

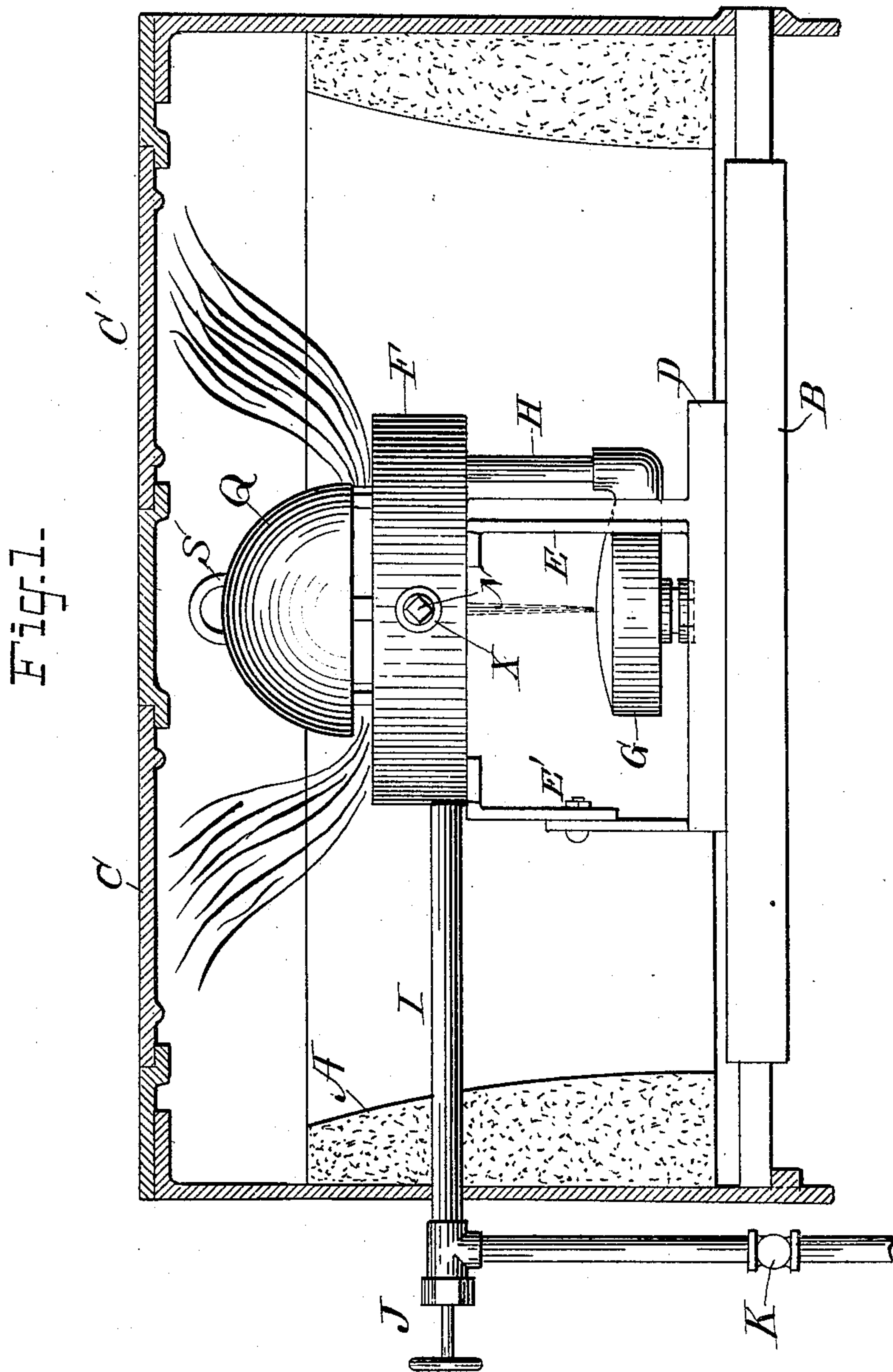
(No Model.)

3 Sheets—Sheet 1.

R. R. STAFFORD.
COMPOUND GENERATIVE BURNER.

No. 594,574.

Patented Nov. 30, 1897.



