BARKER & GILBERT.

Carbureter.

No. 66,777. Patented July 16, 1867.

Fig. 1.

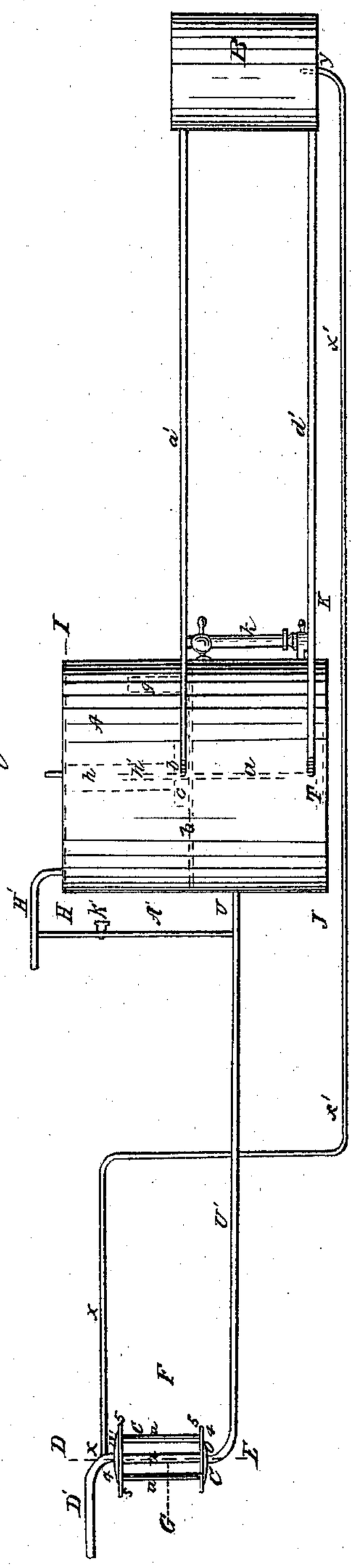

Fig. 6.

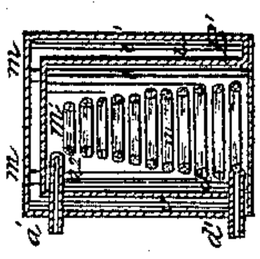

Fig. 9.

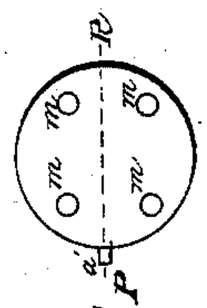

Fig. 7.

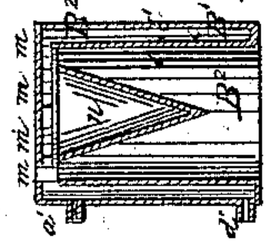

Fig. 8.

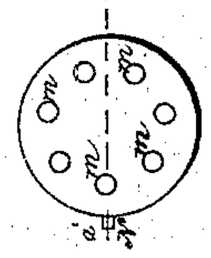

Fig. 5.

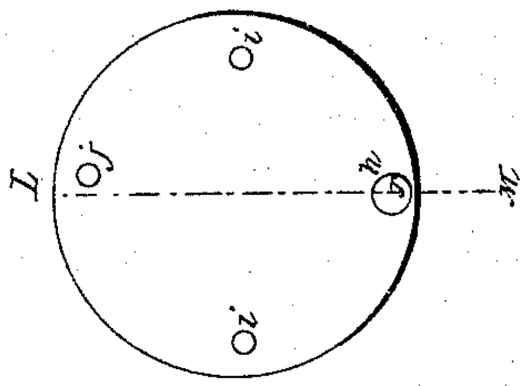

Fig. 2.

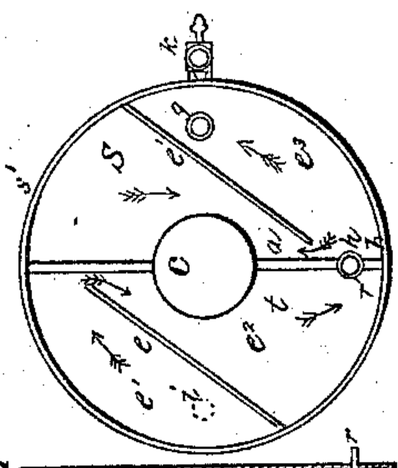

Fig. 3.

