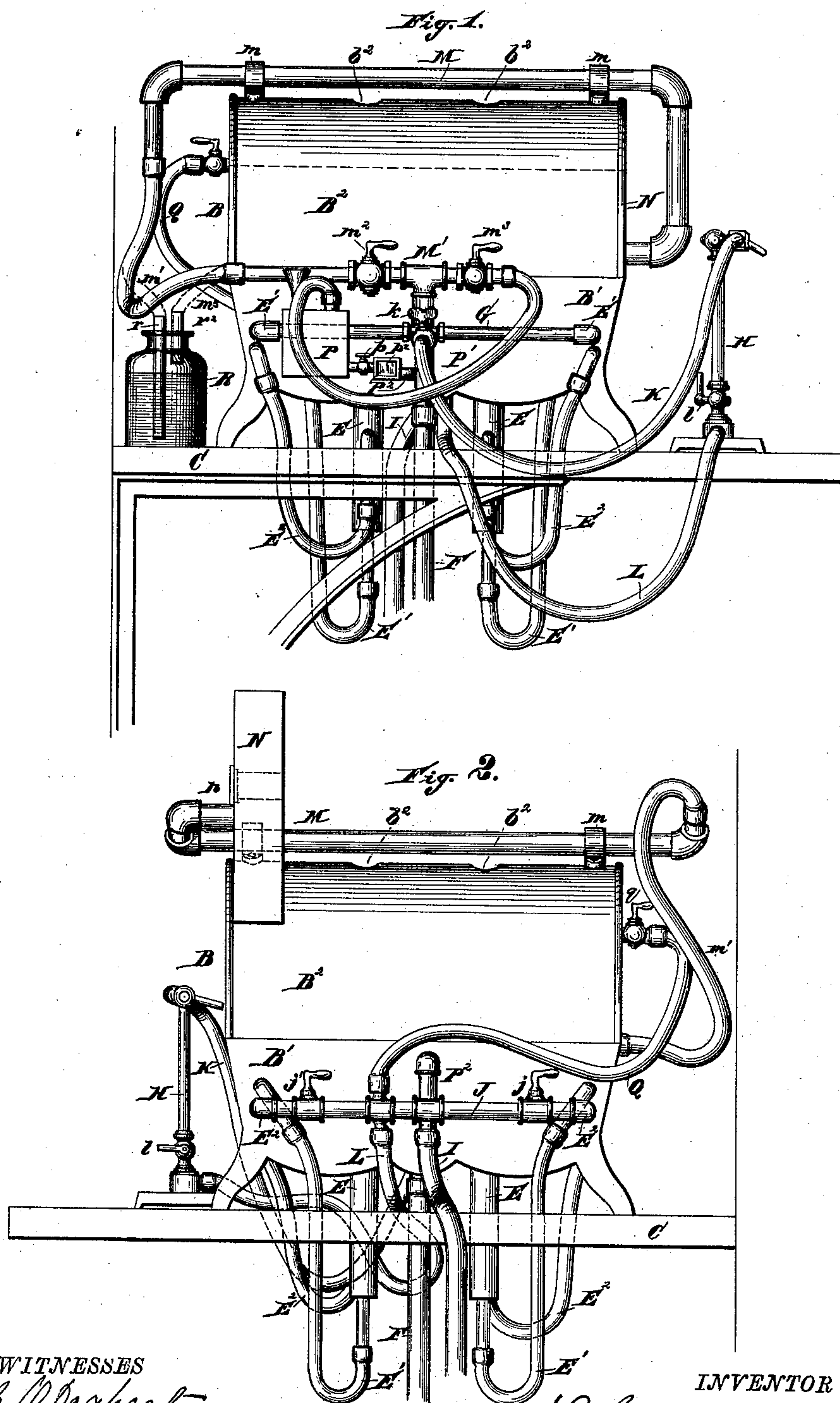
3 Sheets—Sheet 1.

C. H. LAND.

HYDROCARBON FURNACE.

No. 376,003.

Patented Jan. 3, 1888.



