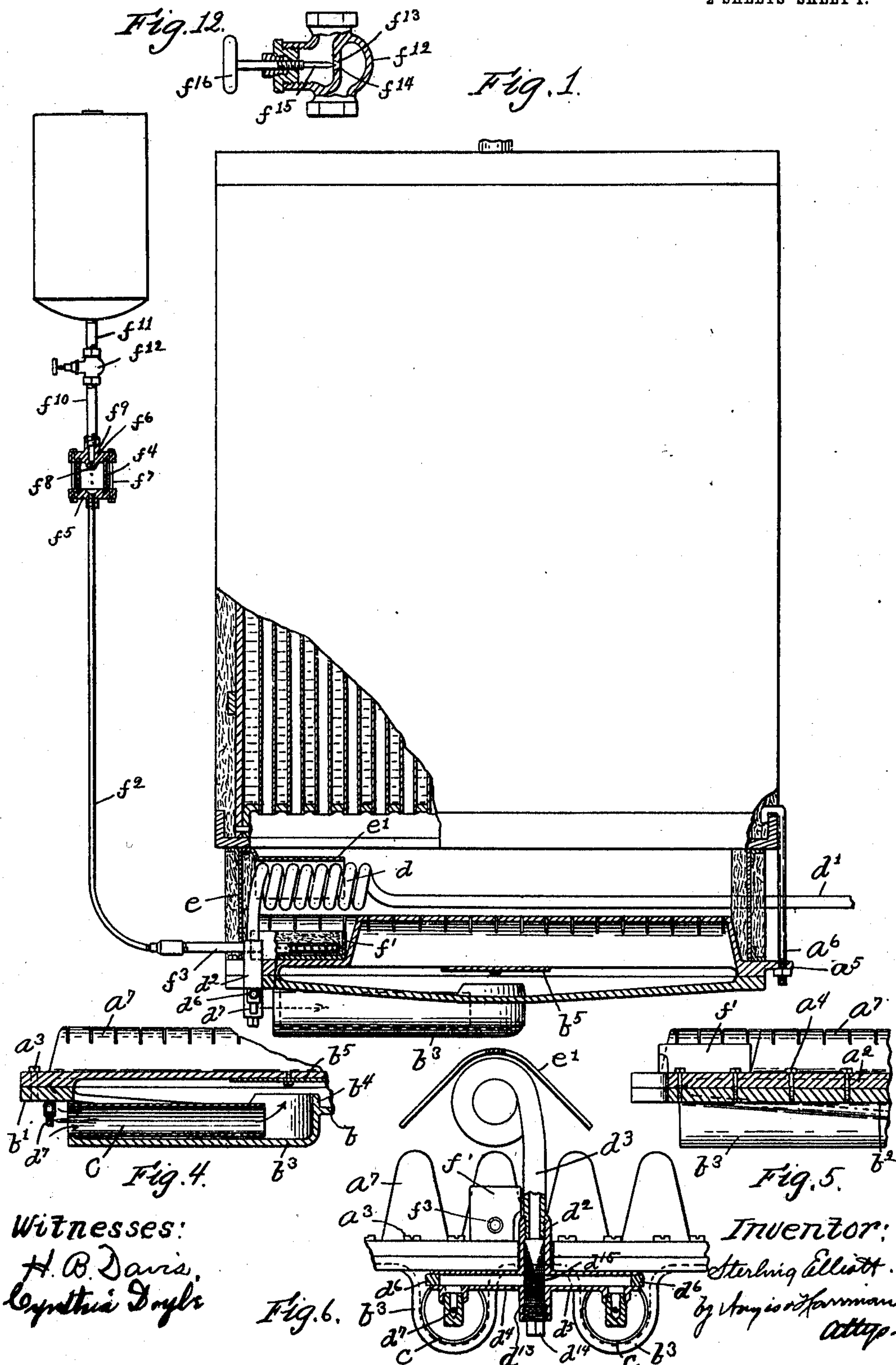


LIQUID HYDROCARBON BURNER.
APPLICATION FILED MAR. 11, 1908.

Patented May 30, 1911.

2 SHEETS—SHEET 1.



S. ELLIOTT.
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993,665.

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2 SHEETS-SHEET 2.

Fig. 2.

