

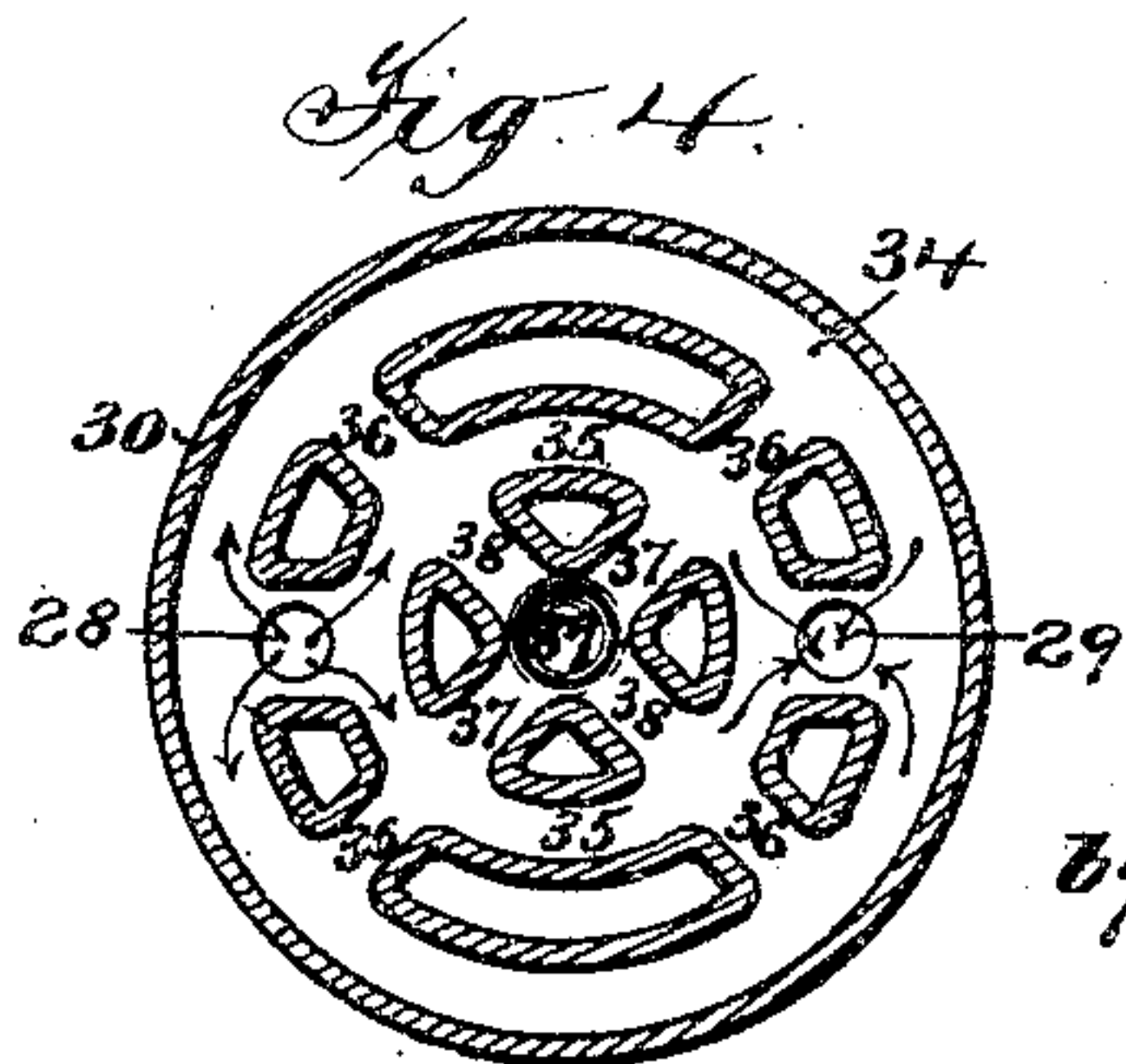