WITNESSES

WITNESSES
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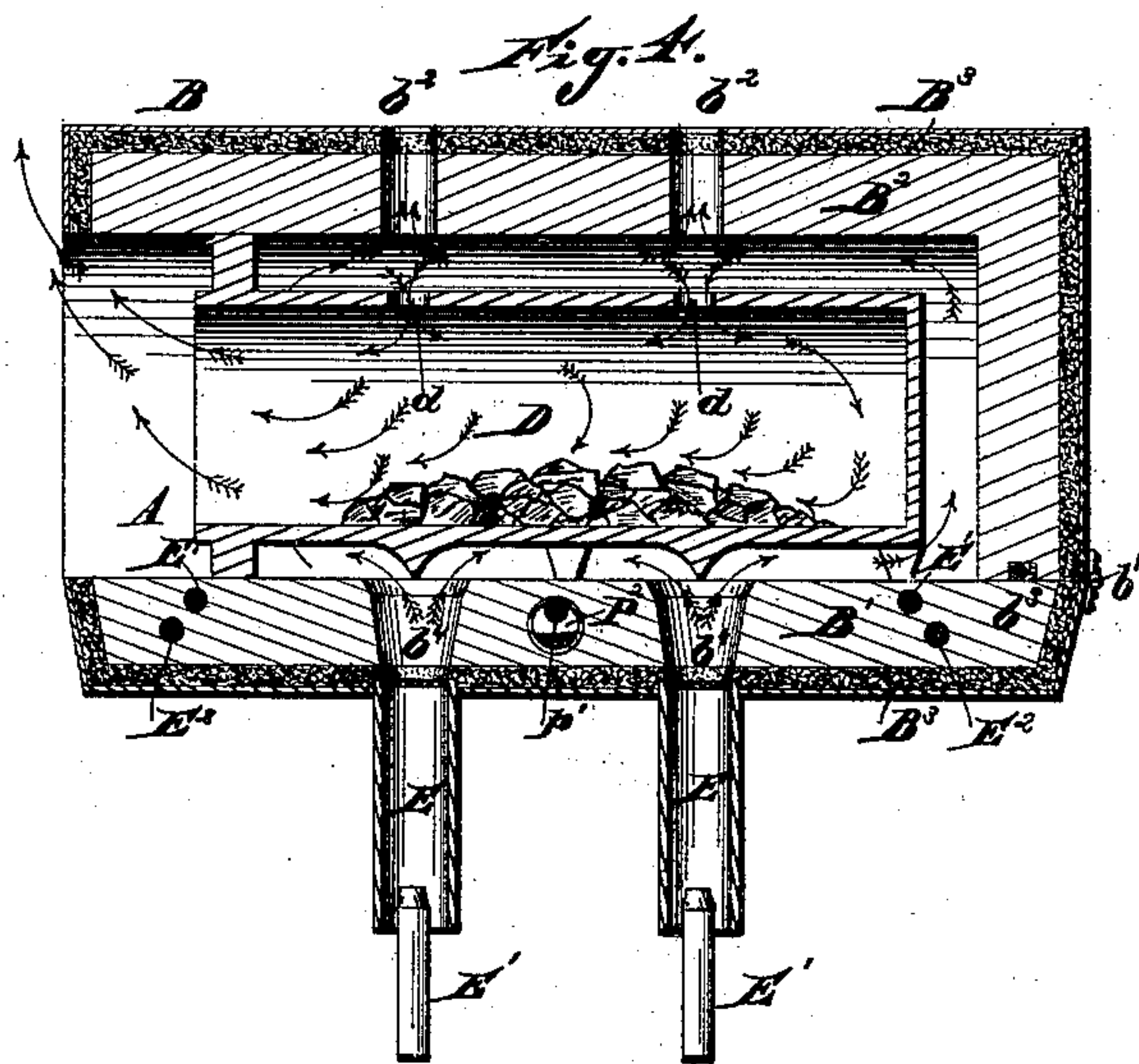