WITNESSES
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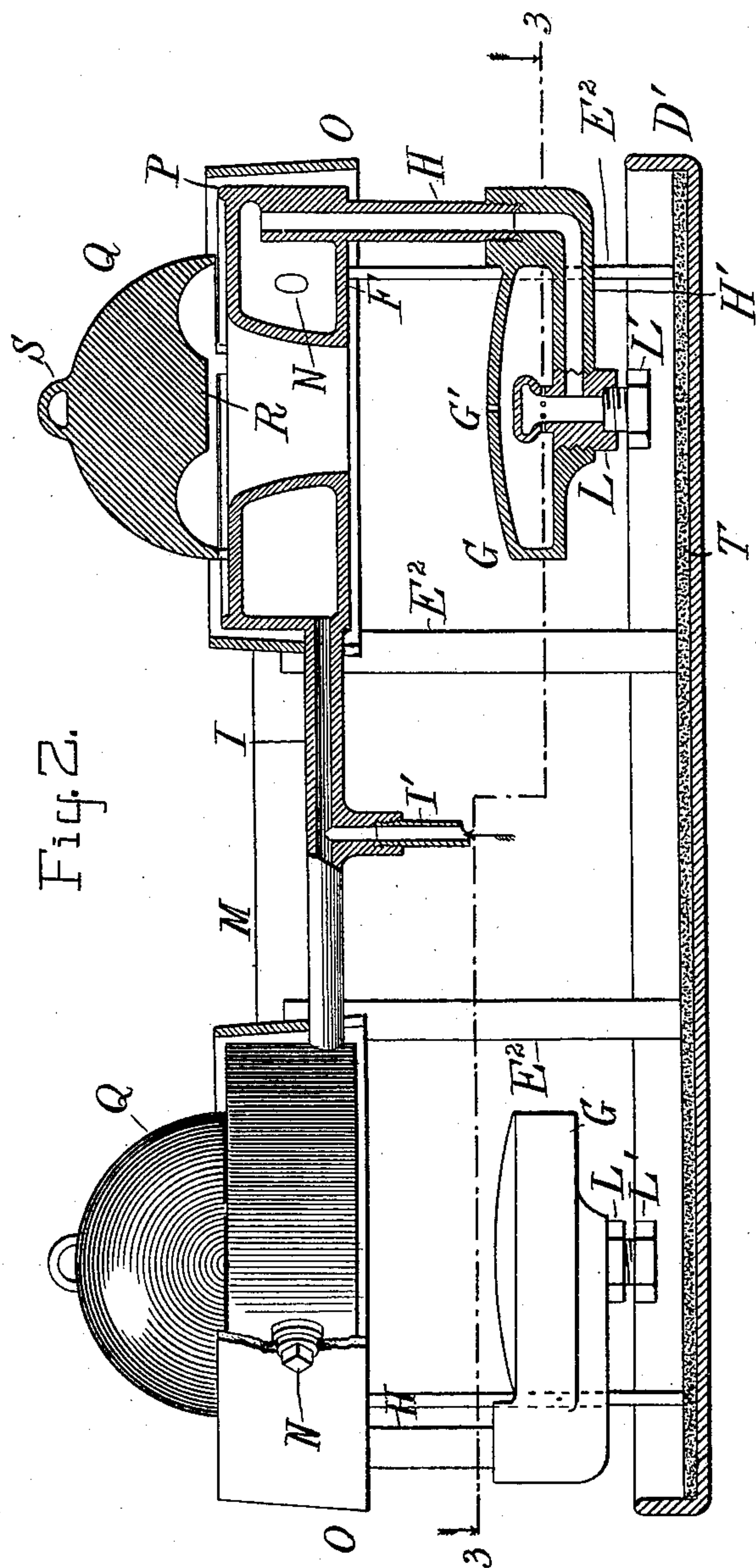
(No Model.)

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R. R. STAFFORD.
COMPOUND GENERATIVE BURNER.

No. 594,574.

Patented Nov. 30, 1897.



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(No Model.)

3 Sheets—Sheet 3.

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FIG. 3.