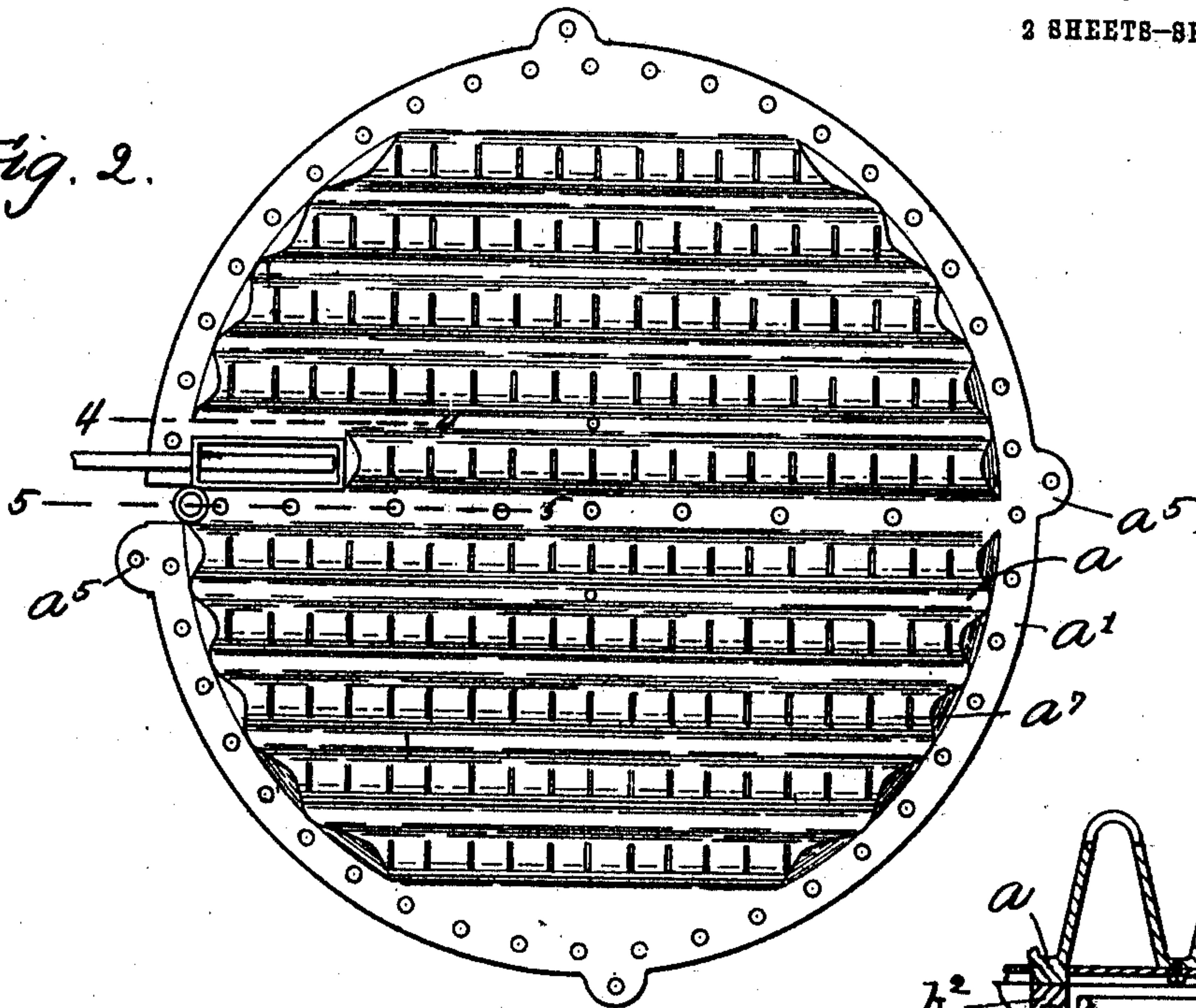


Fig. 3.