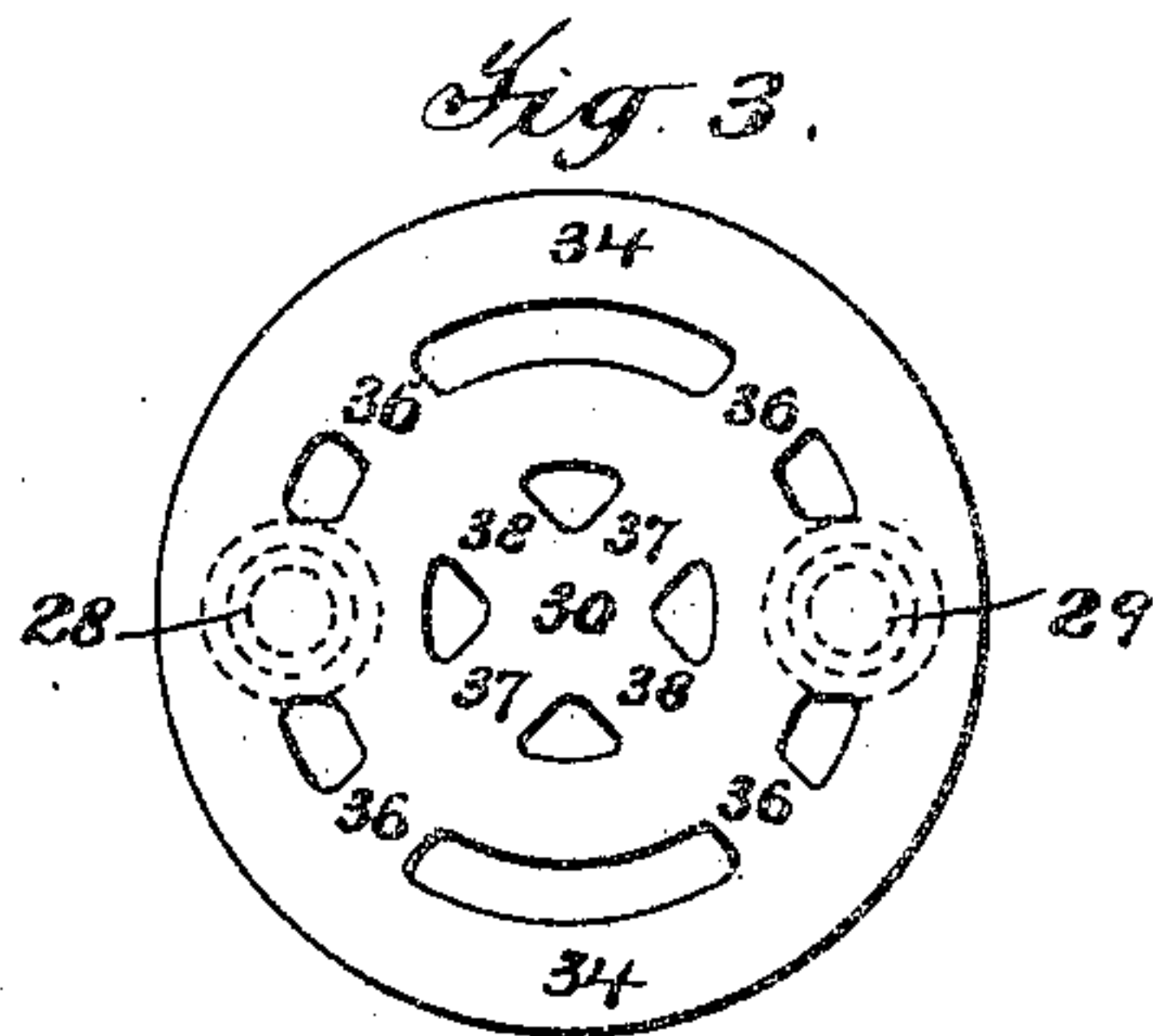
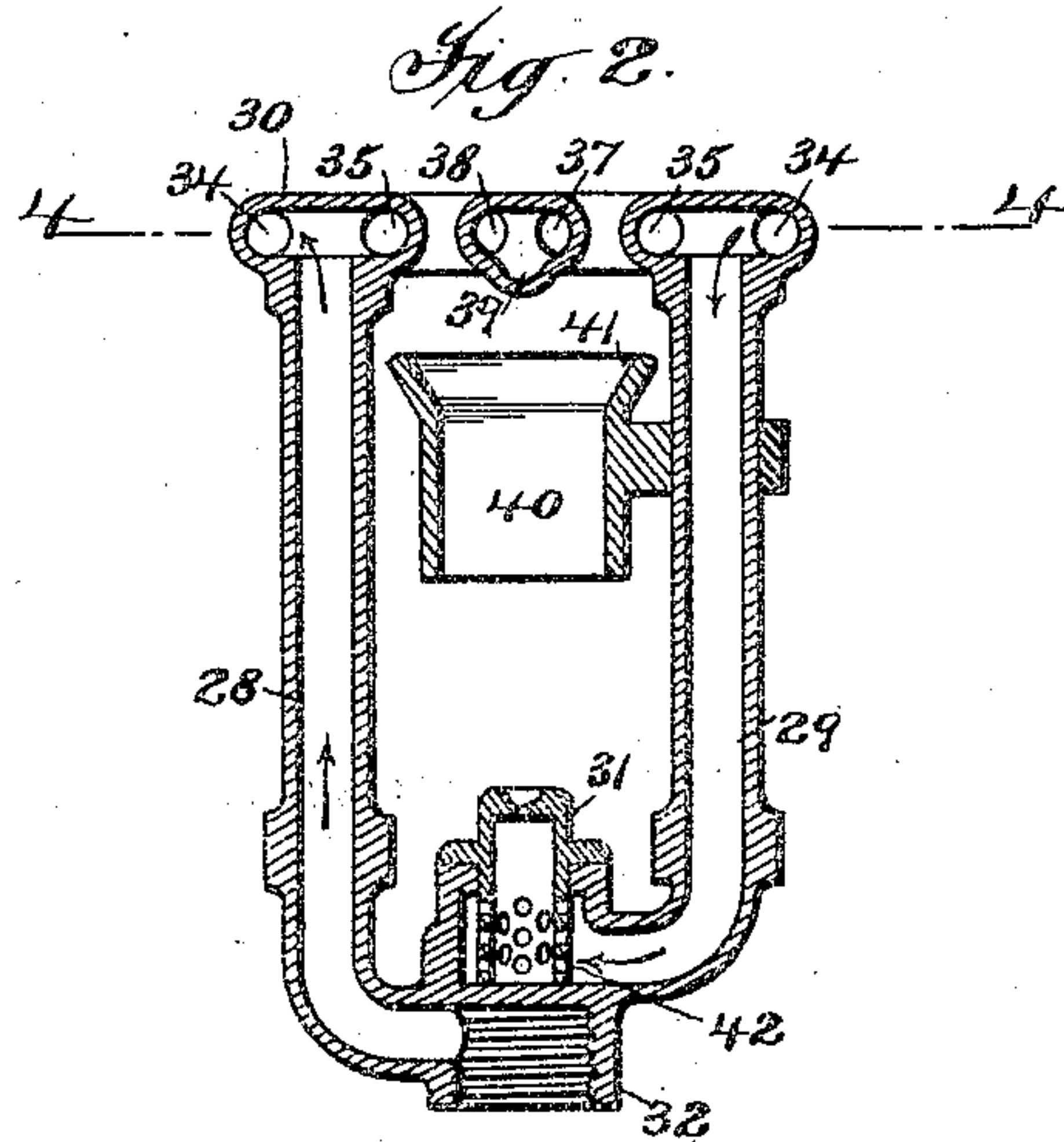