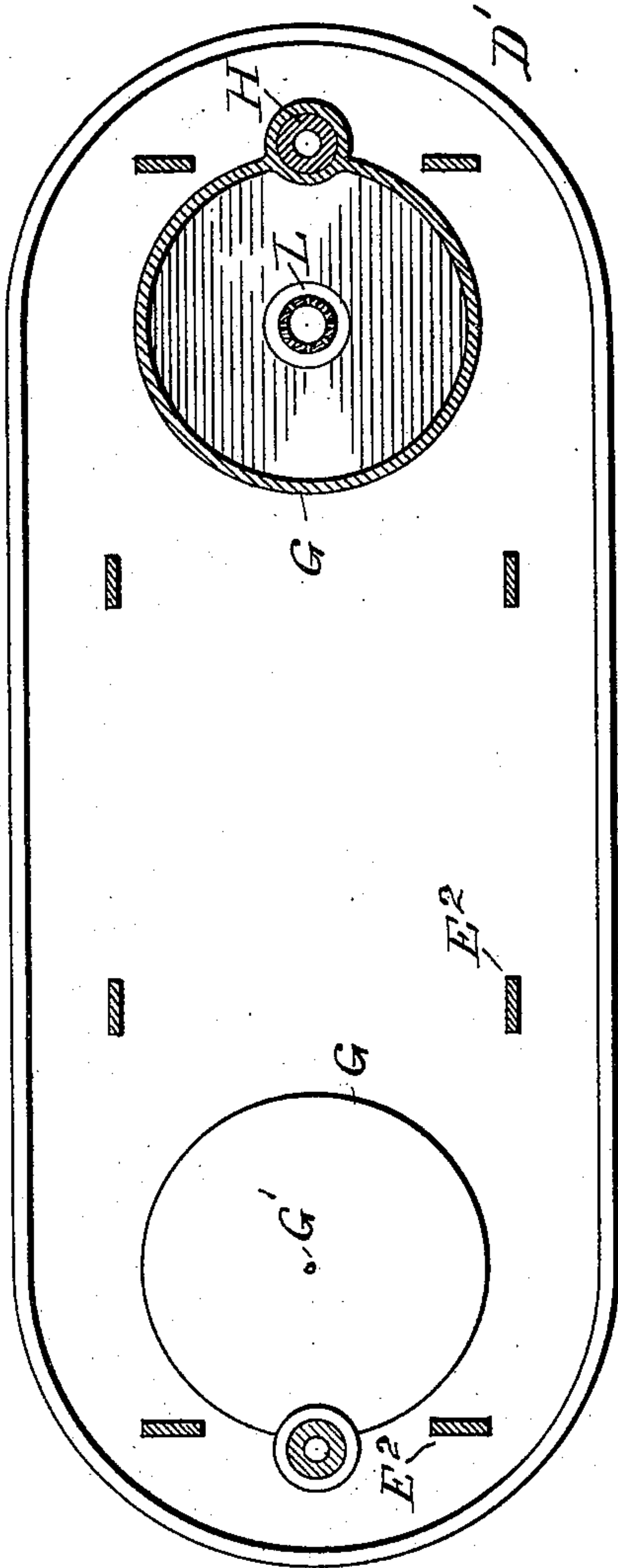
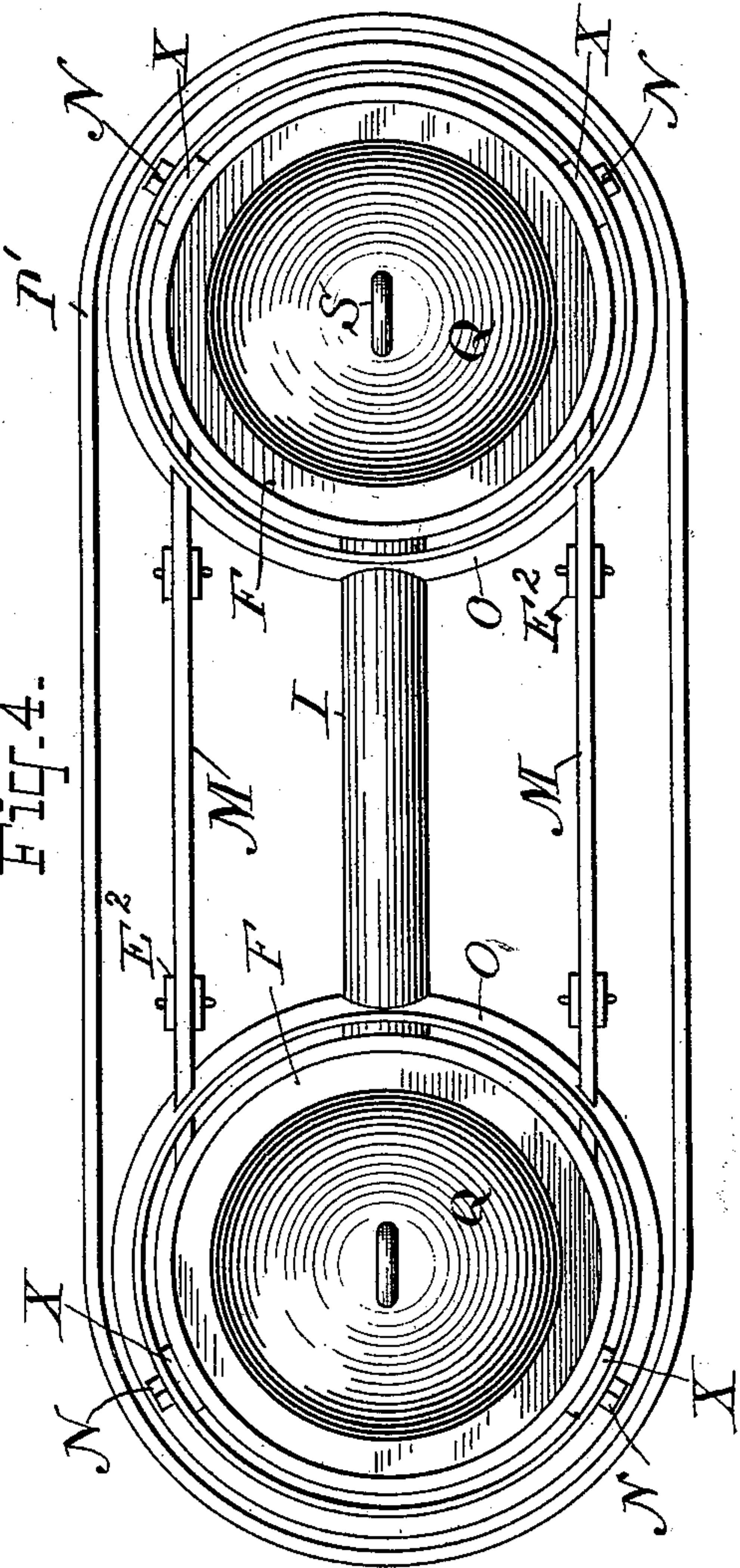