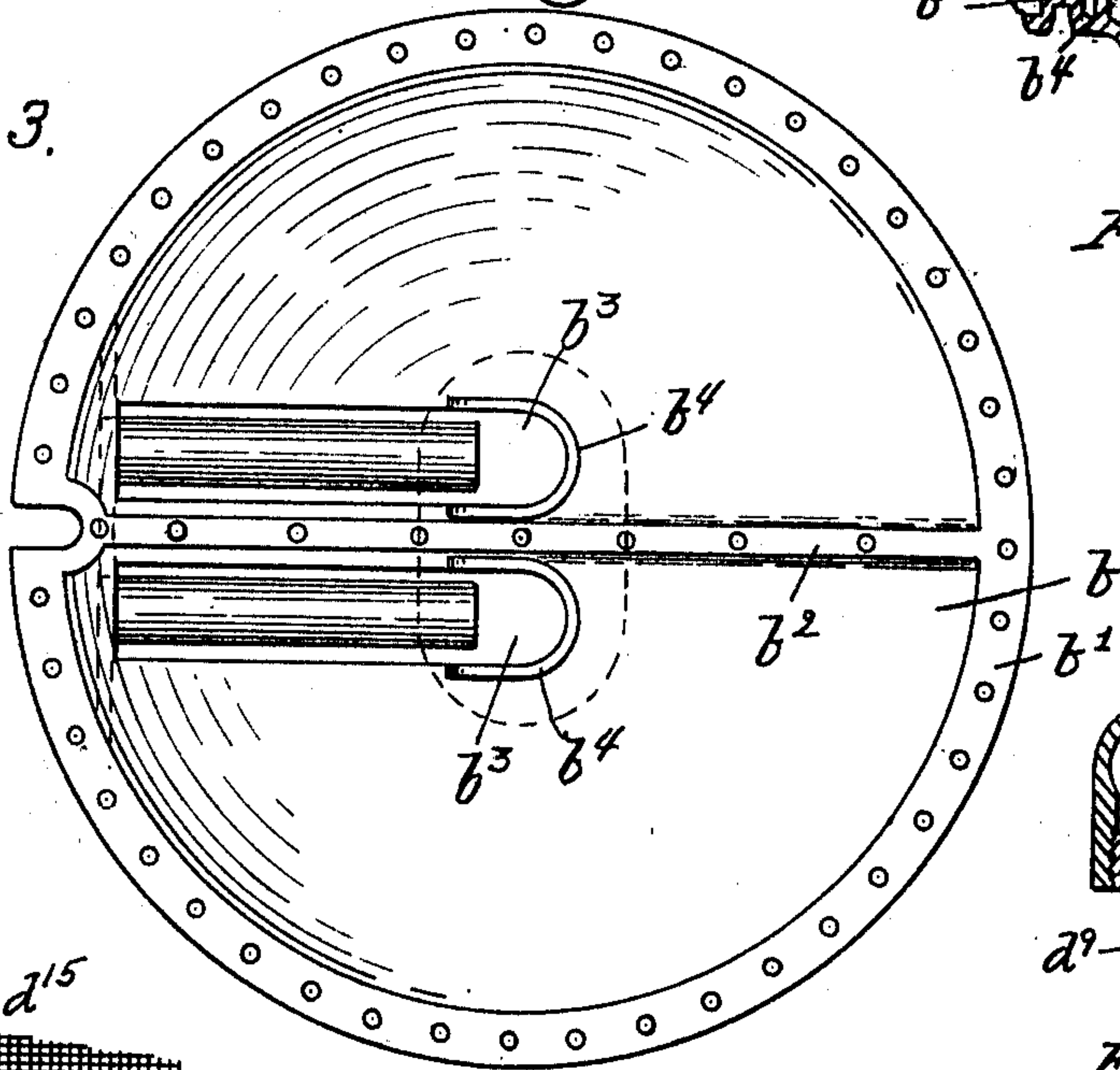


Fig. 10.



Fig. 9.