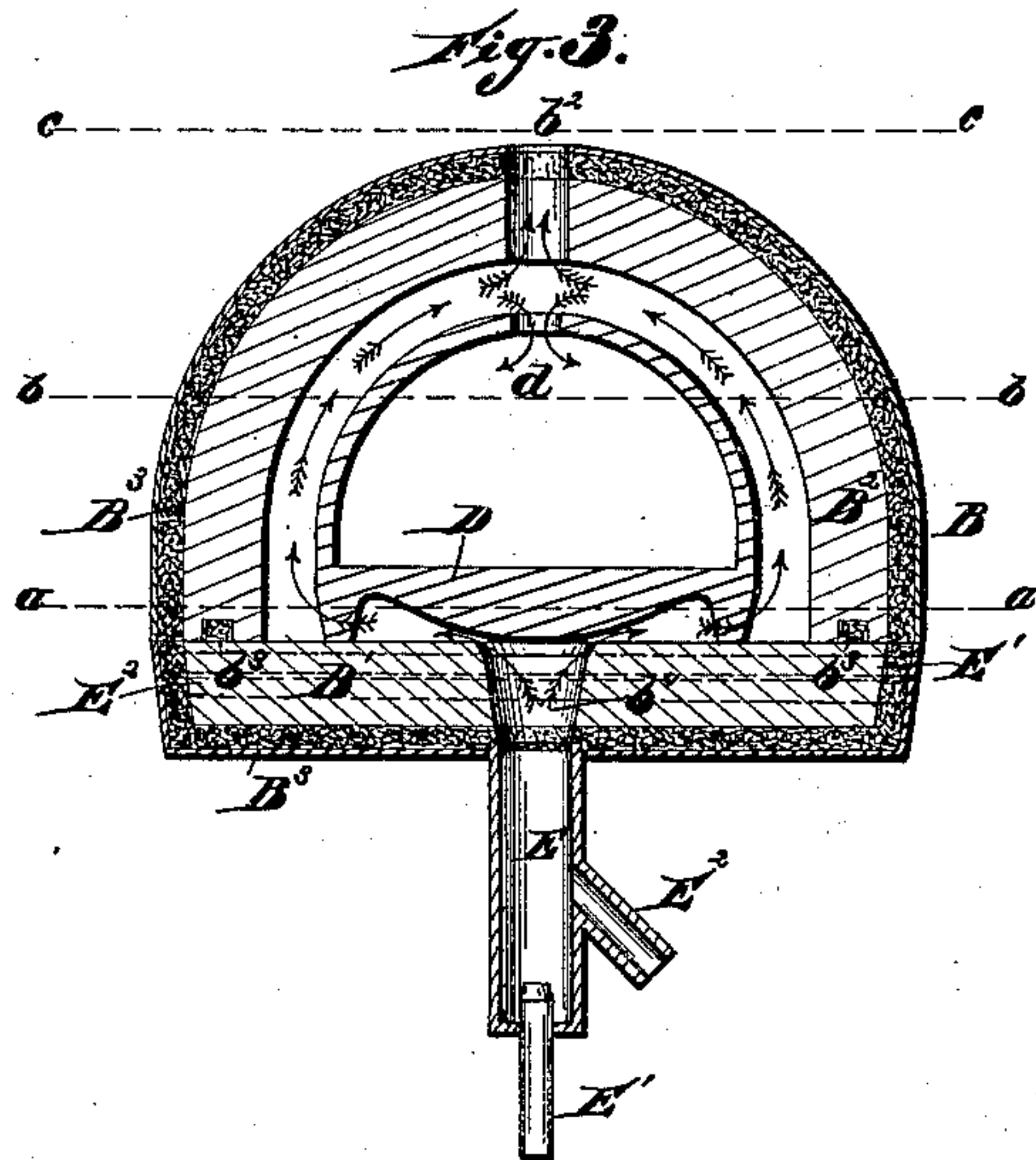
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