(No Model.)

2 Sheets—Sheet 1.

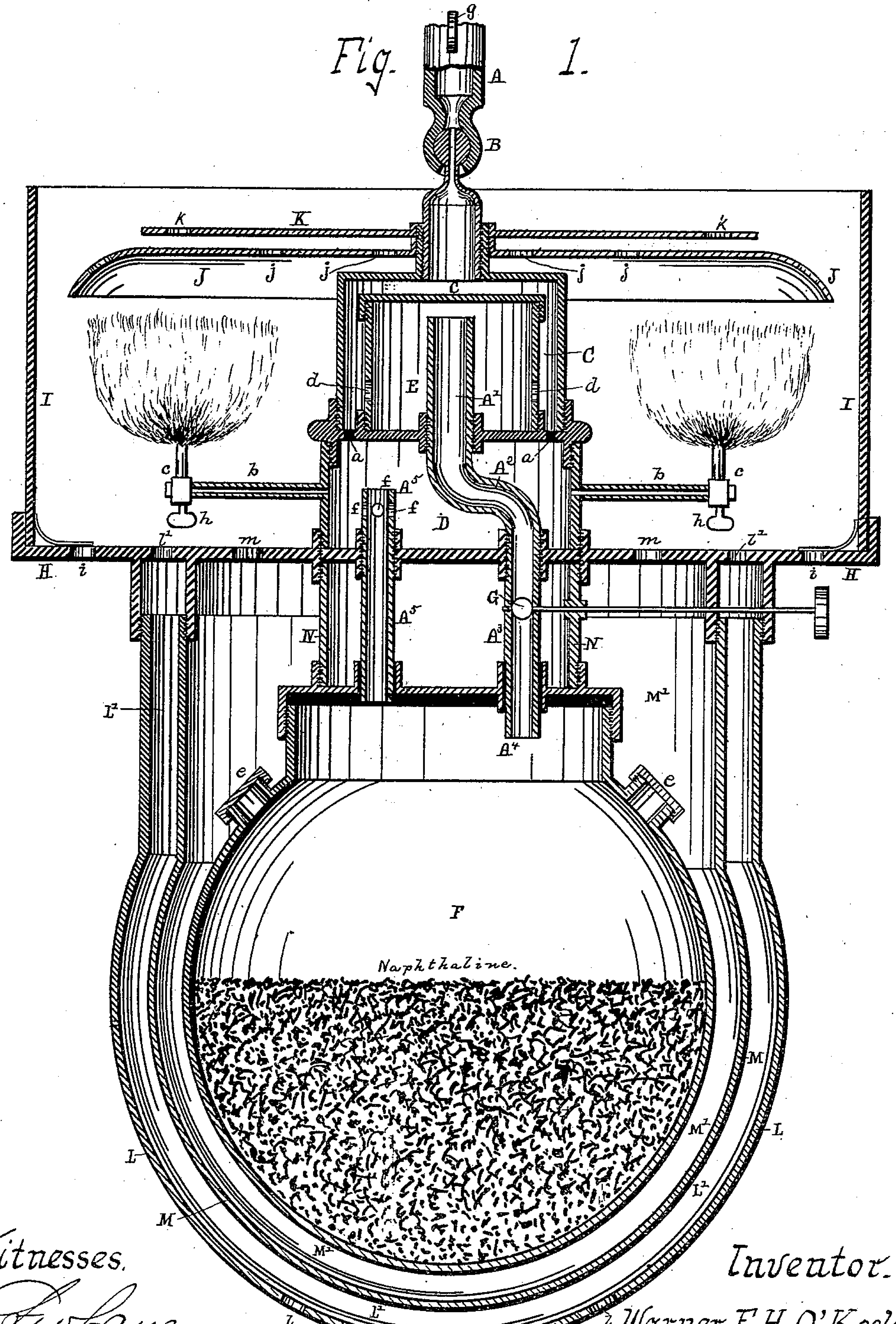
W. F. H. O'KEEFE.

APPARATUS FOR CARBURETING GAS.

No. 346,940.