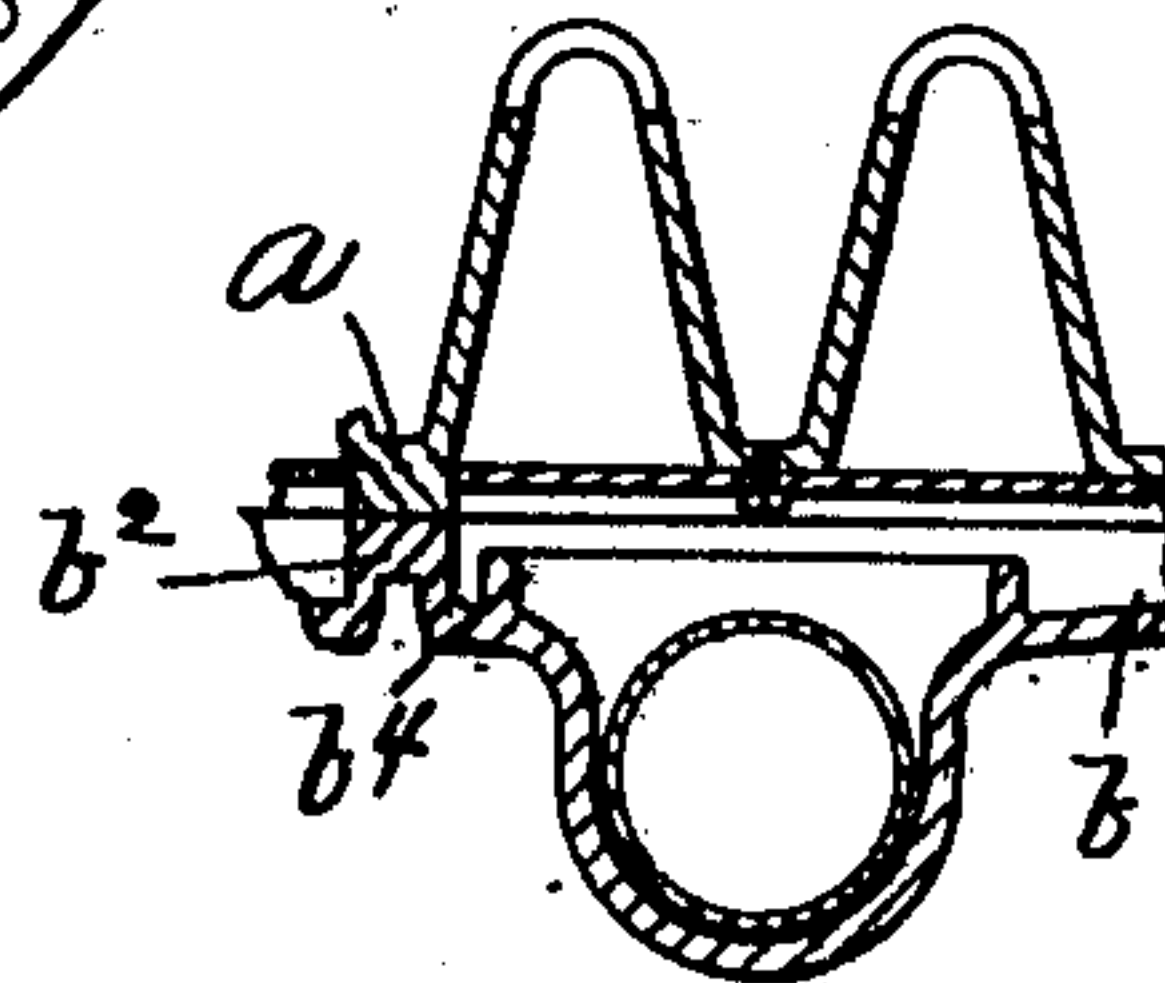
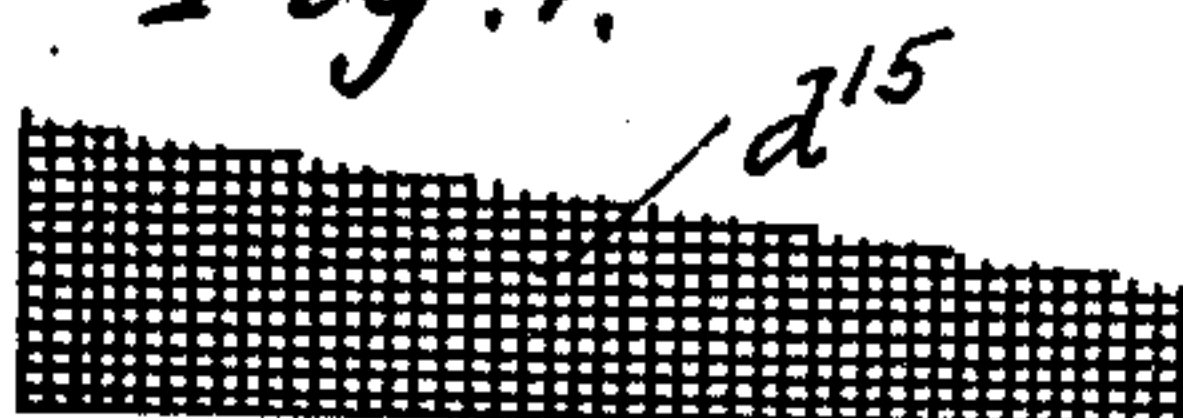


Fig. 8.

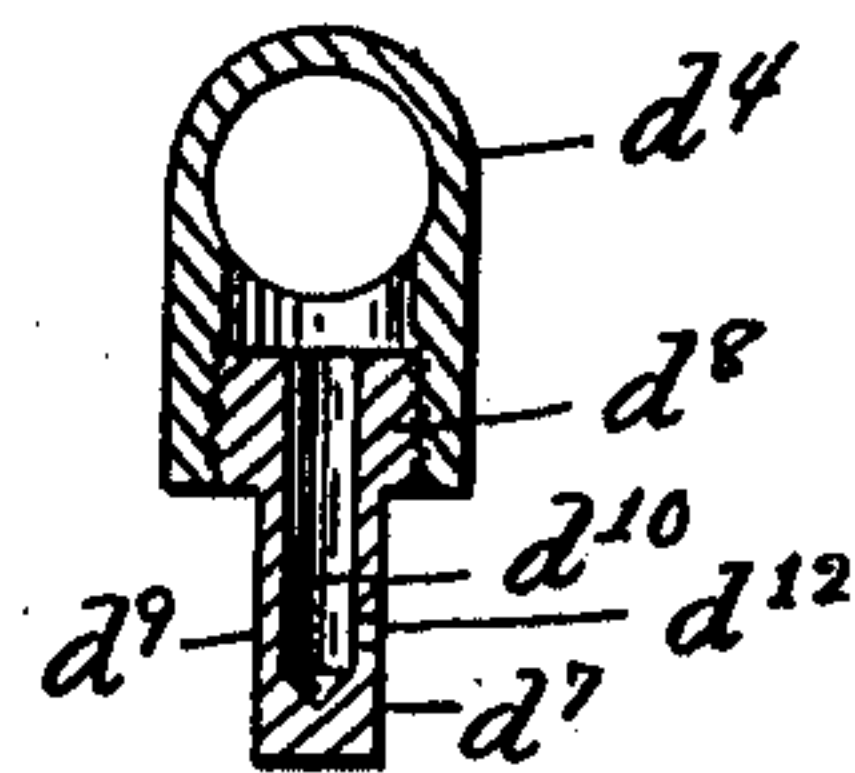


Fig. 7.