FIG. 4.



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UNITED STATES PATENT OFFICE.

RINALDO R. STAFFORD, OF HOBOKEN, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED FUEL GAS GENERATOR COMPANY, OF NEW JERSEY.

COMPOUND GENERATIVE BURNER.

SPECIFICATION forming part of Letters Patent No. 594,574, dated November 30, 1897.

Application filed August 28, 1896. Serial No. 604,160. (No model.)

To all whom it may concern:

Be it known that I, RINALDO R. STAFFORD, a citizen of the United States, and a resident of Hoboken, in the county of Hudson and State of New Jersey, have invented a certain new and useful Compound Generative Burner, of which the following is a specification.

This invention relates to generative burners for liquid fuel, and has for its object the production of a burner of this sort which will be positive in its action, perfect in its combustion, and yet be simple and economical in construction.

There has heretofore in the use of generative burners been a great deal of trouble experienced in thoroughly gasifying the liquid fuel fed to the burner, and it has not been found practicable to burn any but the lighter oils in this manner.

The burner forming the subject of this invention thoroughly gasifies all the oil that flows to it and produces perfect combustion of the gas, and it is especially designed for use with petroleum and other mineral oils and their products.

To this end the invention consists in compounding the generative chambers, in providing for throwing down any solid carbon formed in or entering said chambers, in a special construction for feeding air to the flame, and in particular means for deflecting the flame.