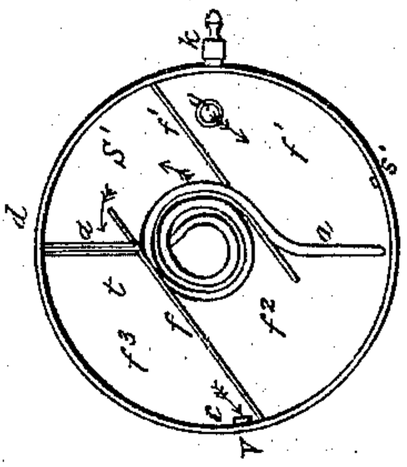

Fig. 4.

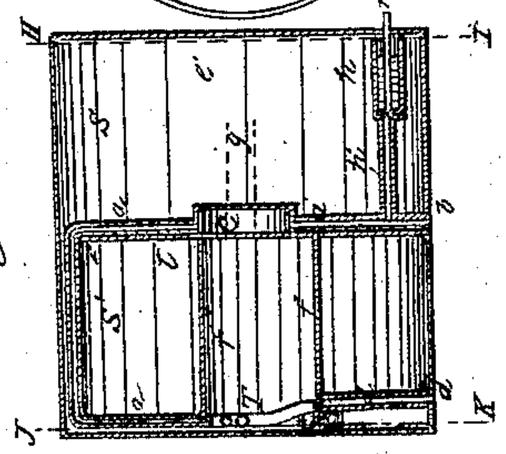

Fig. 12.

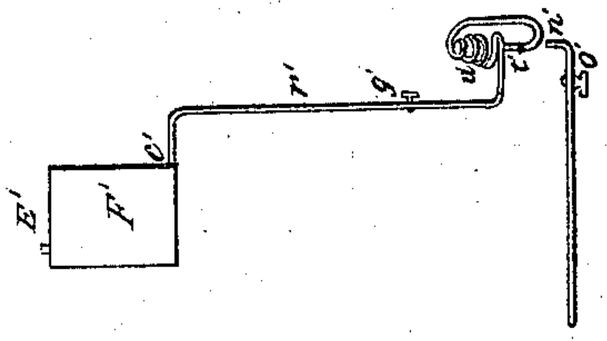

Fig. 10.

Fig. 11.

Witnesses:

T. A. Curtis
W. H. Spencer

Inventor:

J. F. Barker,
C. T. Gibson

UNITED STATES PATENT OFFICE.

J. F. BARKER AND C. N. GILBERT, OF SPRINGFIELD, MASSACHUSETTS.

IMPROVED APPARATUS FOR CARBURETING AIR AND GAS.

Specification forming part of Letters Patent No. **66,777**, dated July 16, 1867.

To all whom it may concern:

Be it known that we, J. F. BARKER and C. N. GILBERT, of Springfield, in the county of Hampden and Commonwealth of Massachusetts, have invented an Improved Apparatus for Carbureting Air or Gas; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, and to the letters of reference marked thereon, in which—

Figure 1 is an elevation of the apparatus set up for operation. Fig. 2 is a horizontal transverse section through line H I of Fig. 1, showing the upper chamber of the carbureter. Fig. 3 is a horizontal transverse section through line J K of Fig. 1, showing lower chamber of the carbureter. Fig. 4 is a vertical transverse section of the carbureter through line L M of Fig. 5. Fig. 5 is a top view of the carbureter. Fig. 6 is a vertical transverse section of the coil-heater through line P R of Fig. 9. Fig. 7 is a vertical transverse section of another form of heater through line N O of Fig. 8. Fig. 8 is a top view of such heater. Fig. 9 is a top view of the coil-heater. Fig. 10 is a horizontal transverse section of the condenser through line F G of Fig. 1. Fig. 11 is a vertical transverse section of the condenser through line D E of Fig. 1. Fig. 12 is a view of a benzine-stove and gas-burner for use in heating the fluid.

