S. N. NORTH.

GAS GENERATOR.

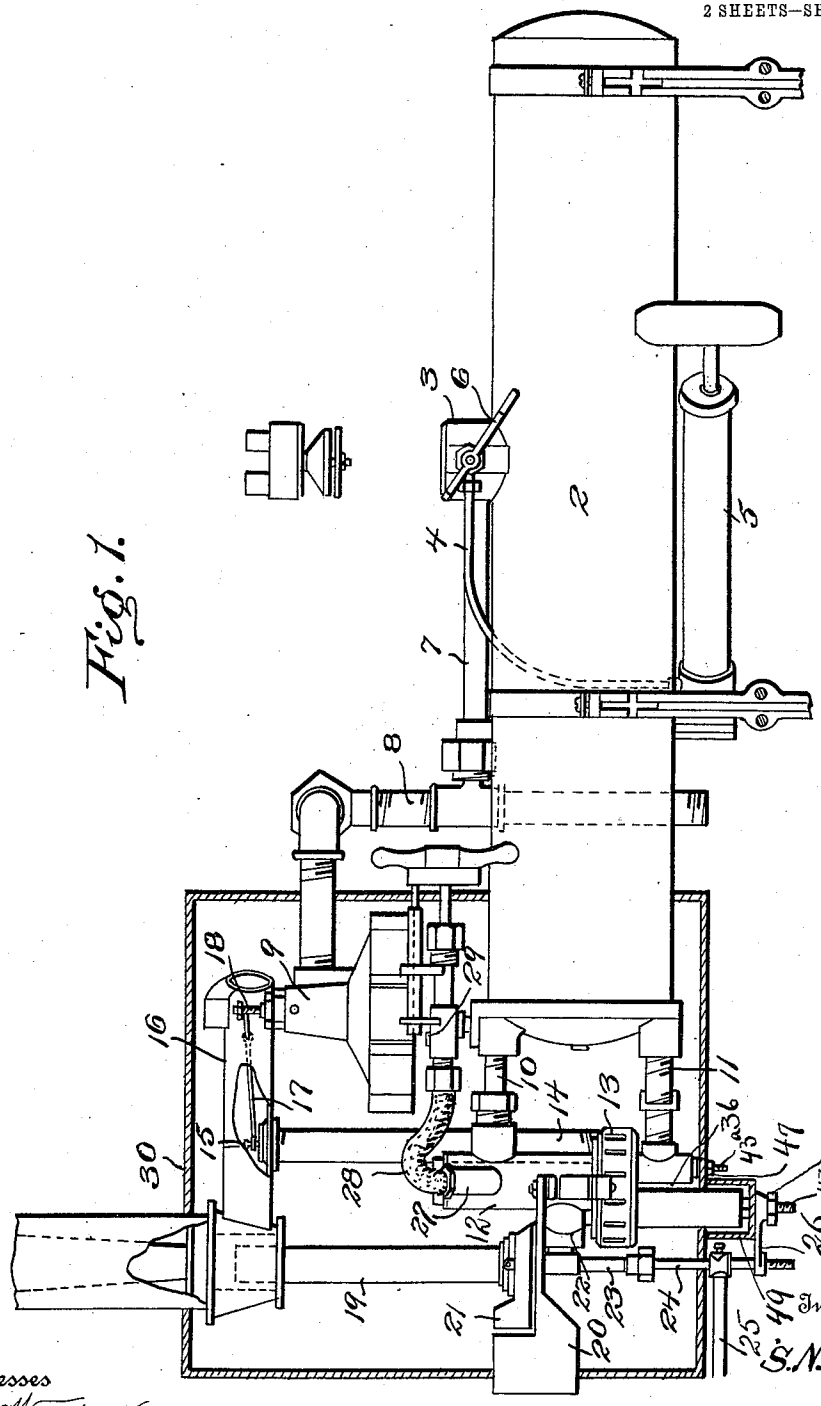
APPLICATION FILED MAR. 8, 1911.

**1,015,632.**

Patented Jan. 23, 1912.

2 SHEETS—SHEET 1.

Fig. 1.




Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

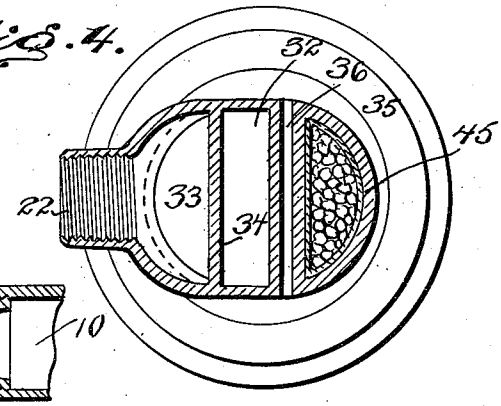



Fig. 2.