The invention further consists in the construction and combination of parts hereinafter fully described, and set forth in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 represents one form of burner as applied to an ordinary cooking-range. Fig. 2 represents a compound burner in sectional side elevation. Fig. 3 represents a sectional plan taken on the plane indicated by line 3 3, Fig. 2. Fig. 4 represents a plan of the duplex burner.

This burner is designed and perfectly adapted for universal use. As indicated in Fig. 1, it may be placed in the fire-box of a range, or the burners may be arranged in duplex or any number of them coupled together for use under boilers or under any extended surface to be heated. They may also be placed in box or

parlor stoves and in general may be located in any heater adapted for the consumption of solid fuel. They may also be used in the skeleton form of stoves in which gasolene or ordinary illuminating-gas is now used.

In Fig. 1 A indicates the fire-box of an ordinary range, B the grate thereof, and C C' the covers or griddles. The burner shown in this figure consists of the drip-pan D, from which arise standards E E', preferably cast or otherwise formed integral with the pan, but which may obviously be otherwise secured thereto. Upon these standards is mounted in any suitable way the primary generating-chamber F, from which is suspended in any suitable manner the secondary generator G. By preference this generator is suspended by means of the pipe H, through which connection is had between these chambers. Into the primary generating-chamber the inlet-pipe I enters at the lower portion, as indicated. This pipe is provided with a suitable needle-valve, (indicated at J,) and the pipe leading to said valve is by preference provided with any suitable form of check-valve, the location of which is indicated at K. In this construction the standards E E' engage with the under surface of chamber F, after the usual manner of securing stove-legs in place, and to provide for putting these standards in place one of them, as E', is made in two parts.

The details of the generating-chambers are brought out in Fig. 2. The chamber F consists of a hollow ring the central opening of which expands gradually from the lower to the upper side, as indicated. Into this opening the jet of flame enters, and the gradual expansion of the opening provides for the spreading of the flame and prevents the noise which would arise if the opening did not expand upwardly or was contracted instead of expanded.

As illustrated, the inlet-pipe I enters through the side of chamber F, at the bottom thereof, for admission of the oil, and the outlet-pipe H at the opposite side of the chamber leads from the upper portion thereof and conducts the vapor generated into the secondary chamber G at the bottom. The secondary generator

consists of a chamber, substantially as shown, having through its top a small jet-opening G' for the issuance of the gas to be burned. Under this opening and removably inserted in the bottom of the chamber is the hooded rose-plug L, in which the perforations open laterally under the edge of the hood, as indicated, thereby discharging the vapor into the chamber at right angles to the direction of the escaping gas. This plug, as shown, is made removable from the chamber G for the purpose of cleaning the chamber, and the rose-plug is closed by a plug, as L'. The two generators may be joined together in any suitable manner and the connection between them made as found most expedient.

As well known in all forms of apparatus for containing or handling petroleum, it is a difficult matter to make couplings and joints sufficiently tight to prevent the escape of the oil. For this reason in this apparatus the number of joints has been reduced as greatly as possible.

In forming the duplex burner the primary generators are cast together, the pipe I being integral therewith and the bridges M being employed to make the union between said chambers more perfect. The pipe H is also cast integral with the chamber F, and the duct H' for conveying the vapor into the rose-plug is cast integral with the chamber G. As a further precaution in making the joints tight the ends of the feeding-pipe I' and the pipe H are inwardly coned, and the seats of the pipes with which they unite are also coned, as illustrated, to fit them. This conical formation provides for crowding the ends of the pipes more firmly into the threaded sockets, and at the same time furnishes better means for retaining packing. For the insertion into the molds and the removal from the castings of the cores necessary in their formation suitable openings are formed in the outer walls of the chamber F, which are afterward plugged, as indicated at N. These openings also serve a further purpose—that of enabling the chamber to be cleaned—and the plugs serve a further purpose—namely, that of supporting the air-directing ring O, which, as shown, is placed about the primary generator and is upwardly tapered to form an air-passage between it and the chamber of greater extent at the lower edge than at the upper. This ring is placed at the proper distance from the walls of the chamber by means of the bosses X, formed about the openings in the walls of the chamber.