The nature of our invention consists, first, in an improved method of heating or evaporating naphtha or other hydrocarbon oil used in the manufacture or enrichment of illuminating-gas, when produced by the passage of currents of atmospheric air or of coal-gas over or in contact with naphtha or other hydrocarbon oil, whereby such air or gas becomes charged with the volatile portions of the naphtha, or is carbureted, and can be used for illuminating or heating purposes, which we accomplish by means of a heated fluid passing from a heater through suitable pipes and radiators placed within the carbureter, so that the naphtha or other hydrocarbon oil contained therein shall be heated by the radiation of the heat from the fluid passing through the pipes and radiators instead of being heated by direct circulation of the naphtha itself, as has been done heretofore.

Our invention also consists in subjecting the naphthalized air or gas, at some point after it leaves the carbureter and before it reaches the distributing-pipes, to a lower degree of temperature than it will ultimately attain before it is consumed, for the purpose of condensation, so as to remove or send back to the carbureter the surplus naphtha or other hydrocarbon oil, which would otherwise collect in the pipes or be thrown out at the burners.

In the different kinds of apparatus heretofore used for the manufacture of air-gas, or for enriching coal-gas by the vaporization of naphtha, a certain amount of heat is absorbed by the process; consequently the naphtha is continually growing colder in proportion to the rapidity of the evaporation and the temperature of the surrounding atmosphere, and the fluid, therefore, vaporizes less rapidly; and unless the lost heat can be restored, or, in other words, unless the fluid in the carbureter can be kept at a uniform temperature, the quality of the gas made or enriched is variable, being more heavily charged with the vapor of the naphtha at one time than at another.

As the union of the vapor of any hydrocarbon oil with coal-gas, or with air, is not a chemical combination, but merely a mechanical union, and as the atmosphere will absorb only a certain amount of vapor under a given temperature, and as the amount is greater in proportion to the increase of heat, it follows that if a given quantity of air or coal-gas absorbs its maximum amount of vapor under a high temperature (say 90°) in a carbureter, and afterward such air or gas becomes cooled in the gas-pipes, or falls to a much lower temperature, (say 40°,) a portion of the vapor will be condensed, and is liable to be thrown out at the burners in the form of liquid naphtha, thereby rendering life and property liable to loss by fire; and on account of this hazard, and by reason of the want of uniformity in the quality of gas furnished, neither process of naphthalizing air or of carbureting coal-gas has been very generally introduced.

To enable others skilled in the art to make and use our invention, we will proceed to describe its construction and operation.

In the drawings, A represents the carbureter, being of a circular form and having the partition *t* placed transversely across it, dividing it into two compartments or chambers, S and S′, which are designed to be filled, or partially filled, with some loose substance which shall have sufficient capillary attraction to draw the naphtha or a portion of it above the surface of the main portion of it, and thus expose more of it to contact with the current of air or gas which might be passing through the carbureter A than would otherwise be exposed. This partition *t* forms the top of the lower chamber, S′, and the bottom of the upper chamber, S. Into the upper chamber, S, are secured the two partitions *e* e^1, which are secured comparatively tight to the sides and top of the chamber S, and an aperture, *g*, is made in the bottom of the chamber S, which communicates with the lower chamber, S′, into which aperture is inserted and secured a tube which extends upward in the chamber S about halfway to the top of said chamber. An aperture, *s*′, is made near the bottom of the chamber S for the purpose of drawing off the naphtha or residuum whenever it may be desirable. An aperture, *i*, is made in the top of the chamber S, through which to force the air or gas which is to be naphthalized or enriched, and also the aperture *j*, through which to fill the chambers with the hydrocarbon oil; also the aperture *i*, into which is secured any desirable arrangement to operate as a vent while filling the chambers, and the aperture *y*′, which communicates with the valve *h*. The lower chamber, S′, is furnished with similar partitions, *f* f^1, which are, like those in the upper chamber, S, secured to the sides and top of the lower chamber, S′, comparatively tight, and the aperture U is made in the side of the lower chamber, S′, and near its top, into which is secured the end of the pipe U′. A suitable faucet is inserted into the aperture *s* in the side of the lower chamber, S′, near the bottom, for the purpose of drawing off the oil in the said lower chamber, S′, when desirable. Communicating with the aperture *b* in the side, and near the bottom of the upper chamber, S, is the pipe *a*, which enters the radiator *c*, which radiator may be of a cylindrical form, and closed at the top and bottom, so as to be perfectly tight in the joints. From the radiator *c* the pipe *a* passes to the point 2, and down through the partition *t* to the lower part of the lower chamber, S′, where it is formed into the coil T, which serves as a radiator for the purpose of heating the naphtha contained in the lower chamber, S′, and from the coil or radiator T it passes to and is connected with the aperture *d*.