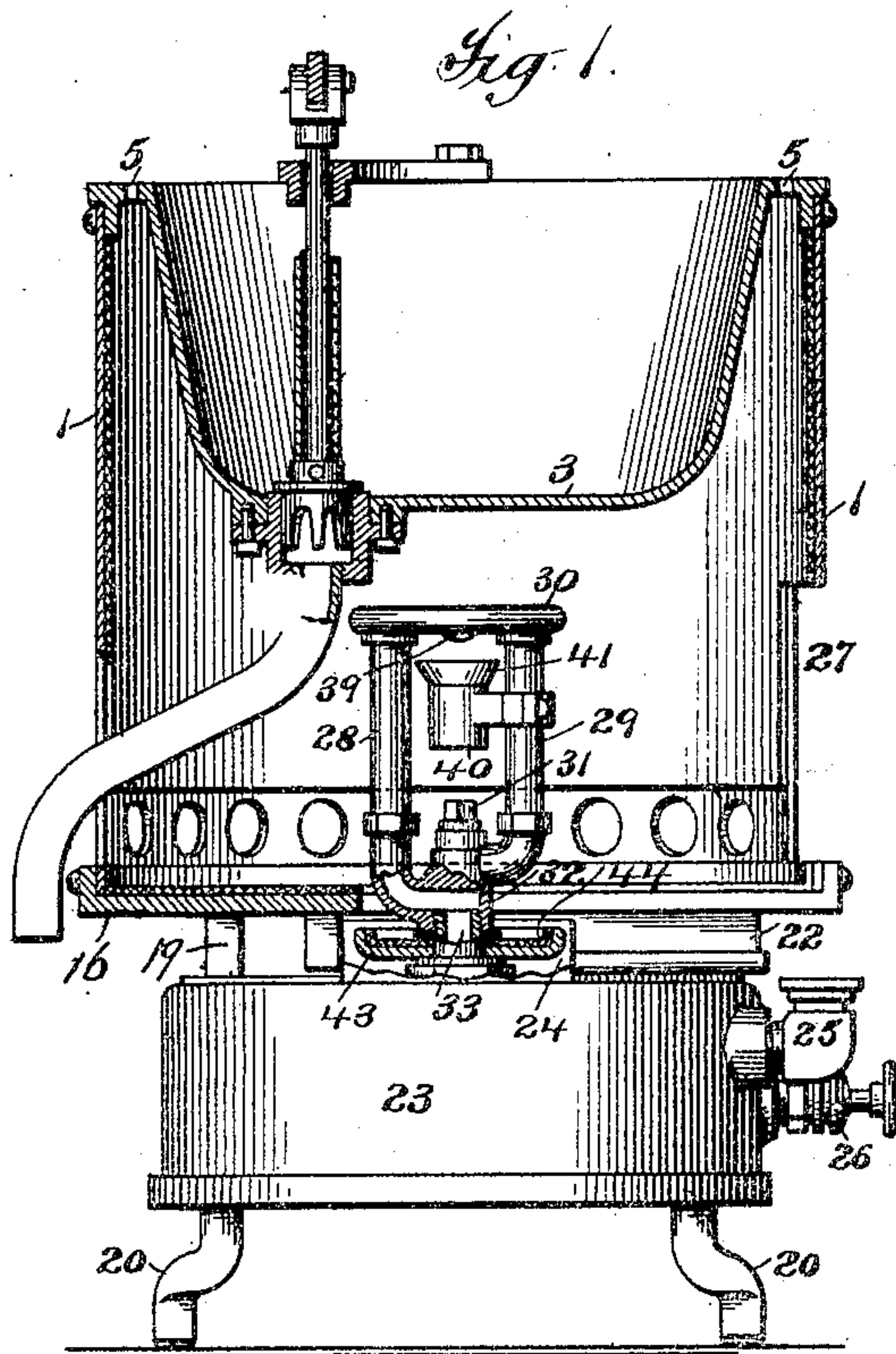
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PATENTED MAY 9, 1905.