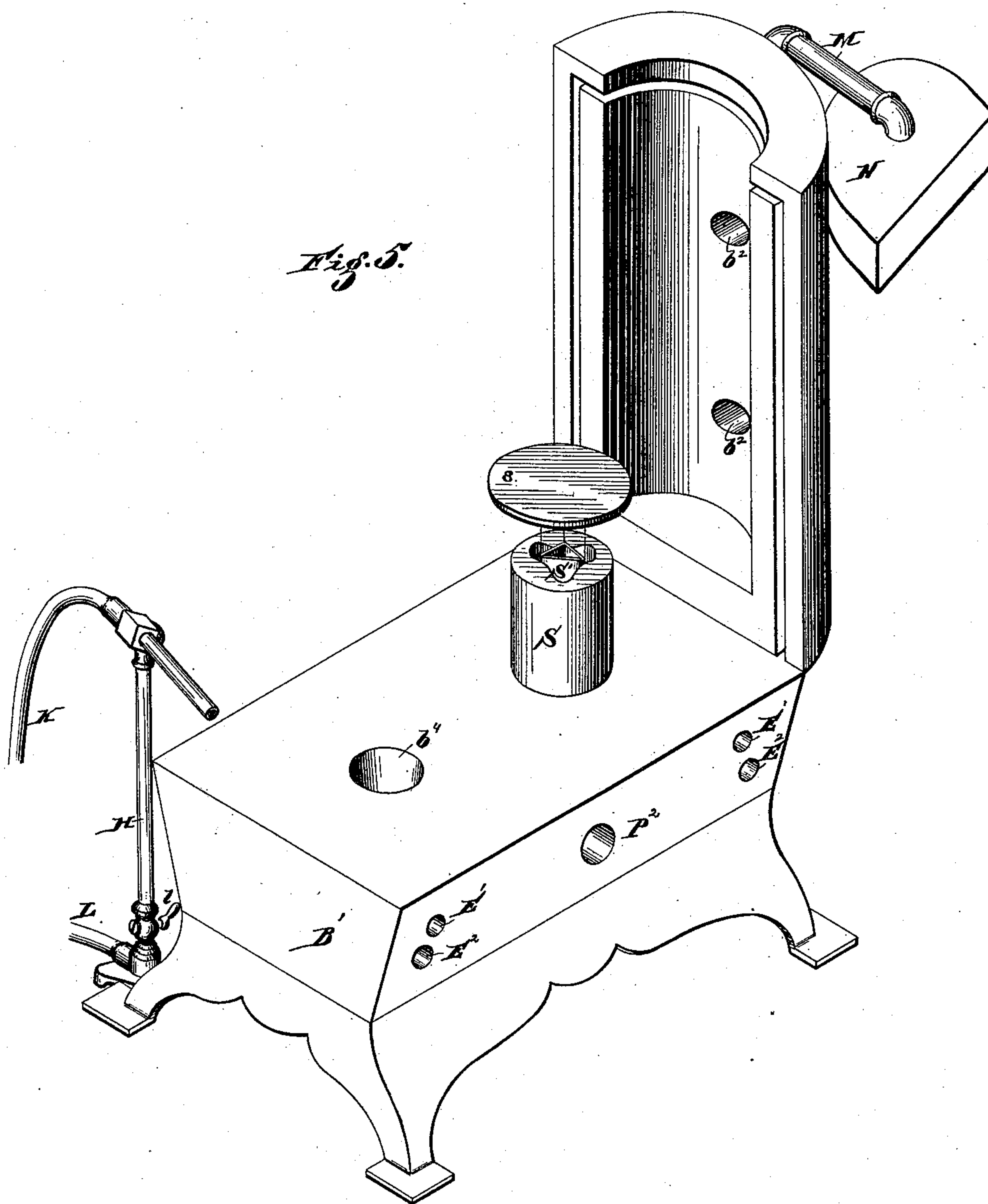
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UNITED STATES PATENT OFFICE.