Fig. 6 represents a coil-heater, B, which is constructed in the form of a double cylinder, or two cylinders, *l* *l*′, one inside the other, and both closed at the top, and connected with each other by the pipes *m* *m* *m*, the top of each cylinder having apertures where the pipes *m* *m* are attached, these pipes *m* *m* thus forming ports of egress for any smoke or gases which might be formed by the burner. The inner cylinder, *l*, is smaller than the outer cylinder, *l*′, leaving the space *o* between the two cylinders *l* and *l*′, which space *o* is closed at the bottom by the two cylinders having a continuous connection all around with each other, thus rendering this space *o* perfectly tight. This space *o* is intended to be filled with some non-condensing substance, as gypsum, to prevent the heat from radiating through the outer cylinder and being in a measure lost, and the two cylinders *l* and *l*′, with the space *o* filled with the non-conducting substance, we denominate the "case," B^1. The coil *m*′ is placed in the inside of the cylinder *l*, the lower part of which coil *m*′ passes through the lower part of the case B^1 and the upper part of the said coil *m*′ passing through the upper part of the case B^1, both passages occurring at the apertures d^2 and a^2, the ends of this coil connecting at the apertures a^2 and d^2 with the pipes a^1 and d^1, whichare connected with the carbureter at the apertures *b* and *d*.

Another form of heater is shown in Fig. 7, where an inverted cone, *n*, may be used instead of a coil. Said cone *n* not being closed at its base, the liquid is admitted into it from the space *o*, the other characteristics in its construction being similar to that shown in Fig. 6, except that, instead of the space *o* being filled with a non-conducting substance, it is filled with the fluid which is to be heated, and the pipes a^1 and d^1, instead of passing through the case B^1, are merely attached to the outer cylinder, *l*, so that the fluid which is heated in the space *o* can pass out and in through the tubes a^1 and d^1. This form of heater might be provided with a case outside to prevent loss of heat by radiation. An aperture, U, is made in the side of the lower chamber, S′, near its top *t*, which communicates with the pipe U′, this pipe U′ passing into the lower end of the condenser C at C′. The outer ends of the condenser C are made convex, and also made hollow, by attaching the convex portion 4 to the plane or flat piece 5, thus forming the spaces *v* and *v*′, which communicate with each other through the pipes *u* *u* *u*. An aperture, *w*, communicates with the pipe D′, which pipe D′ passes to the distributing-pipes. The end of the pipe U′ which is connected to the carbureter A, being somewhat lower than the condenser C, is inclined downward as it approaches the carbureter A. The pipe *x*′ is connected at one end to and communicates with the pipe D′, and to the other end of the pipe *x*′ is attached a burner, *y*, for the purpose of heating the fluid in the heater. Communicating with the pipe *a* is the pipe *h*′, to the upper part of which is attached the valve *h*, consisting of a small wire, *r*, at the lower end of which is secured a small disk, large enough, however, to completely cover the top of the pipe *h*′. This disk is kept down in contact with the top of the

pipe h' by means of a spiral spring attached to the wire r. Any suitable self-acting valve will answer the purpose quite as well, or a siphon might be used in place of a valve. This valve serves as an aperture at which to fill the heater, pipes, and radiators with the fluid to be heated, and also serves the purpose of an escape or safety valve, as by any unusual amount of expansion of the fluid in the pipes a^1 a or radiators the disk of the valve h will be raised by such force of expansion, and any undue amount of pressure removed.