Witnesses:
H. B. Davis.
Cynthia Doyle.

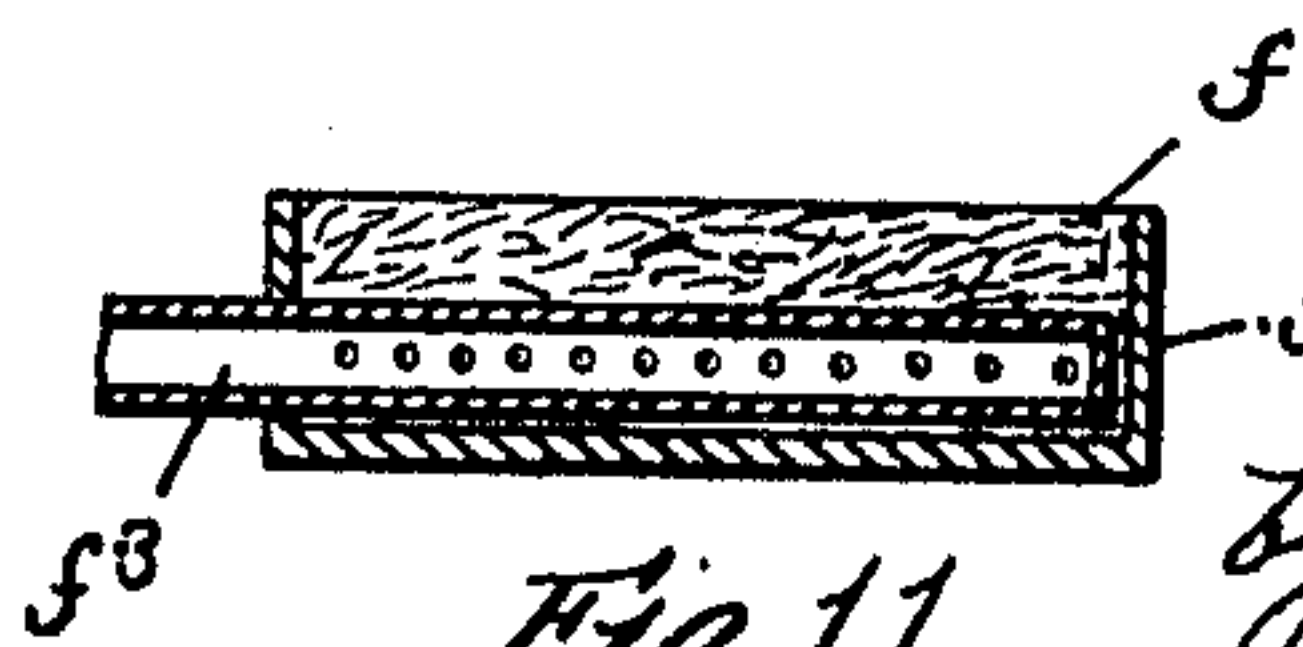


Fig. 11.

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UNITED STATES PATENT OFFICE.

STERLING ELLIOTT, OF NEWTON, MASSACHUSETTS.

LIQUID-HYDROCARBON BURNER.

993,665.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed March 11, 1908. Serial No. 420,301.

To all whom it may concern:

Be it known that I, STERLING ELLIOTT, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Liquid-Hydrocarbon Burners, of which the following is a specification.

This invention relates to liquid-hydrocarbon burners especially adapted for small steam boilers for automobiles.

The invention has for its object to improve and simplify the construction of the burner to the end that the parts thereof may be cheaply manufactured and easily assembled; that any liquid hydrocarbon which may enter or form in the compartments of the burner may be conducted toward the central part thereof, and at such point permitted to escape; that the inlet orifice to the burner may be employed as an exit for any liquid-hydrocarbon which may enter or form in the burner; that the mixing tube or tubes may be supported in such manner and in such relation to the burner as to deliver the mixture of gas and air at the central part thereof; that the mixture which is delivered to the burner may be distributed equally to all parts of the burner; that the vaporizer may be heated by the burners and also by the pilot-burner; that the pipe connecting the vaporizer with the jet-nozzles may be heated; that the support for the jet-nozzles may be heated; that the support for the jet-nozzles may be so arranged with respect to the burner as to be heated by its intimate contact therewith.

The invention also has for its object to construct an improved form of support for the jet-nozzles; also an improved form of filter which is contained in said support for the jet-nozzles; also an improved form of jet-nozzle.

The invention also has for its object to construct an improved form of pilot-burner for the vaporizer whereby a flame of large area may be produced in proximity to the vaporizer, which will not readily blow out even under extraordinary conditions; also to provide means for determining the quantity of liquid-hydrocarbon which is delivered to the pilot-burner, and means for regulating its delivery.