CHARLES H. LAND, OF DETROIT, MICHIGAN.

HYDROCARBON-FURNACE.

SPECIFICATION forming part of Letters Patent No. 376,003, dated January 3, 1888.

Application filed April 22, 1886. Serial No. 199,823. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. LAND, of Detroit, county of Wayne, State of Michigan, have invented a new and useful Improvement in Hydrocarbon-Furnaces; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object an improved compound hydrocarbon-furnace for obtaining high temperatures by the use of liquid or gaseous fuels, either separately or in combination with each other, for metallurgical, chemical, and various other purposes; and it consists of the combinations of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a side elevation of a device embodying my invention. Fig. 2 is a similar elevation from the opposite side. Fig. 3 is a vertical cross-section; Fig. 4, a vertical longitudinal section. Fig. 5 is a perspective view with the cover thrown up, and illustrating features of my invention.

A represents a combustion-chamber; B, the inclosing-walls of said chamber, made in any suitable form or material, the same being preferably constructed of a base-section, B', and a cover-section, B², hinged together, as shown at b', preferably upon one end, so that the cover may be swung back. In furnaces for certain uses this hinged construction will be found convenient; but I do not limit myself thereto. The walls may be constructed with any suitable escape flues or vents, b², of any proper construction, either consisting simply of orifices in the case or otherwise, as may be desired. For some uses, also, it will be advantageous to close the case in an outer wrapping of asbestos or other analogous packing, B³, to prevent the penetration of air through the wall. Where a covering and base-section are made separate and united, I prefer, also, to provide an intermediate packing of asbestos or other analogous material, as shown at b³. This packing I have found to be a thorough preventive to the entrance of the atmosphere to the combustion-chamber.

C represents a support to the furnace.

D represents a muffle or oven located within the combustion-chamber, which may be of any desired construction, provided with one or more orifices, d, having any desired location, but preferably located at the top of the muffle, as shown, through which the residue of combustion may enter the muffle. The muffle is constructed to rest a little above the base of the combustion-chamber, so that the products of combustion may have free circulation underneath and around the same.

E represents an ordinary Bunsen or other suitable burner communicating with the combustion-chamber through orifices b⁴ in the base. E' is the air-blast pipe connected therewith; E², a hydrocarbon-pipe.

F represents the air supply pipe from the bellows, said supply-pipe communicating with a main, G, to supply both of the burners and also a blow-pipe, H.

I represents a hydrocarbon-pipe leading from a light-hydrocarbon generator and communicating with a main, J, through which hydrocarbon is supplied to both burners. In order to bring the air-blast and the hydrocarbon vapors to the burners in a heated condition, I prefer to lead the pipes E², communicating with said hydrocarbon-main J, through the base of the combustion-chamber, as shown in dotted lines, Fig. 3, and thence to the burner, as shown, while also the pipes E', communicating with the main G, are likewise led through the base-wall of the combustion chamber and thence to the burner.

j j' are stop-cocks in the main J, to control the supply of hydrocarbon to either of the burners.

K represents an air-pipe leading from the air-main G to the blow-pipe H.

k is a stop-cock to control the admission of air thereto.

L represents a hydrocarbon-pipe leading from the main J to the blow-pipe; l, a stop-cock to govern the admission of hydrocarbon to the blow-pipe.

M represents a counter-draft pipe located in supports m, preferably over the furnace and the orifices b², so that the draft in its passage through said pipes may be heated by the products of combustion escaping through said orifice. This counter-draft pipe is engaged with a movable furnace-door, N. This pipe

I prefer to hang in such a manner that it may have a longitudinal sliding movement, and also a swinging movement at right angles to said sliding movement, so that the door N may be thrown down to close the entrance to the combustion-chamber, as shown in Fig. 1, or so that the door may be removed and thrown out of the way, as shown in Fig. 2, for purposes which I will hereinafter explain. The end of the counter-draft pipe opposite the movable door is connected with the air supply pipe F in any suitable manner—as, for instance, by an intermediate flexible pipe, m' , leading to an additional air-main, M' , communicating with the air-main G. It is evident, however, that the counter-draft pipe may be caused to communicate with the air-blast pipe F in various ways, and I would have it understood that I do not limit myself to the means shown.

m^2 represents a stop-cock to govern the admission of air to the counter-draft pipe.