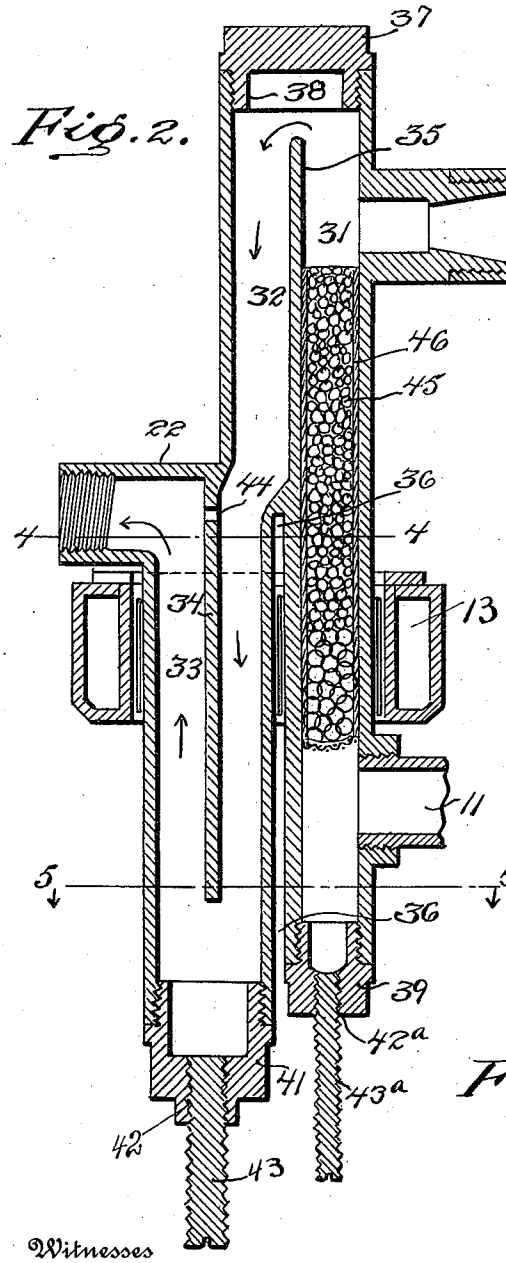
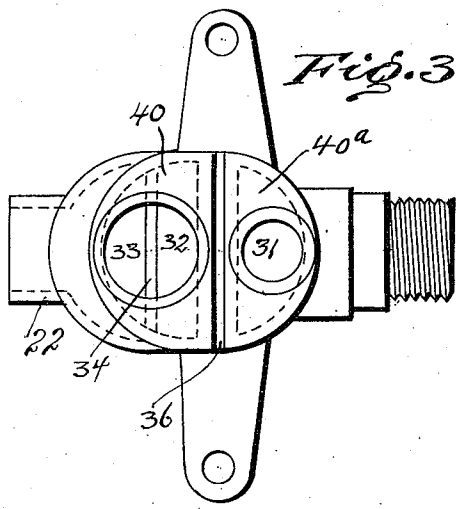



Fig. 3.



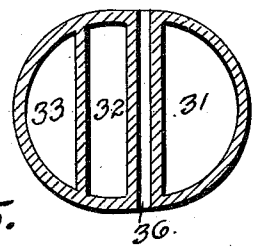




Fig. 5.

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# UNITED STATES PATENT OFFICE.

SAMUEL N. NORTH, OF RISING SUN, INDIANA.

## GAS-GENERATOR.

1,015,632. Specification of Letters Patent. Patented Jan. 23, 1912.

Application filed March 8, 1911. Serial No. 613,084.

*To all whom it may concern:*

Be it known that I, SAMUEL N. NORTH, citizen of the United States, residing at Rising Sun, in the county of Ohio and State of Indiana, have invented certain new and useful Improvements in Gas-Generators, of which the following is a specification.

My invention relates to generators for gas machines designed for generating gas from gasolene, alcohol and other liquid hydrocarbons, and the invention relates particularly to that type of generator wherein there is provided a gas generating chamber connected to a tank or reservoir containing gasolene or other hydrocarbons, said generator being surrounded by an exteriorly disposed burner, the liquid hydrocarbon being admitted to the generating chamber and being therein converted into a gas.

The primary object of my invention is the provision of a generator of this type provided with means for more completely gasifying the liquid hydrocarbon by more completely superheating the gas generated therein and so constructed that the generated gas shall be submitted to the action of the burner a number of times before passing out through the delivery duct.

A further object is the provision of a generator of this character wherein the gasolene containing portion of the generator shall be separated from the superheating portion by an air space, thus preventing the absorption of the heat from the gas by the liquid hydrocarbon contained in the first named portion of the generator.