About the upper edge of the chamber F is preferably formed a slight bead P to assist in directing the flame and also to prevent the deflector Q from being pushed off from said chamber. This deflector is preferably of cast metal and of the form indicated. On its lower surface about its periphery it is supplied with suitable supports, such as legs, of sufficient length to provide the necessary space for the passage of the flame between it and the sur-

face of the chamber F. It is normally located centrally over the opening in the annular chamber F. In the center of its lower face is provided a flat surface R for breaking up the flame issuing from the jet in chamber G and directing it against the inner wall of chamber F and for reflecting heat through the central space of chamber F onto chamber G. About the surface R is an annular groove for deflecting the blaze down upon the upper surface of chamber F. The deflector is also provided with a loop or eye of any suitable form, (indicated at S,) by which it may be readily removed with a hook or by the same means moved to different positions upon the chamber F to direct the flame as desired. For instance, referring to Fig. 1, if it is desired to direct the greater portion of the flame to one of the covers, as C, the deflector Q will be moved to the right and in the reverse direction if it is desired to direct a greater portion of the flame to the cover C'. If the flame is to issue equally on all sides, the deflector is located centrally over the opening in the primary generator.

The pan D is intended to serve as the base of the burner in or upon which the remaining parts shall be supported. With a duplex burner this pan has cast or otherwise secured to it the standards E², of which the end ones directly sustain the chamber F, while the middle ones are forked at their upper ends to receive the bridge-pieces M, through which and said forked ends pins may be passed, as indicated in Fig. 4, to secure the parts together.

In the duplex burner the rings O are notched and rest upon bridges M and the pipe I and are provided, as in Fig. 1, with apertures for the plugs N.

Within pans D and D' are preferably located sheets of asbestos T to absorb any oil that may drip upon them and to furnish a vaporizing substance in starting the burner.

Having now described the details of construction the operation of the apparatus will be explained.

As in most generative burners for liquid fuel, the oil is fed to the burner under pressure, which pressure may be supplied in any suitable way, either by gravity when the location of the burner will allow of the suitable elevation of the reservoir, or hydrostatically when the burner is used in such environment as will allow pumping the oil directly into the reservoir, or pneumatically when it is most advantageous to pump air into the reservoir. Then to provide against the possibility of the tension at the burner being greater than the pressure at the reservoir the check-valve K is employed. As stated, any form of mineral oils or their products may be used in this burner. In starting up the burner the needle-valve J is opened and the oil allowed to enter through pipes I' I into chamber F, where it is divided by the central wall and whence it flows through pipe H and rose L into chamber G, and as

soon as a drop or two has oozed out of the jet-opening G' and fallen upon the asbestos pad T the needle-valve is closed. These few drops of oil as soon as they strike the asbestos form sufficient vapor to permit of their ignition, and as soon as ignited the heat therefrom expands the oil in chamber G, allowing more to escape, thereby increasing the heat about said chamber until the oil therein is thoroughly vaporized and nothing but vapor escapes from the jet G'. This escaping vapor becomes ignited from the flame about it and shoots into the opening of the primary generator. The needle-valve may then be opened and the burner allowed to run as long as desired. The flame passing into the opening of the annular chamber generates vapor from the oil therein, which passes through pipe H and issues laterally from the openings in the rose L. It then strikes the walls of chamber G, and any solid carbon contained therein is thrown down, while the vapor due to the heated condition of said chamber is thoroughly gasified, and the gas, issuing with great force from the jet, strikes the surface R of deflector Q and is then by the curved portion of said deflector thrown down upon the upper surface of chamber F, whence it is slightly thrown upward by the bead P, and when the ring O is used is still further upwardly thrown thereby. At the same time the ring causes air to be more intimately mixed with the flame. The ring O may be adjusted to a greater or less distance above the bead P, and by such adjustment is determined the diameter of the flame.

When it is desired to heat surfaces above the burner, as in boilers and ranges, the ring will be located substantially as indicated in Fig. 2. If it is desired to heat the side walls, as in a box or parlor stove, then the ring will be placed lower down and the flame allowed to expand more laterally. From the burner thus constructed a greater expanse of flame is obtained than from any burner heretofore known or used. The reason of this greater force and extent of flame is believed to be found mainly in the construction of the chamber G, into which the vapor is forced from the primary generator and in which said vapor, by means of the heat of the jet reflected by the surface R through the central space of the primary generator and the heat thrown down from the primary generator, is immediately converted into a highly-rarefied gas and forced from the jet under great pressure. This accounts for the force and volume of the flame, and the construction of chamber F and deflector Q accounts for the extent of the flame. The ring O may or may not be used. In Fig. 1 it has been omitted.