A gage, k, may be attached to the carbureter, communicating with the lower part of the lower chamber, S′, to indicate the height of the naphtha in the chamber S′, the height of the tube g regulating the quantity of naphtha in the upper chamber, S. The carbureter A may be made or composed of any number of chambers, with a gage attached to one or more of them, any of the common gages in general use for that purpose answering the purpose as well.

Having thus described the construction of our invention, we will now proceed to explain its operation.

The wire r and the disk attached thereto are raised, and the pipes a a^1 d^1 and radiators c and T and heater, with the connecting-pipes, are filled with any desirable and convenient fluid that will not congeal at a low temperature, as glycerine and when filled the wire is released or the valve shut. The carbureter A is then filled sufficiently with the naphtha or other hydrocarbon oil by pouring it through the aperture i. When the upper chamber, S, is filled to the top of the tube g, the naphtha flows into and down the tube g into the lower chamber, S′. The filling is continued until about the same quantity is indicated by the gage to be in the lower chamber, S′, as is in the upper chamber, S. Heat is now applied under the coil m' in the heater B, and as the fluid in the coil m' becomes heated it rises, and as the heat continues it is forced out into the pipe a^1, and thence into the carbureter A, into and through the radiator c. In its passage thus through the pipes a^1 and radiator c the fluid becomes somewhat cooled, and readily passes down through the pipe a into the lower chamber, S′, of the carbureter A, and as it becomes more cooled it rushes back through the radiator T, the pipes a and d^1, into the heater B, to supply the place of that which has been heated and forced out through the pipe a^1; and thus a complete and active circulation of the heated fluid is produced.

The heated fluid, in its passage through the pipes and radiators in the carbureter A, diffuses its heat very thoroughly through the naphtha contained in the carbureter A, which naphtha also becomes thoroughly and uniformly heated, and is thus made to give off rapidly a portion of its volatile properties, or is converted into vapor. If, now, a current of atmospheric air or of coal-gas is forced into the pipe H′ and through the aperture i, it comes in contact with this vapor, and the surface of the naphtha in the upper chamber, S, in the subdivision e^1, passes around the partition e in a direction indicated by the arrows, through the subdivision e^2, around the partition e^1 into the subdivision e^3, and down the tube g into the lower chamber, S′, striking the vapor and naphtha in subdivision f^1, passing around the partition f^1, through the subdivision f^2, around the partition f into the subdivision f^3, and out the aperture U into the pipe U′. In its passage thus through the carbureter A, if the circumstances are favorable, the air or gas may have become surcharged with the vapor; and if the condenser C be placed in any cold locality, and the naphthalized air or gas which has passed through the carbureter A pass on through the pipe U′ and into the condenser C, the surplus vapor which the air or gas may have absorbed will become condensed and flow back as liquid naphtha into the pipe U′, down this pipe, which is inclined back into the carbureter A, and be again heated and converted into vapor.

A supply of gas for the burner y, with which to heat the fluid in the heater, is obtained through the pipe x', which is connected with the gas-pipe D′.

Instead of using a gas-burner for the purpose of heating the fluid, we may use the device shown in Fig. 12, which is a combination of a benzine-stove with a gas-burner, F′ being the vessel containing the burning-fluid, which is filled at the orifice E′, and at c' is attached the pipe r', having a stop-cock, g', and terminating in the burner t', the pipe r' being coiled immediately over the burner t' at u'. As commonly used, the fluid being placed in the vessel F′ and let down through the pipe r' to the coil u' and burner t', a swab is dipped into some inflammable liquid and set fire, and held under the coil u' a short time until the coil or pipe is sufficiently heated to convert the liquid therein into vapor, when it issues from the burner t', and is easily lighted, and continues to burn as long as the coil u' is supplied with the liquid.