Patented Aug. 10, 1886.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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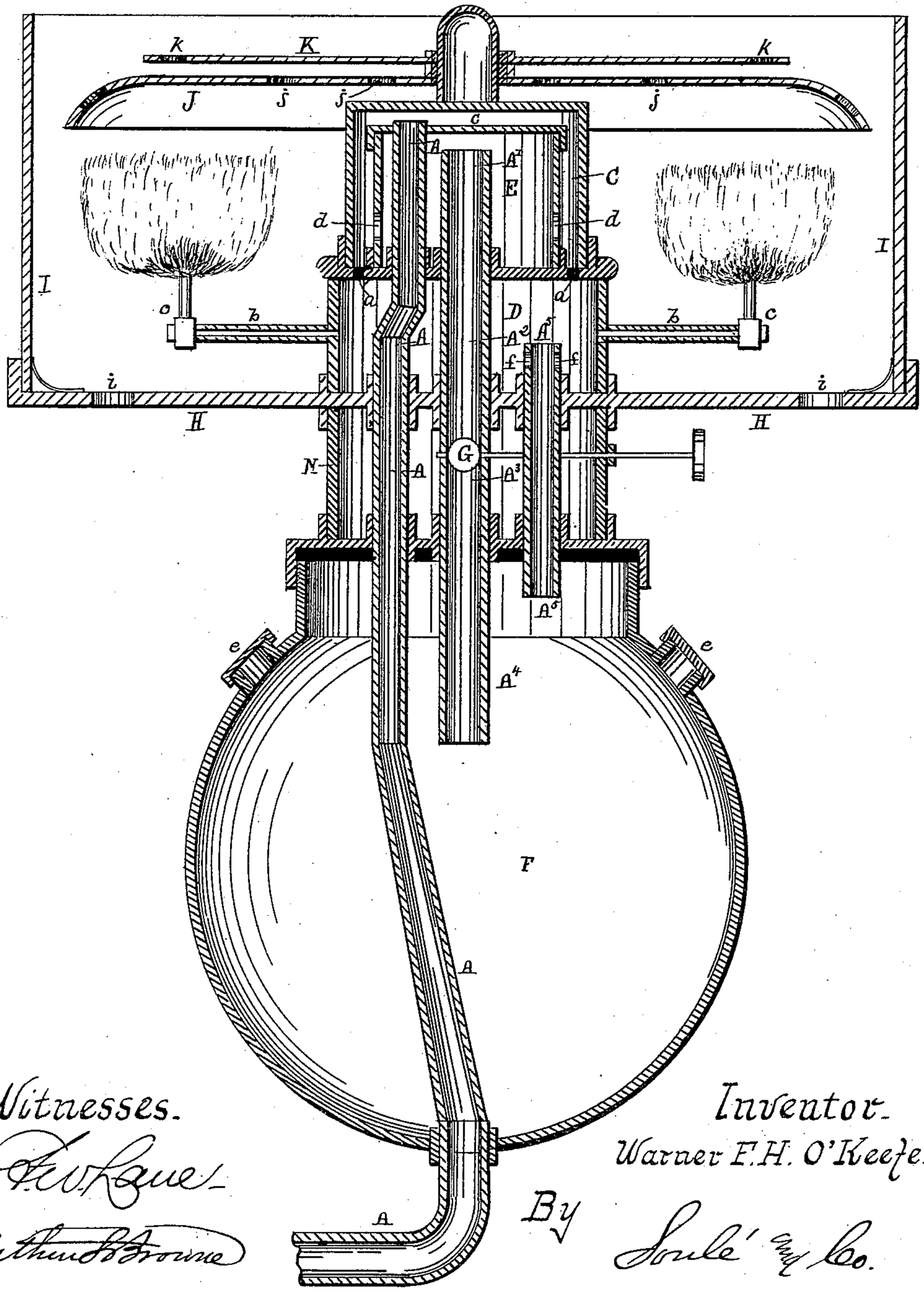
Fig. 2.



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UNITED STATES PATENT OFFICE.

WARNER F. H. O'KEEFE, OF ALLEGHENY, PENNSYLVANIA.

APPARATUS FOR CARBURETING GAS.

SPECIFICATION forming part of Letters Patent No. 346,940, dated August 10, 1886.

Application filed November 10, 1885. Serial No. 182,338. (No model.)

To all whom it may concern:

Be it known that I, WARNER F. H. O'KEEFE, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Carbureting Gas; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to an apparatus wherein natural gas, or natural gas mixed with any other gas or gases, is enriched or carbureted by heating the gas and projecting the same into a vessel containing naphthaline or other hydrocarbon, whereby the hydrocarbon is vaporized and the vapor thereof is mixed with the natural gas and the mixture is conducted to the burners. This improved apparatus is shown in the accompanying drawings, in which—

Figure 1 is a central vertical section of the apparatus, and Fig. 2 is a similar section illustrating a modification.