P represents a heavy-hydrocarbon receptacle; P' , an air-blast pipe communicating therewith, and P^2 a pipe through which heavy hydrocarbon passes from said receptacle to the hydrocarbon-main J. I prefer that said pipe P^2 should pass through the base of the wall of the combustion-chamber, so that its contents may be heated before being delivered into the main J. The force of the supply through the pipe I will prevent the heavy hydrocarbon passing through the pipe P^2 from descending into the hydrocarbon-pipe I, the contents of each of said pipes I and P^2 being caused to split or divide from the point of their entrance into the main J and pass in both directions to both burners when the stop-cocks J and J' are opened.

p represents a stop-cock to govern the admission of heavy hydrocarbon through the pipe P^2 .

m^3 is a stop-cock to control the admission of air into the receptacle P.

Q is a hydrocarbon-pipe leading from the main J into the combustion-chamber, provided with a stop cock, q , to control the admission of hydrocarbon therein.

R represents a jar for supplying any desired atmosphere to the combustion chamber.

Having thus described the various parts, I will now proceed to set forth the operation of the device. It will be seen that the hydrocarbon supply through the pipe I is divided upon its entrance into the main J and passes in both directions from the point of its admission into said main, thence through the base-wall of the combustion-chamber, and becomes heated, from whence it is communicated through pipes E^2 to the burners E. The air-blast F passes to the main G, and, being divided, passes in both directions through said main and through the base-wall of the combustion-chamber, whereby it becomes heated and is passed to the burner through the pipes E' . Combustion takes place beneath and around the muffle D, carbon monoxide being formed around the base of the muffle and car-

bon dioxide around the upper part of the muffle, and the dioxide, being heavier, is driven into the muffle through the orifices b^2 , while the monoxide disappears. For many kinds of work it will be convenient to leave the muffle and the combustion-chamber open at one end, as shown in Fig. 4. The blast which forces the carbon dioxide into the muffle through the orifices d affords an effectual resistance to the entrance of air into the muffle, excluding oxygen and overcoming all liability of oxidation. Should, however, the presence of oxygen be desired within the muffle, the removable door N is caused to close the combustion-chamber, when a blast of air may be admitted through the pipe M, which passes through the door. Thus the force of the blast through the pipe M will force oxygen into the muffle. This may be readily accomplished whenever the presence of oxygen is desirable. So, too, when for any purpose the presence of hydrocarbon is desired in the combustion-chamber, it may be readily admitted through the pipe Q. By locating a piece of mica in the door N, as shown at n , Fig. 2, the progress of the work within the muffle may be watched when the combustion-chamber is closed. By admitting the air-blast through the pipe M, the same being heated by the passage of said pipe over the orifice b^2 , the counter-pressure of said blast will readily overcome the pressure produced by the blast through E' within the combustion-chamber, so that all fuel-gases may be entirely prevented from entering the muffle, even though it should be cracked, so that in this manner the most delicate porcelain may be baked without the least liability of injury. It will be seen, moreover, that by disengaging the flexible pipe m' from the main M' and engaging said flexible pipe with the jar R or other retort, as upon the retort-pipe r , and leading a separate pipe from the main M' to the retort, as at r^2 , any desired vapor or gas may be forced into the muffle, thus making the furnace invaluable for scientific experiments and other uses. When the muffle is removed from the furnace, two burners are exposed and the base is ready for the various appliances for crucible, ladle, and blow-pipe work. One or both burners may be operated at any time, and also, if desired, in conjunction with the blow-pipe. The furnace may readily be heated to a very high temperature in a very brief period of time. The light or heavy hydrocarbon supply through the pipes I and P^2 may either be used separate or together in any desired quantity, while means are provided, as shown and described, by which any other desired gas or vapor—such as oxygen, hydrocarbon, nitrogen, &c.—may be easily introduced for any desired purpose, the whole mechanism being completely under the control of the operator, and the temperature may be held or raised to any desired point. Various chemical effects may thus be produced within the furnace both upon the gases admitted and upon the substances placed in the muffle or