The generator-chambers have been illustrated in their preferred form, but they may be of any other outline, the hollow ring or annulus F, if desired, being made of any polygonal design.

The proportion between the inner and outer

diameters of the ring may also be varied as circumstances may demand, and the relative sizes of the generating-chambers may also be varied.

The burners may also be coupled together in any desired manner and in any desired numbers and supported in any suitable way other than that set forth.

The generator may also be of different form and construction, and the bridges uniting the primary generators, Figs. 2 and 4, may be changed in form and supplemented by braces or cross-pieces, and many other changes in details of construction may be resorted to without departing from the spirit of my invention.

What I claim as my invention is—

1. The combination with the annular generating-chamber having the central opening expanded upwardly, of the jet directing its flame into the center thereof, and a circular concave deflector having a flat central flame-breaking surface and movably located over the central opening to return the flame to both the central and upper walls of the chamber and to shape its outward course, substantially as set forth.

2. A substantially semispherical deflector having a central, flat, flame-breaking surface, a concave annular groove extending from said surface to the edge of the deflector, and suitable supports at said edge in combination with an annular generating-chamber upon which said deflector rests, and a gas-jet directing its flame through the central opening of said chamber and against said flame-breaking surface for the purpose set forth.

3. The combination with the primary generating-chamber, of the secondary generating-chamber to which heat from the former is deflected, the said secondary chamber being provided with a gas-outlet and with a vapor-inlet consisting of a hooded rose located under said outlet and having lateral openings under the hood which discharge the vapor into the chamber at an angle to the outflow of gas, as and for the purpose set forth.

4. The combination with the secondary generating-chamber suitably heated and provided with a central discharge-outlet, of the vapor-inlet projecting into said chamber under said outlet and provided with lateral openings for entering the vapor at an angle to the discharge, as and for the purpose set forth.

5. A regenerative oil-burner consisting of an annular primary generating-chamber having an oil-inlet at the bottom of one side and a vapor-outlet at the top of the opposite side, a secondary generating-chamber provided with a jet discharging into the central space of the primary chamber, a pipe leading from said outlet to an inlet at the bottom of the secondary chamber, a laterally-discharging rose in the secondary chamber in which said pipe terminates, said rose being located under the jet-opening, and a deflector over the opening of the primary chamber and con-

structed to break up the jet of flame issuing from the secondary chamber and direct it against the primary chamber, substantially as and for the purpose set forth.

5 6. A regenerative oil-burner, consisting of the annular primary generating-chamber F, having an inlet at one side and an outlet-pipe discharging from the opposite side, a secondary generating chamber G, having an opening in the center of its bottom and a jet-opening in the center of its top, and having a duct H', cast integral therewith and constructed for connection to the outlet-pipe from chamber F, and a rose-plug fitted to the opening in the bottom of the secondary chamber and communicating with said duct, all substantially as and for the purpose set forth.

15 7. The circular generating-chamber G, suitably heated and having a jet-opening at the center of its top, a screw-threaded opening at the center of its bottom, an inlet-duct cast integral with its bottom wall and opening into the side of said bottom opening, and the screw-threaded rose-plug L, provided with the stop-

per L', and having a lateral opening registering with said duct, substantially as and for the purpose set forth. 25

8. The combination with the annular primary generating-chamber provided with an oil-inlet, of the secondary generating-chamber 30 connected therewith and located under the central space of the primary generator and having a discharge or jet opening in alignment with the center of said space, and a deflector above the annular chamber provided with a flat surface located over said space for deflecting the heat downward to the secondary chamber and for breaking up the flame and directing it against the central wall of the annular chamber for the purpose set forth. 35 40

Signed at New York, in the county of New York and State of New York, this 26th day of August, A. D. 1896.

RINALDO R. STAFFORD.

Witnesses:

WM. H. CAPEL,
D. H. DECKER.