Figure 1 is a vertical section of a liquid-hydrocarbon burner embodying this invention, and the pilot-burner, a portion of a boiler being also shown for the purpose of illustrating the application of the burner

thereto. Fig. 2 is a plan view of the top burner plate. Fig. 3 is a plan view of the bottom burner plate. Fig. 4 is a vertical section of a portion of the burner plates taken on the dotted line 4—4 Fig. 2. Fig. 5 is a vertical section of a portion of the burner plates taken on the dotted line 5—5 Fig. 2. Fig. 6 is a vertical section of the jet-nozzles and support therefor. Fig. 7 is an enlarged sectional detail of one of the jet-nozzles. Fig. 8 is an enlarged sectional detail of the central portion of the burner. Figs. 9 and 10 are details of the filter which is contained in the support for the jet-nozzles. Fig. 11 is an enlarged longitudinal vertical section of the pilot-burner. Fig. 12 is a vertical section of the regulating-valve for the pilot-burner.

The burner comprises essentially a top-plate *a* and a bottom-plate *b*, both circularly formed and of substantially the same diameter, each having a marginal flange *a'*, *b'*, of approximately the same width, and each having upon one side of it a diametrically disposed rib *a*², *b*². The flanges and ribs of both plates are planed off to present flat faces, so that when the two plates are superimposed, the flanges and ribs thereof will abut. Inside the flanges and ribs, each plate is hollowed out or dished, so that when the two plates are placed one upon the other two tight compartments are formed between them which are separated by the abutting ribs. The two plates are rigidly secured together by screws *a*³ which extend through the flanges thereof and by screws *a*⁴, which extend through the ribs. A circularly formed shell is thus produced. One of the burner-plates, as for instance, the top-plate *a* has several ears *a*⁵ extending from its flange which receive bolts *a*⁶ of hook-form, or of any other form, which connect the burner with the bottom of the boiler. The top-plate *a* has several upwardly extended elongated projections or ribs *a*⁷, inverted V-shaped in cross section, which are made hollow and are in open communication with the compartments formed by the two connected burner-plates, and the tops of said projections are slitted for the passage of the mixture. All of these projections except one, extend from side to side of the burner-plate, the excepted projection terminating a short distance from the side to leave a space between its end and the side of the burner plate for the pilot-burner, to be de-

scribed. The top plate thus presents several parallel rows of exit orifices for the mixed gas and air. The bottom plate b has formed in its upper side two or any other number of elongated depressions b^3 , which extend from points near the center to one side thereof. These depressions are preferably arranged in parallelism and their outer ends terminate inside of the marginal flange b' . These depressed portions are open at their outer ends and at the top and are provided at their inner ends with upright end walls. A mixing tube c is arranged in each depression, which extends from the outer end thereof to a point near the inner end wall. The mixing tubes are made cylindrical and of a size to substantially fit and thereby fill the depressions, but as the inner ends of said tubes terminate a short distance from the inner end wall of the depressions a well or space is formed at the inner end of each depression which is in open communication with the compartment above it.

The depressions are arranged one in each compartment of the burner, so that at points near the center of the burner each compartment has a well or space at the end of its mixing tube which receives the mixture and delivers it to the compartment above it. The inner end of the depression forms the inlet orifice to the compartment of the burner. The top surface of the bottom burner-plate inclines from its marginal flange toward its center, as represented in Fig. 1, so that the inlet orifice to each compartment, which is located at the end of the mixing tube, occupies a position at the extreme lower level. By inclining the top surface of the bottom plate any liquid-hydrocarbon which may enter or form in the compartments of the burner will have a tendency to flow toward the center, so that it may escape through the inlet orifices. A flange b^4 is formed on the top surface of the burner-plate partially around each inlet orifice, as shown in Fig. 3, and the liquid-hydrocarbon is permitted to escape along the portion of the orifice which is not provided with a flange. The flange extends around that portion of the inlet orifice opposite the end of the mixing tube and is provided particularly for the purpose of deflecting gas upward and thereby preventing it from being forced across the burner.

Above the inlet orifices, a deflecting-plate b^5 is located, which is attached to the burner-plates. This plate is made large enough to deflect the vaporized mixture to all parts of the burner-compartments, so that it will be caused to escape from all of the openings in the top burner-plate with substantially equal pressures.