crucible. I have discovered that the presence of carbon dioxide forced into and through the combustion-chamber or muffle in this manner is a ready and effectual means for preventing the oxidation of substances at high temperatures in open hearths, while the hearth may be closed in a convenient manner whenever desired. This counter-resistance of the blast of carbon dioxide through the open muffle, preventing the encroaching atmosphere, I regard as a very important feature of my invention. A furnace so constructed is adapted for a great variety of purposes, such as muffle-work, crucible-work, blow-pipe work, forging, and brazing, while it is complete in its adaptation, also, for the uses of the chemist, assayer, jeweler, dentist, metallurgist, and others. The range of work that can be accomplished by means of it is practically without limit, while at the same time the work may be done much more expeditiously than has been the case in devices hitherto constructed. The furnace may be heated to over 3,240° Fahrenheit in a few minutes. By making the furnace in two or more sections the proper construction of the interior fire-brick surface of the combustion-chamber and any repairs needed therein may be readily accomplished while the bed or base is also accessible for different purposes. In leading the pipe P^2 through the base of the furnace I prefer to enlarge the pipe, so that there will be formed a cavity (shown at p') above the heavy hydrocarbon, in which said carbon may be vaporized, and a tendency overcome for the same to be driven into the combustion chamber without being properly vaporized, the pipe P^2 thus forming a generator. The said pipe may be provided with a glass indicator, p^2 . By the use of the heavy hydrocarbon vaporized in the pipe P^2 the cost of fuel may be materially reduced, while also the heavy hydrocarbon is capable of producing a higher heat. By making the muffle removable, as shown, a new muffle may readily be inserted in case one becomes injured, and even when the furnace is heated. The pipe Q , whereby hydrocarbon may be admitted into the combustion chamber, should be introduced into said chamber in the region of the presence of dioxide of carbon, for the reason that should it enter the presence of the region of monoxide of carbon free oxygen would be encountered and the effect destroyed; but on entering the region of dioxide of carbon any free oxygen that might be forced into this region would be taken up by the hydrogen so injected. By locating it as above described a richer carbon may be created to be forced into the muffle, and carbon be thereby deposited in the muffle, if desired. I have ascertained that the presence of the monoxide of carbon is very injurious in its effect where it is allowed to come in contact with the work; but by this construction I am enabled to free the work from the presence of said monoxide and prevent injury thereby.

As illustrated in Fig. 5, the furnace is adapted for use with blow-pipe work, brazing and soldering, crucible-work, &c. In this case S represents a crucible-jacket. By reference to the same it will be seen that a crucible, S' , can be set within and all kinds of smelting carried on thereby, the jacket serving to confine heat upon the crucible, and also serves as a support therefor. When the muffle is removed and the crucible thus located in place, the device is adapted for jewelers' use for making certain castings, &c., while at the same time that this operation is being performed upon one of the burners the other may be used for soldering-work. In the usual investments of pieces of jewelry, artificial teeth, and the like, it will be seen that by placing them over the blast of one of the burners they can be conveniently brought up to a red heat, and then, by a small jet from the blow-pipe, the soldering can be had without danger of oxidation, the blast serving the same purpose as the usual charcoal beds in work of this kind. In smelting the ores—iron ore especially—as heretofore conducted, the monoxide of carbon has always been present and mingles with the smelting mass, resulting in consequent injury. Dioxide of carbon, however, becomes a protector to such substances, and it therefore becomes exceedingly desirable to smelt ores in the presence of dioxide of carbon and not in the presence of monoxide of carbon. My invention is designed to provide for the accomplishment of this end in an efficient and simple manner.

In Fig. 3 the monoxide of carbon will be formed in the region between the dotted lines $a a$ and $b b$, while the dioxide will be formed between $b b$ and $c c$. The dioxide of carbon becomes a protector in the smelting of ores, as no free oxygen is present.