D. F. O'BRIEN.

COMBINED HYDROCARBON VAPORIZER AND BURNER.

APPLICATION FILED MAY 21, 1901.



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UNITED STATES PATENT OFFICE.

DENIS F. O'BRIEN, OF NEWARK, NEW JERSEY.

COMBINED HYDROCARBON VAPORIZER AND BURNER.

SPECIFICATION forming part of Letters Patent No. 789,228, dated May 9, 1905.

Original application filed March 15, 1899, Serial No. 709,137. Divided and this application filed May 21, 1901. Serial No. 61,223.

To all whom it may concern:

Be it known that I, DENIS F. O'BRIEN, a citizen of the United States, residing at Newark, county of Essex, and State of New Jersey, have
 5 invented certain new and useful Improvements in a Combined Hydrocarbon Vaporizer and Burner, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to an improved combined vaporizer and burner designed particularly for use in pipe-joint-pouring apparatus, but equally applicable to other uses.

It is the object of the present invention to
 15 provide a combined vaporizer and burner of such high efficiency that with one such burner the very high degree of heat necessary for melting lead may be attained, whereas in prior constructions in order to attain such high de-
 20 gree of heat beneath the melting-pot it was necessary to employ many of such burners. This I accomplish by combining with the burner a vaporizer consisting of a network of intercommunicating vaporizing-tubes provid-
 25 ing a series of circuitous paths for the hydrocarbon from the inlet-pipe to the burner, these several tubes being closely grouped together above and in line with the flame and the outer walls thereof being so formed as to deflect the
 30 flame from one to the other, so that all portions of the vaporizer are equally exposed to the flame from the burner proper and equally heated thereby. By means of this construction I secure a vaporizer of large capacity and am
 35 thus enabled to rapidly vaporize a large quantity of the hydrocarbon, and thus to increase the size of the outlet-orifice of the burner many times over the burners heretofore employed and to thus correspondingly increase
 40 the size of the flame.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a pipe-joint-pouring apparatus provided with a combined vaporizer and burner embodying the
 45 present invention. Figs. 2, 3, and 4 are details, on an enlarged scale, of the combined vaporizer and burner, Fig. 2 being a vertical section of the same, Fig. 3 a plan view, and Fig. 4 a horizontal section taken on the line
 50 4 of Fig. 2 or through the vaporizer proper.

Referring to said drawings, and particularly to Fig. 1 thereof, 1 represents the casing of a pipe-joint-pouring apparatus containing a lead-melting pot 3, between which and the casing 1 are provided openings 5 for the escape
 55 of the products of combustion from the casing. The pipe-joint-pouring apparatus shown forms the subject-matter of Letters Patent No. 694,179, granted to me February 25, 1902, on an application filed by me March 15, 1899,
 60 Serial No. 709,137, (of which this is a division,) and as it is described at length in said Letters Patent a detailed description of it here is unnecessary. The casing 1 and all its connected
 65 parts are supported by four legs 19, having feet 20, (two of which are shown,) which rest upon the pipe to be operated upon, and the bottom plate 16 of said casing 1 is also provided on its under surface with a pair of lugs
 70 22, turned inwardly toward each other for supporting an asbestos-covered tank 23, containing hydrocarbon, such tank for the purpose of connecting it to the bottom plate 16
 75 being in turn provided with a pair of corresponding lugs 24 for engagement with the lugs 22, as more fully described in my said prior Letters Patent. The tank 23 is provided with
 80 an orifice closed by a cap 25, through which the tank is supplied with hydrocarbon, and is also provided with an air-pump 26, by which it is supplied with air for forcing the hydrocarbon from the tank to the combined vaporizer
 85 and burner. To the upper side of the tank 23 is connected the combined vaporizer and burner which when the tank is in position in the bottom plate of the casing is directly beneath the melting-pot 3. To permit the movement of
 90 the vaporizer and burner into and out of the casing with the tank, the bottom plate 16 and the walls of the casing (at 27) are cut away, as shown in Fig. 1. The combined vaporizer
 95 and burner consist generally of an inlet-pipe 28 and an outlet-pipe 29, with a vaporizing portion 30, consisting of a network of intercommunicating tubes between them, the inlet-pipe 28 communicating with the interior of the tank 23 and with the vaporizer 30, while the outlet-pipe 29 communicates at one end with said vaporizer and at its opposite end with the burner proper, 31. The base of the
 100

combined vaporizer and burner is provided with a hub 32, with which the inlet-pipe 28 communicates, said hub being interiorly threaded for attachment to a correspondingly-threaded tube 33 from the hydrocarbon-tank 23, though the connection may be made in any other desired manner. It will be readily understood from the foregoing that the hydrocarbon forced from the tank 23 by the air therein supplied by pump 26 enters the inlet-pipe 28, passes upwardly through the same, thence through the vaporizer 30, where it is vaporized, the vapor thus generated passing downwardly through the outlet-pipe 29 and finally through the burner 31, where it is ignited and burned. It will be observed that the vaporizing portion 30 of the burner is located above the burner proper and in the path of the flame therefrom, so as to be heated thereby, for the purpose of vaporizing the hydrocarbon.