A further object is the provision of means whereby the gas generated in starting the machine may pass directly from the superheating chamber to the delivery pipe and not act to force any liquid gasolene or other hydrocarbon out of the delivery pipe.

While I have shown my generator as being applied to a particular form of gas machine, I wish it understood that I have shown this form as an illustration of the application of my generator and do not wish to be limited to this use.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is a side elevation of a gas machine with my improved generator applied thereto, the casing surrounding a portion of the machinery and the generator being shown in section. Fig. 2 is a longitudinal section of the generator separated from the rest of the machine, the burner being also shown in section. Fig. 3 is a view of the under side of the generator. Fig. 4 is a section on the line 4—4 of Fig. 2. Fig. 5 is a section on the line 5—5 of Fig. 2.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

The gas machine with which my generator is particularly adapted to be used is illustrated in Fig. 1. These parts are well known and are in common use and hence they may be briefly described. In this figure, 2 designates a gasolene tank having a filling opening 3 and provided with an air pump 5 with a connecting tube 4 leading to the filling opening and controlled by an air valve lever 6. 7 designates the filling opening escape pipe which leads to a main escape pipe 8 connected at its upper end to a governor 9. The tank 2 is connected by pipes 10 and 11 to the generator 12. The pipe 11 leads from the bottom or lowermost portion of the tank 2 while the pipe 10 leads from the uppermost portion of the tank or reservoir. Surrounding the generator 12 is the burner 13 of any suitable construction and shown as an annular chamber provided with outlet or burner openings. The burner is supplied by a pipe 14 and is governed by a governor valve 15 disposed within a tubular member 16. This valve 15 has a lever 17 which projects through the pipe 16 and is connected to the governor valve stem 18. Leading from the generator 12 is a delivery pipe which delivers vapor to the mixing tube 19. 20 designates the body of an air inducting device and 21 the cover thereof. The gas delivery duct 22 leading from the generator discharges the gas immediately below the air inducting device and the passage of the gas is regulated by means of a gas delivery valve casing 23 having therein the needle 24 supported by the arm 26 and controlled by the lever 25. Located adjacent to the generating chamber 12 is the initial heating nozzle 27 connected to the elbow 28 and having the air valve 29. All these parts are as ordinarily constructed and are inclosed within a casing 30 which entirely surrounds and covers in the governor, the generator, the induction devices and the mixing tube. The needle valve stem, however, extends below the casing so that it may be

easily regulated and the casing only incloses one end of the tank and a portion of the escape pipe.

My invention relates specifically to the construction of the generator and a means whereby the gas passing from the liquid containing portion of the generator may be superheated by being passed back and forth through the superheater a number of times before its final discharge, thus causing a more complete gasification of the hydrocarbon and securing a better action of the apparatus.

Referring now to Figs. 2 and 3, which show the detailed construction of the generator, it will be seen that the generator 12 consists of a gasolene chamber 31 designed to contain liquid gasolene and connected near its upper end to the inlet pipe 10 and near its lower end to the inlet pipe 11, these pipes leading from the tank or reservoir 2. The reservoir is disposed at an equal height to the generator so that when the tank or reservoir 2 is filled, the liquid gasolene or other hydrocarbon will not flow through the top connection of the generator. Disposed parallel to the liquid containing chamber 31 is a gas chamber 32 which is connected at its upper end to the gasolene chamber 31, and disposed parallel to the gas chamber 32 is a gas chamber 33 which is disposed parallel to the chamber 32 and connected at its lower end thereto. This chamber 33 only extends part way up the length of the chamber 32 to a point above the burner 13 and then extends outward and is connected to the gas delivery pipe 22. Preferably these several chambers are cast in one piece, the chambers 32 and 33 being separated merely by a common wall 34 which does not extend down to the lower ends of the chambers and the upper portions of the chambers 31 and 32 being always separated by a common wall 35 which does not extend to the lower ends of the chambers 31 and 32. The lower portions of the chambers 31 and 32 are separated by an air space 36 which extends up to a point above the burner 13. It will be seen that the upper portion of the body of the generator forms a cylinder divided into two chambers by a common partition wall 35. The upper end of the generator is closed by a many sided plug 37 having a screw threaded annular flange 38. Extending across the lower end of the chamber 31 is a wall $40^a$ having therein, as shown in Fig. 3, an opening closed by the hollow screw threaded plug 39. Extending across the cylindrical body which forms the lower conjoined ends of the chambers 32 and 33 is a wall 40 having therein an opening closed by a hollow screw threaded plug 41. The plug 41 is provided with a drainage opening 42 closed by a screw threaded plug pin 43, and the plug 39 is formed with a drainage opening $42^a$ closed by a screw threaded plug pin $43^a$. The partition wall 34 at a point just directly opposite to the delivery pipe 22 is provided with a perforation 44, this perforation acting as a safety opening to permit the initial passage of gas from the upper portion of the generator where the lower portions of the chambers 32 and 33 are filled with liquid gasolene, thus preventing the liquid gasolene so contained from being driven out of the delivery pipe 22 by the pressure of gas behind it. The gasolene chamber is intended to be filled with granular particles such as gravel which may be contained within a pocket or sack of closely woven brass wire. These granular particles are designated 45 and the sack or other holder for the same is 46.