For smelting ores I design to provide my furnace with an improved muffle or retort, which will form the subject of a separate application.

In the use of crucibles and their jackets of the form shown in Fig. 5 I prefer to employ a cap, s , removably located upon the crucible, the crucible preferably extending above the jacket, the cap thus serving to radiate the heat down and around the crucible, while it permits ready access also to the crucible.

For certain kinds of work the crucible might be wholly located within the jacket and supported upon a tripod with any suitable cover.

I am aware that furnaces have been provided with adjustable injection-pipes whereby the direction in which the fuel and air are injected into the furnace may be varied, and that steam, air, and hydrocarbon have been injected into a furnace through a mixing-pipe directly exposed to the heated products of combustion from said furnace; but these I do not claim, and my invention differs from such and from other inventions of this class, in that the gases and vapors are not injected into the

combustion-chamber, but into the muffle for the purpose of producing certain definite effects on substances placed therein, and also in the greater variety of uses to which my furnace can be successfully applied, its greater simplicity, economy, and convenience, and in the peculiarities of construction hereinbefore described, and defined in the following claims.

I would have it understood that I do not claim the combination of hydrocarbon burners with a muffle and furnace, nor the combination, with such muffle-furnace and burners, of an air-blast; neither do I broadly claim a muffle-furnace made in separate sections or provided with asbestos packing and air-tight wrapping. I would also have it understood that I do not herein claim the combination, with a hydrocarbon muffle-furnace and burners, of a light-hydrocarbon pipe or generator and a heavy-hydrocarbon reservoir and generator, as herein described, as such will be made the subject of a separate application for patent.

What I claim is—

1. The combination, with a furnace chamber having an air and vapor blast, of a muffle provided with openings in its top and a counter air-blast pipe communicating with the interior of the muffle, substantially as described.

2. The combination, with a furnace-chamber having escape-flues, a muffle in said chamber, and a burner for heating the same, of a counter-blast pipe located over the escape-flues of the furnace-chamber, whereby it is superheated and adapted to convey a counter-blast into the furnace-chamber to drive off injurious gases from the work and to admit determined gases to the work without chilling the muffle, substantially as described.

3. The combination, with a muffle-furnace having a movable door and a burner for heating the furnace, of a sliding and swinging counter-blast pipe adapted to communicate with the interior of the muffle, said pipe being located over the escape-flues of the furnace and connected with the movable furnace-door, substantially as and for the purposes described.

4. The combination, with a furnace-chamber, a muffle having top openings, a burner, and an air-blast exerting a pressure upon the products

of combustion, of a counter-blast to communicate with the interior of the muffle and force the products of combustion out under a greater pressure than that operating the blast in the combustion-chamber, substantially as and for purposes described.

5. The combination, with a furnace-chamber, a muffle, and a heating-burner, of a removable door, and a counter-blast pipe located over the escape-flues of the furnace-chamber, substantially as described.

6. The combination, with a muffle-furnace provided with burner and a removable door, of an air-blast pipe communicating with the burner, and a counter-blast pipe supporting said door, substantially as described.

7. The combination, with a muffle-furnace provided with an air and vapor blast, of a counter-blast pipe communicating with the air and vapor blast and adapted to communicate with the interior of the furnace, substantially as described.

8. The combination, with a muffle-furnace provided with vents b^2 , of a muffle perforated upon its upper surface, said furnace provided with one or more burners, the construction being such that the carbonic dioxide generated within the furnace will penetrate the muffle, substantially as described.

9. The combination of a furnace-chamber, an open muffle arranged in said furnace-chamber and having top perforations, and a heating-burner provided with an air-blast and communicating with the furnace-chamber to force the residue of combustion through the muffle and resist the encroachment of the atmosphere into said open muffle, substantially as described.

10. The combination, with a furnace-chamber provided with a removable cover and a muffle, of air and oil supply pipes and a blow-pipe located in front of the open muffle, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

CHARLES H. LAND.

Witnesses:

N. S. WRIGHT,

M. B. O'DOHERTY.