Heretofore in combined vaporizers and burners the vaporizers have been of such small effective area and otherwise of such character and so related to the flame from the burner as to be incapable of vaporizing rapidly but a very small quantity of hydrocarbon for each burner, a small vaporizer being sometimes provided for each burner or a large vaporizer for several burners, the effective vaporizing-surface in either case being of small extent. In the vaporizers and burners of this character the burner proper has of necessity, because of the small quantity of hydrocarbon vaporized, been provided with a very small discharge-orifice for the vapor and produced but a very small flame, a single burner being inefficient in apparatus such as those for pouring pipe-joints, where a very high degree of heat was required. To obtain such high degree of heat with such vaporizers and burners as heretofore constructed, it has been found necessary to employ either a number of such combined vaporizers and burners or a large vaporizer and a plurality of burners or jets. This rendered such apparatus expensive both in first cost and in the making of repairs. In such vaporizers, moreover, the vaporization is often so imperfect that the carbon separated from the hydrogen chokes the orifice in the burner. The combined vaporizer and burner provided by the present invention, however, is by reason of certain peculiarities, which will now be described in detail, in the construction of the vaporizer and its arrangement relatively to the burner proper of largely-increased capacity over the old type of vaporizers and burners and capable of more perfectly vaporizing hydrocarbon, the capacity of the combined vaporizer and burner provided by the present invention being such that with one such burner may be developed the high degree of heat required in pipe-joint-pouring and other apparatus.

Referring to Figs. 2, 3, and 4, it will be ob-

served that the vaporizer portion 30 of the burner consists of a network of tubes, two of which, the annular tubes 34 35, may be termed the "main" tubes, which are connected by branch tubes 36 and intersecting tubes 37 38, inclosed by and communicating with the tube 35. The inlet-pipe 28 and the outlet-pipe 29, as will be observed, communicate directly with the main tubes 34 35, so that the hydrocarbon issuing from the inlet-pipe 28 may pass therefrom into the vaporizer in four different directions, as indicated by the arrows in Fig. 4, and each thence by a plurality of circuitous paths to the outlet-pipe 29. These various tubes are closely grouped together, as shown, and in such position relatively to the burner proper that all portions of each tube, including the upper sides thereof, will be exposed to the flame therefrom and all portions of the vaporizer thus maintained equally at the high degree of heat necessary for perfect vaporization of the hydrocarbon. The under surfaces of the tubes are rounded, as shown, so that the wall of each tube will deflect the flame impinging upon it toward the walls of the circuitous tubes. For this purpose also that portion of the under surface of the vaporizer which is directly in line with the discharge-orifice in the burner—*i. e.*, the point of intersection of the tubes 37 38—is additionally provided with a rounded protuberance 39. The tubes 37 38 thus not only act as vaporizing-tubes, but also act as a baffle for the flame from the burner-opening, directing or spreading the flame outwardly toward the annular tubes 35 34 and tubes 36, each of which, as just above stated, is rounded on its under side, so that it will in turn divide or deflect the flame and cause it to impinge upon the adjacent tubular portions of the vaporizer. This arrangement of the tubes of a vaporizer—that is to say, with central or inner tubular portions, as 37 38, crossing each other in line with the burner-opening, so that they will act as a baffle for the flame from the burner-opening—is of considerable importance. The provision of tubular portions at this place increases the capacity of the vaporizer and also the rapidity and thoroughness with which it vaporizes the hydrogen, such tubular portions being located at the point where the heat is greatest—namely, in line with the burner-opening—and results in the production of a perfect gas without the separation of the carbon from the hydrocarbon. Again, a baffle of some kind is necessary in a vaporizer in order to spread the flame or divide it, so that it will impinge upon the outer portions of the vaporizer. Heretofore such baffles have been provided in vaporizers; but they have been made solid, (as distinguished from being made tubular for the passage of the hydrocarbon,) and under the high degree of heat to which the baffles have been subjected in these vaporizers the baffles have soon burned out, thus destroy-