d represents the vaporizer, which is made as a spiral coil, connected at one end with a supply pipe d' , and at the opposite end with

a cross-fitting which supports the jet-nozzles. The vaporizer coil is located in a plane above the tops of the burners near one side thereof, and the cross-fitting is arranged below it. An upright branch d^2 of the cross-fitting is screwed onto the end of a pipe d^3 which, as herein shown, is an extension of the vaporizing coil, but which may be made as an independent section connected to the vaporizing coil, and the horizontal branches d^4 , d^5 , thereof extend in opposite ways from said upright branch. The outer ends of the horizontal branches are closed by screw-plugs d^6 . Near the extremity of each horizontal branch and on the under sides thereof an opening is provided into which is screwed a jet-nozzle d^7 . The jet-nozzles are made alike and each consist of a plug having a cylindrical screw-threaded end portion d^8 , see Fig. 7, which enters a hole in the horizontal branch of the cross-fitting and a quadrangular or parallel sided end portion d^9 adapted to be engaged by a wrench. Each plug is formed with an internal recess d^{10} which is in open communication with the cross-fitting, and at or near the bottom of said recess, at one side of the plug, a small orifice d^{12} is formed through which the hydrocarbon in vapor or other form issues in the form of a jet. The cross-fitting has a branch d^{13} depending from it opposite the upright branch which is adapted to serve as a drip. This branch is closed by a screw-plug d^{14} , which may be easily removed whenever desired.

A filter d^{15} is placed in the cross-fitting. It is contained essentially in the depending drip branch and extends up into the upright branch, being thereby located at the junction of the several branches of the fitting. It is composed of a strip of wire gauze, see Fig. 9, made wider at one end than at the other, which is coiled upon itself, the narrow end of the strip being upon inside of the coil, so that when coiled a recess of conical form is provided at the upper end, as shown in Fig. 6.

The cross-fitting is arranged with its upright branch d^2 in a recess formed in the marginal flanges of the burner-plates, and with its horizontal branches d^4 , d^5 , in engagement with the under side of the lower flange, and when so disposed the fitting is in intimate contact with the burner and the depending jet-nozzles are disposed opposite the inlet ends of the mixing tubes. By arranging the fitting in intimate contact with the burner it is kept intensely heated by the heat of the burner which is conducted to it. The vaporizer is located above the pilot-burner f , within the inclosing shell e , and the pipe leading therefrom, which is connected with the cross-fitting, extends down inside of said shell adjacent the pilot-burner. The pilot-burner f is located above the top

burner-plate, at the end of the short projection, and as the vaporizer is located above the pilot-burner, it receives no direct heat from the burners a^7 , hence means are herein provided for deflecting the heat from the burners a^7 , which are located at each side of the vaporizer, and such means consists of a curved plate e' disposed above the vaporizer, which is attached at one end to the side wall in any suitable manner, and which extends downward at each side over the tops of the adjacent burners a^7 , to concentrate the heat at the vaporizer.

The pilot-burner for the main burner herein employed consists of a permeable body of refractory material, represented at f , and contained in a receptacle f' , of any suitable shape and dimensions, which is open at the top to thereby expose the surface of said permeable body. The permeable body of refractory material may consist of asbestos or sand, or any equivalent material, but I prefer to employ asbestos as it may be compactly arranged and formed into a body which may be conveniently placed in the receptacle and held. The delivery pipe f^2 leads to said receptacle and has at its extremity a nozzle f^3 , which passes through the end wall thereof and extends along the lower part of the permeable body for a considerable distance. The nozzle f^3 , which may be of any suitable construction, is perforated to provide for delivering the liquid-hydrocarbon to all parts of the permeable body. The liquid-hydrocarbon which is delivered to the receptacle will be drawn up or otherwise caused to rise in said receptacle, and when lighted will burn at the exposed surface of the permeable body which is contained therein. As said permeable body has a large surface a flame of large area is produced which very efficiently heats the vaporizer beneath which the pilot-burner is located and which cannot be easily blown out even under extraordinary conditions. As the vaporizer is herein shown as an elongated body, the receptacle containing the permeable body of refractory material is likewise elongated so as to comprehend a heating area approximately coextensive with the vaporizer, but the dimensions of the respective parts are immaterial. The delivery pipe f^2 leads from a sight-feed indicator and conducts the liquid-hydrocarbon to the receptacle f' . The sight-feed indicator herein shown consists of a glass tube f^4 supported in upright position by and between a pair of end plates f^5, f^6 , of circular or other form, which are connected together by bolts f^7 or otherwise. The lower plate f^5 has a center hole through it, preferably countersunk at its upper end, and the delivery pipe f^2 is connected to said plate, being fitted or screwed into said hole. The upper plate f^6 likewise has a center hole through it and has

on its under side a drip nozzle f^8 of conical or other form through which said center hole extends and has on its upper side a boss f^9 through which said center hole also extends. A section f^{10} of the supply pipe is fitted or screwed into said boss and thereby connected with the upper plate. The liquid-hydrocarbon which is delivered to the sight-feed indicator passes through the center hole of the upper plate and drips from the nozzle f^8 , and the drops falling from the nozzle pass through the glass tube and enter the delivery pipe which is connected with the lower plate, to be conducted by said pipe to the receptacle f' . In lieu of this particular form of sight-feed indicator any other suitable form may be employed. By means of a sight-feed indicator of this or any other form the quantity of liquid-hydrocarbon which is delivered to the pilot-burner is known by counting the number of falling drops per minute.