From the gas-supply pipe A is suspended by a ball-and-socket joint, B, the carbureting apparatus and the burners. The gas is first conducted into a gas-inlet heating-chamber, C. Immediately below this chamber is a distributing-chamber, D, communicating therewith by ports *a a*, from which distributing-chamber the burner branch pipes *b b* extend. The burners *c c* are arranged surrounding the chambers C and D, and the heat therefrom heats the chamber C and the gas therein contained. The chamber C preferably communicates directly with the distributing-chamber, in order that the gas may be supplied directly to the burners on first lighting the same, and in order that the proportions of the natural gas and hydrocarbon vapor may be properly regulated. Within the heating-chamber C, and entirely inclosed thereby, is an inner heating-chamber, E, which at its lower portion communicates with the outer heating-chamber by ports *d d*. Extending upward within chamber E is a gas-discharge pipe, A′, opening near the top of the chamber, which conducts the gas to the hydrocarbon-reservoir. This circuitous course of the gas is provided in order to retain the gas in position to receive heat as long as possible.

Suspended from the bottom of the distributing-chamber D, preferably by a cylindrical inclosing-casing, N, is the hydrocarbon-reservoir F. This reservoir is of a sufficient size to contain a sufficient quantity of hydrocarbon, which is introduced therein through apertures *e e*. The heated gas from the pipe A′ in the heating-chamber passes through pipe A^2, extending through chamber D, pipe A^3, and outlet-pipe A^4 opening directly into the hydrocarbon-reservoir. The pipe A^4 projects downward in a vertical direction, whereby the gas coming through the pipe impinges directly on the surface of the hydrocarbon, the heat thereof vaporizing the hydrocarbon. The mingled gas and vapor are conducted from the reservoir F to the distributing-chamber D by pipe A^5, which has a number of distributing-ports, *f f*. The mingled gas and vapor here intermingle with the natural gas already admitted to the chamber through ports *a a*, and the resulting product is supplied to the burners.

A stop-cock, *g*, in the pipe A controls the admission of the gas into the apparatus, and stop-cocks *h h* in each burner branch enable one of more of the burners to remain unlighted. A valve, G, located between the heating-chamber and the hydrocarbon-reservoir, preferably in pipe A^3, regulates the admission of heated gas into the hydrocarbon-reservoir, and thus regulates the proportion of gas and vapor in the distributing-chamber.

Beneath the burners and in the same horizontal plane with the bottom of the distributing-chamber is arranged a bottom plate, H, which supports a transparent globe, I, which incloses the burners. The plate H is provided with inlet-ports *i i*, to admit air to the burners. Above the heating-chamber and the burners is a deflecting-plate, J, having downwardly-curved edges, which deflects the heat from the burners downward upon the heating-chamber, thus utilizing more effectively the heat from the burners. The plate J is provided with apertures *j j*, which carry off the

products of combustion. These apertures are preferably formed in the plate immediately above the heating-chamber. In order to still further confine the heat, a second plate, K, is arranged a short distance above the plate J. This plate has apertures *k k*, near its outer edge, to assist in carrying off the products of combustion, but is solid above the apertures in the lower plate, in order to prevent a direct upward draft.

In order to protect the reservoir F from being chilled by contact with the air in the room, it is surrounded by an outer jacket, L, and an inner jacket, M, both of which inclose air-spaces L′ M′, and which are removably suspended from the plate H. The outer jacket, L, is provided with apertures *l l* at its bottom, which establish communication between the outer air and the space L′, and apertures *l′ l′* in the plate H establish communication between the space L′ and the burner-space above the plate H. This furnishes an additional means for supplying air to the burners. Other apertures, *m m*, in the bottom plate, H, establish communication between the burner-space and the jacketed space M′. These permit a free circulation of heated air around the hydrocarbon-reservoir and keep the reservoir warm, and assist somewhat in vaporizing the hydrocarbon. Both jackets L and M are removable to permit access to the feeding apertures of the reservoir.

As above mentioned, the space between the reservoir and the distributing-chamber is inclosed by a cylindrical casing, N, which not only serves to support the reservoir, but also protects the gas-pipes A^3 and A^5 from contact with the air and thus prevents any cooling of the same.

The suspension of the apparatus from the gas-supply pipe by the ball-and-socket joint B is especially advantageous in railway-trains, ships, &c., since thus the apparatus is at all times enabled to retain a proper vertical position.