To remedy the inconvenience attending the use of a separate vessel of fluid and a swab, and to lessen the danger from fire always attending the use of inflammable liquids, we combine the use of a common gas-burner, which may be supplied with gas from the carbureter A, with a benzine-stove, as shown in Fig. 12.

The gas may be lighted from the burner n', which is placed under the burner t' and coil u', and sufficiently near them to allow of their being heated by the flame from the gas-burner n', and allowed to burn until the coil u' is sufficiently heated to form vapor, when the vapor issuing from the burner t' will become ignited, which will then itself heat the coil u' and generate the vapor needed for its own consumption, and the gas may then be turned off, and the heat from the burner t' need only be used.

A great saving is effected by the use of this

arrangement of a benzine-stove, as there is generally, after use, a residuum in the carbureter which will not vaporize, and this can be drawn off and placed in the vessel F′, and used for the purpose of heating the fluid in the heater B, either with or without the gas-burner *n′*, as may be desirable.

As more vapor from the naphtha would be absorbed or taken up by the air or gas passing through the carbureter A immediately after a fresh supply of naphtha had been placed in the carbureter A than would be taken up from naphtha which had been longer under the process of vaporization, it follows that such air or gas would be richer in its illuminating properties, and to remedy this want of uniformity in the quality of the gas, we make use of the pipe A′ and stop-cock *k′*. If the air or gas passing through the pipe U′ is too rich in naphtha vapor, we turn the stop-cock *k′*, so that more or less of the atmospheric air or coal-gas (whichever may be under the process of enrichment) from the pipe H′ may flow down the pipe A′ into the pipe U′, and thus the air or gas which is too rich in naphtha vapor becomes diluted. If the air or gas passing through the pipe U′ lacks richness in naphtha vapor, more heat is applied under the heater B, which causes the naphtha in the carbureter to give off more vapor, which is taken up by the air or gas passing through, and in this way great uniformity is attained in the quality or illuminating property of the air or gas.

It is evident that various modifications of the radiators *c* and T may be used in the carbureter A, the principle of their operation, however, remaining the same, whatever may be their particular form.

To guard against danger from fire, we place the carbureter A in a small apartment by itself, and detached from the building to be lighted, and place the heater B outside this apartment containing the carbureter A, with the pipes a^b and d^1 passing through the partition from one vessel to the other, so that the two vessels shall each be in separate compartments.

We are aware that devices have been used to manufacture naphthalized air, as in Letters Patent granted to Oakes Tirrill, and bearing date June 5, 1866, and numbered 55,395, and also in Letters Patent granted to William Thompson, assignor to the Cleveland Gas Machine Company, dated April 30, 1867, and numbered 64,382; but our invention differs very materially from said devices, both in construction and operation, and we disclaim any and every part of said devices, irrespective of our construction and arrangement.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The heating of the fluid of any carbureter used for the purpose of carbureting air or gas by means of a heated fluid, the same being circulated in pipes and radiators through the carbureter and heater, substantially as herein described and set forth.

2. The heater B, having a case, B^1, filled with a non-conducting substance, and the coil *m′*, when used in combination with radiators placed inside a carbureter, substantially as herein described, and for the purpose set forth.

3. We claim, in combination with a carbureting apparatus, a condenser, substantially as herein described, so as to cool the gas after being carbureted, and before it passes into the distributing-pipes, for the purpose hereinbefore specified.

4. We claim the use of the condenser C, in combination with the carbureter A, the radiators *c* and T, and the heater B, when constructed and operating substantially as described and set forth.

5. The valve *h*, in combination with the pipe *a*, radiators *c* and T, and carbureter A, all constructed substantially as described, and for the purposes herein specified.

6. The heater B^2, having the space *o* between the two cylinders *l* and *l′*, with the inverted cone *n*, having its base open and attached to the upper part of said cylinder *l*, so that the interior of said inverted cone *n* shall communicate with the space *o*, all constructed and operating substantially as herein described and set forth.

J. F. BARKER.
C. N. GILBERT.

Witnesses:
T. A. CURTIS,
W. H. SPENCER.