ing the vaporizer or, if the baffle be removable, necessitating the substitution of a new baffle for the one so burned out. In the present case, however, the baffle is provided by tubular portions of the vaporizer itself, with the result that because of the passage through such tubular portions of the hydrocarbon such tubular baffle is not affected by the heat any more than other portions of the vaporizer and will last as long as such other portions. For the purpose of mixing air with the vapor from the burner and for the purpose of concentrating the flame upon the vaporizer and the pot 3 there is provided between the burner proper and such vaporizer a tubular mixer 40, which is adjustably connected, as shown, with the inlet or outlet pipe 28 or 29, the operative position of such mixer being substantially that illustrated in the drawings—namely, in somewhat close proximity to the vaporizer. At its upper end the mixer 40 is provided with an upwardly and outwardly projecting flange 41 for guiding the flame radially outward, so as to envelop all portions of the vaporizer. By reason of the large number of tubular passages presented to the incoming hydrocarbon and their arrangement relatively to the flame large quantities of hydrocarbon are rapidly vaporized and at the same time perfectly vaporized, and I am thus enabled to provide the burner with an outlet-orifice of large size, thus securing a large flame. Between the outlet-pipe 29 and the discharge-orifice in the burner I interpose a strainer 42, formed by perforating the walls of the burner near its base, as shown in Fig. 2, for a purpose hereinafter referred to. Beneath the burner is provided a pan 43, covered with asbestos 44, for containing a quantity of hydrocarbon which is burned therein for the purpose of heating the vaporizer 30 preliminary to supplying hydrocarbon thereto from the tank.

The manner of using the apparatus is as follows: Before starting up—i. e., heating the vaporizer to the high degree necessary for perfect vaporization—it is necessary in order to secure the best results that the vaporizer should be freed from hydrocarbon and maintained in that condition until properly heated. To accomplish this, a petcock (not shown herein, but shown and described in my said prior Letters Patent) in the orifice 25 is opened and kept open during the heating of the vaporizer, thus permitting the air to escape from the tank and confining the hydrocarbon therein and causing the return to the tank of any hydrocarbon which happens to be in the vaporizer. As soon as the vaporizer has been thus heated the petcock is closed and the piston of the pump 26 given a few strokes to supply the tank with air for forcing oil therefrom into the vaporizer, so that the latter may be tested in order to determine that the vaporizer has been properly heated

for perfect vaporization. When this is determined, additional strokes are given to the pump-piston to increase the pressure up to a high working pressure. The oil thus supplied to the vaporizer is vaporized therein, the vapor passing therefrom to the burner and thence through the outlet-orifice in the latter, where it is mixed with air and ignited, the flame passing upwardly through the mixer 40, where a perfect mixture of vapor and air is obtained and by which it is directed against the vaporizer and against the under side of the pot 3, the flange 41 of the mixer guiding the flame outwardly, so as to envelop all portions of the vaporizer, and the under side of the several tubes of the latter directing the flame from one to the other, so that all portions of the vaporizer are equally exposed to the flame and equally heated thereby. When the lead in the pot 3 has been melted, it is permitted to escape therefrom into the delivery-pipe of the pot and thence to the joint to be poured, as described in my said prior Letters Patent. When it is desired to extinguish the flame, all that is necessary to be done is to open the petcock in the tank 23, thus permitting the escape of air confined in the tank, and consequently arresting the supply of hydrocarbon to the vaporizer and burner.

It sometimes happens that users of hydrocarbon apparatus are not always careful in starting up to see that the vaporizer is free from hydrocarbon and the supply of hydrocarbon thereto from the tank cut off during the heating of the vaporizer. In such cases the hydrocarbon is imperfectly vaporized, the carbon separated from the hydrogen forming into flakes which are collected in the burner and obstruct the outlet-orifice therein, thus rendering the apparatus temporarily inoperative and necessitating removal and cleansing of the burner. This difficulty is avoided in the present case by the provision of the strainer 42 and the peculiarities in the construction and arrangement of the vaporizer, by reason of which a very high pressure is generated in the vaporizer sufficient to force the carbon, should any collect in the burner, outwardly through the outlet-orifice in the latter. Should flakes of carbon form in the vaporizer in the present case, therefore, due to imperfect vaporization resulting from neglect on the part of the user, such carbon will be arrested by the strainer 42 and prevented from entering the discharge-orifice in the burner, it being afterward forced out of the strainer and through the outlet-orifice in the burner by the high pressure of the vapor generated in the vaporizer. The formation of flakes of carbon, which obstruct the outlet-orifice in the burner and render the apparatus temporarily inoperative, occurs in prior constructions not only in case of neglect by the user to free the vaporizer from hydrocarbon, but frequently in the ordinary operation of the apparatus,

because of the small capacity of the generator and the low pressure in the vapor generated. It can only occur in the burner of the present apparatus, however, in case of neglect, as the
5 vaporizer in the present case is, as before pointed out, of such capacity and so related to the burner that very large quantities of hydrocarbon are rapidly and at the same time perfectly vaporized during the operation of
10 the apparatus, so that the formation and deposit of flakes of carbon within the vaporizer and burner is entirely avoided.