Connected in the delivery pipe, above the sight-feed indicator, is a regulating-valve, of any suitable construction, by which the quantity of liquid-hydrocarbon which is allowed to pass through the indicator may be regulated. The regulating-valve herein shown, see Figs. 1 and 12, is of the needle-valve variety, and comprises a case f^{12} to the opposite ends of which sections f^{10} and f^{11} of the delivery pipe are connected, a partition wall f^{13} arranged in said case having a passage f^{14} through it formed with a conical valve-seat, and a conical ended spindle f^{15} or stem having a screw-threaded portion which extends through a suitable stuffing-box and which is provided with a hand wheel f^{16} by which it may be turned and thereby adjusted. The spindle may be turned to move its conical end into the passage f^{14} and close it, or to move said conical end any distance away from said passage to thereby regulate the flow of liquid-hydrocarbon through the valve. By watching the indicator and manipulating the regulating-valve the supply of liquid-hydrocarbon may be regulated minutely.

When starting the pilot-burner the valve may be opened wide to provide a continuous flow of liquid-hydrocarbon, if necessary, but subsequently it will be partially closed and adjusted to supply the quantity required. The section f^{11} of delivery pipe leads from a supply tank of any suitable shape and size which contains liquid-hydrocarbon, or alcohol or equivalent.

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

1. A liquid-hydrocarbon burner consisting of two plates secured together, each recessed on its side adjacent the other, the top-plate having a plurality of exit orifices and the bottom-plate having its upper surface in-

clined toward the center and having an elongated depression extending from near the center to near the edge, provided with an upright wall at its inner end, and a mixing-tube arranged in said depression which terminates in front of the end wall thereof and forms in conjunction with said end wall an inlet-orifice, substantially as described.

2. A liquid-hydrocarbon burner consisting of two plates placed one upon the other and secured together, each recessed on its side adjacent the other, the top-plate having a plurality of exit orifices and the bottom-plate having an elongated depression extending from near the center to near the edge provided with a wall at its inner end, a mixing-tube arranged in said depression and terminating near the inner end thereof and forming in conjunction with the end wall thereof an inlet-orifice, and a flange extending upwardly around the inner end of said depression, substantially as described.

3. A liquid-hydrocarbon burner consisting of two plates placed one upon the other and secured together, each recessed on its side adjacent the other, the top-plate having a plurality of exit orifices and the bottom-plate having an elongated depression extending from near the center to near the edge provided with a wall at its inner end, a mixing-tube arranged in said depression and terminating near the inner end thereof and forming in conjunction with the end wall thereof an inlet-orifice, and a flange extending upwardly around the inner end of said depression, and along the sides of said depression to points back of the end of the mixing-tube, substantially as described.

4. A liquid-hydrocarbon burner consisting of two plates placed one upon the other and secured together, each recessed on its side adjacent the other, the top-plate having a plurality of exit orifices and the bottom-plate having its upper surface inclined toward its center and having an elongated depression extending from near the center to near the edge provided with a wall at its inner end, a mixing-tube arranged in said depression and terminating near the inner end thereof and forming in conjunction with the end wall thereof an inlet-orifice, and a flange extending upwardly around the inner end of said depression, substantially as described.

5. A liquid-hydrocarbon burner having its top-plate provided with several rows of exit orifices extending from side to side thereof, and a short row of exit orifices, a pilot-burner located at the end of said short row of exit orifices, a vaporizer located above it, and a curved plate located above said vaporizer which extends over the adjacent rows of exit orifices at opposite sides of said vaporizer, substantially as described.

6. The combination with the vaporizer of a liquid-hydrocarbon burner, of a fitting connected with said vaporizer having a plurality of jet-nozzles and passages leading to all the jet nozzles, and a filter arranged in said fitting across said passages consisting of a tapering strip of wire-gauze coiled upon itself to form a cylinder with a conical recess at its upper end, substantially as described.

7. The combination with a vaporizer of a liquid-hydrocarbon burner, of a fitting connected with said vaporizer having a plurality of jet-nozzles and passages leading to all the jet nozzles, and a filter-space with an opening leading thereto, made large enough to provide for the removal of the filter, a filter contained in said filter-space which crosses the passages leading to all the jet-nozzles, and a closing-plug for said opening, substantially as described.

8. A liquid-hydrocarbon burner having a top-plate provided with exit orifices and recessed to receive a pilot-burner, a pilot-burner contained in said recess consisting of a permeable body of refractory material contained in an open-topped receptacle, means for delivering liquid material thereto, a vaporizer arranged above said pilot-burner, and a curved plate arranged above said vaporizer having its side portions extended from the exit orifices adjacent the pilot-burner, whereby the heat is deflected onto both the vaporizer and the exposed surface of the pilot-burner, substantially as described.

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

STERLING ELLIOTT.

Witnesses:

B. J. NOYES,
H. B. DAVIS.