The modification, Fig. 2, shows the arrangement of the apparatus when it is not suspended, but mounted on a gas-bracket. In this case the gas-supply pipe A enters the bottom of the hydrocarbon-reservoir at the center thereof, and extends upward through the entire apparatus to the top of the heating-chamber. Otherwise the arrangement is or may be the same. In this figure the jackets L M, surrounding the reservoir, are omitted.

I am aware that it is not new to place the hydrocarbon-reservoir below the gas-burners, and to vaporize the hydrocarbons therein by heating the gas directly from the burners before it enters the hydrocarbon-reservoir. I am also aware that it is not new to control the relative amounts of gas and vapor used by varying the amount of gas admitted to the hydrocarbon-reservoir. I therefore make no claim to such features; but

What I do claim is—

1. The gas-inlet chamber C, a distributing-chamber, D, immediately beneath chamber C, and communicating at all times directly therewith by ports *a a*, and gas-burners communicating with chamber D and surrounding chamber C and in close proximity thereto, whereby the gas within chamber C is heated, in combination with a hydrocarbon-reservoir, F, located below said chamber D, a pipe leading from chamber C through chamber D into reservoir F, which conducts hot gas into reservoir F, thus vaporizing the hydrocarbon therein, and a pipe, A^5, leading from reservoir F to chamber D, which conducts the mingled gas and vapor into the said distributing-chamber D, substantially as set forth.

2. The gas-inlet heating-chamber, a distributing chamber beneath said inlet heating-chamber and communicating therewith, and gas-burners communicating with said distributing chamber and surrounding said heating-chamber, in combination with a hydrocarbon-reservoir beneath said distributing-chamber and communicating therewith, an outlet heating-chamber within said inlet heating-chamber and connecting therewith, and an outlet-pipe opening in the upper part of said outlet-chamber and leading to said hydrocarbon-reservoir, substantially as set forth.

3. A gas-heating chamber, a gas-distributing chamber communicating directly therewith, and a hydrocarbon-reservoir communicating with said distributing-chamber, in combination with a pipe leading from said heating-chamber to said reservoir, and which conducts hot air into said reservoir, thus vaporizing the hydrocarbon therein, and a regulating-valve located in said pipe, substantially as set forth, whereby the supply of hot gas to the hydrocarbon-reservoir may be shut off and further vaporization of the hydrocarbon suspended.

4. A gas-heating chamber, C, a gas-distributing chamber, D, immediately beneath chamber C, gas-burners communicating with chamber D and surrounding chamber C, and a hydrocarbon-reservoir, F, communicating by separate pipes with said chambers C and D, respectively, whereby the hydrocarbons in said reservoir F are vaporized by the hot gas from chamber C, in combination with a reflecting-plate, J, located immediately above said chamber C and said gas-burners, substantially as set forth, whereby the heat from said burners is directed upon said chamber C.

5. A gas-heating chamber and gas-burners surrounding the same, in combination with a reflecting-plate located above said chamber and burners, said plate being provided with apertures for carrying off the products of combustion, and a second plate located above the first and above the apertures therein, substantially as set forth.

6. A gas-heating chamber, a gas-distributing-chamber, gas-burners communicating with said distributing-chamber, and a hydrocarbon-reservoir beneath said distributing-chamber and communicating therewith, in combination

with a perforated plate beneath said burners and above said reservoir, and a jacket suspended from said plate and surrounding said reservoir, said jacket inclosing a space which communicates through the perforations in said plate with the burner-space, substantially as set forth.

7. A gas-heating chamber, a gas-distributing chamber, gas-burners communicating with said distributing-chamber, and a hydrocarbon-reservoir beneath said chamber and communicating therewith, in combination with a perforated plate beneath said burners and chambers and above said reservoir, and two jackets suspended from said plate and surrounding said reservoir, said jackets inclosing two air-spaces, the outer of which spaces communicates beneath with the exterior air and above with the burner-space, and the inner of which spaces communicates with the burner-space, substantially as set forth.

8. An outer gas-inlet heating-chamber, a distributing-chamber beneath said chamber and communicating therewith, a gas-outlet heating-chamber within said outer heating-chamber and communicating therewith, and a hydrocarbon-reservoir located beneath said distributing-chamber and communicating with said outlet heating-chamber and with said distributing-chamber, in combination with a gas-inlet pipe which enters the bottom of said reservoir, extends upward through said reservoir, distributing-chamber, and outlet heating-chamber, and opens into the upper part of said outer heating-chamber, substantially as set forth.

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

WARNER F. H. O'KEEFE.

Witnesses:

F. M. TIERNAN,

C. H. LOVE.