What is claimed is—

1. The combination with a burner, of a vaporizer provided with a supply-inlet and with
15 an outlet to the burner-opening, and comprising an outer tubular portion and an inner or central tubular portion inclosed thereby and communicating therewith at different points,
20 said inner or central tubular portion being arranged in line with the burner-opening so as to serve as a baffle for the flame therefrom, and said several tubular portions being closely grouped together so as to be within the path
25 of the flame from the burner-opening, with spaces between them for the passage of the flame, substantially as described.

2. The combination with a burner, of a vaporizer provided with a supply-inlet and with
30 an outlet to the burner-opening, and comprising two outer tubular portions connected at intervals by tubular branches extending from one to the other and an inner or central tubular portion inclosed by and communicating
35 with said outer tubular portions, said inner or central tubular portion being arranged in line with the burner-opening so as to serve as a baffle for the flame therefrom, and said several tubular portions being closely grouped
40 together so as to be within the path of the flame from the burner-opening, with spaces between them for the passage of the flame, substantially as described.

3. The combination with a burner, of a vaporizer provided with a supply-inlet and with
45 an outlet to the burner-opening, and comprising an outer tubular portion and inner or central tubular portions 37, 38 inclosed thereby and communicating therewith at different
50 points, said inner or central tubular portions 37, 38 crossing each other in line with the burner-opening so as to serve as a baffle for the flame therefrom, and said several tubular portions being closely grouped together so as
55 to be within the path of the flame from the burner-opening, with spaces between them for the passage of the flame, substantially as described.

4. The combination with a burner, of a vaporizer provided with a supply-inlet and with
6 an outlet to the burner-opening, and comprising two outer tubular portions 35, 34 connected at intervals by tubular branches 36 extending from one to the other and inner or
6 central tubular portions 37, 38 inclosed by and communicating with said outer tubular portions, said inner or central tubular portions
37, 38 crossing each other in line with the burner-opening so as to serve as a baffle for
7 the flame therefrom, and said several tubular portions 35, 34, 37, 38 being closely grouped
together so as to be within the path of the flame from the burner-opening, with spaces
between them for the passage of the flame, substantially as described.

5. The combination with a burner, of a vaporizer provided with a supply-inlet and with
an outlet to the burner-opening, and comprising an outer tubular portion and an inner or
8 central tubular portion inclosed thereby and communicating therewith at different points, said inner or central tubular portion being
arranged in line with the burner-opening so as to serve as a baffle for the flame therefrom,
and said several tubular portions being closely
8 grouped together so as to be within the path of the flame from the burner-opening, with
spaces between them for the passage of the flame, and a tubular mixer 40 between the
burner and said tubular portions, substantially as described.

6. The combination with a burner, of a vaporizer provided with a supply-inlet and with
an outlet to the burner-opening, and comprising two outer tubular portions connected at
9 intervals by tubular branches extending from one to the other and an inner or central tubular
portion inclosed by and communicating with said outer tubular portions, said inner or
central tubular portion being arranged in line
with the burner-opening so as to serve as a
baffle for the flame therefrom, and said several
tubular portions being closely grouped together
so as to be within the path of the flame
from the burner-opening, with spaces between
them for the passage of the flame, and
a tubular mixer 40 between the burner and
said tubular portions, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DENIS F. O'BRIEN.

Witnesses:

T. F. KEHOE,
J. A. GRAVES.

It is hereby certified that in Letters Patent No. 789,228, granted May 9, 1905, upon the application of Denis F. O'Brien, of Newark, New Jersey, for an improvement in a "Combined Hydrocarbon Vaporizer and Burner," an error appears in the printed specification requiring correction. as follows: In line 2, page 4, the word "in" should read *of*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of June, A. D., 1905.

[SEAL.]

F. I. ALLEN,
Commissioner of Patents.