It will be seen from Fig. 1 that the lower end of the generator projects below the casing 30 in such manner that the plug 41 may be easily removed without removing the casing 30. This plug is removed when it is desired to clean the generator.

By reference to Fig. 1 it will be seen that the plug pin $43^a$ which closes the drainage opening into the gasolene containing chamber 31 projects through the bottom of the casing 30 and is screw threaded for engagement with a nut 47 whereby the bottom of the sheet metal box or casing 30 may be supported. The lower end of the combined chambers 32 and 33 extends through this sheet metal box or casing 30 far enough to permit a wrench to be applied on the lower end of the same to hold it rigid while taking out the plug 41. The drainage pin 43 on the plug 41 is exteriorly screw threaded for engagement with a nut 48 which supports the gas delivery needle support 26. A small metal box or casing 49 may also be used to cover in the exposed lower end of the chambers 32 and 33. This is supported between the lower face of the many sided cap or plug 41 and the needle support 26.

I find it unnecessary in practice to extend the gasolene containing chamber 31 through the bottom of the metal casing 30 as there is no chance of carbonization within this chamber 31. All carbonizing will take place in chambers 32 and 33 and by taking out the plugs 39 and 41 and the gas delivery valve 23, the machine can be cleaned thoroughly and without taking the same from the supporting brackets.

The operation of my invention is as follows. Liquid gasolene or other hydrocarbon and like products flow in at the pipe 11 from the tank and fills the gasolene containing chamber up to a point just below the inlet pipe 10, this being the height of the gasolene in the tank. In order to start the apparatus, a flame is initially projected against the wall of the generator by means of the initial heating nozzle 27. Normally,

however, this nozzle is cut off and heat is secured through the burner 13. The gasolene contained within the compartment or chamber 31 is volatilized and the vapor from this gasolene passes upward to the upper end of the compartment 31 and into the upper end of the compartment or chamber 32, down which it flows in the direction of the arrows in Fig. 2. The vaporized hydrocarbon passes downward the whole length of the chamber 32 and in so doing is carried downward through the center of the surrounding burner 13 so that it is thoroughly heated. At the lower end of the chamber 32 the vaporized gasolene passes into the upwardly extending chamber 33 and is again passed through the center of the burner 13 and is directly subjected to the heat from the burner. It then passes off through the pipe 22 over the top of the burner and is therefore even more fully subjected to the heat of the burner.

In the ordinary form of generator of this type of machine, the gasolene is volatilized in one compartment or chamber of the generator, then passes into the other compartment, passes half way down therein and then passes directly out through the delivery pipe. As a consequence the gas is not sufficiently heated as it is not once passed entirely through the burner, to say nothing of passing through the burner a number of times. It often occurs that after the machine has been tested at the factory the lower ends of the chambers 32 and 33 contain liquid gasolene. It will be obvious that any gasolene contained in the lower ends of the chambers 32 and 33 will prevent the passage of gas from the chamber 32 into the chamber 33, and under these conditions if vaporization was started, the pressure of the gas in the upper portion of the chamber 32 would act to force this liquid gasolene out through the delivery pipe. In order to prevent this, I have provided the perforation 44 so that the gas may pass directly from the upper portion of the chamber 32 through said perforation and through the delivery pipe. This passage of gas will continue until the gasolene in the lower portion of the chambers 32 and 33 has become vaporized, whereupon the gas will be free to pass downward through the entire length of the chamber 32 and into the lower end of the chamber 33 and so out, the perforation 44 being so small, relatively speaking, as to permit the escape of only a very small portion of the gas directly to the delivery pipe.

By providing the air space 36 which separates the two legs of the generator, I prevent the liquid gasolene contained in the chamber 31 acting to absorb the heat of the gas in the chamber 32. I have found in practice that my generator is economical and thoroughly effective and that the superheated gas is much superior to gas which passes almost directly from the gasolene chamber to the outlet pipe without being superheated.

What I claim is:

1. The combination with a surrounding burner, of a generator comprising a liquid containing chamber extending through the burner, and a connected series of gas superheating chambers connected to the upper end of the liquid containing chamber and extending back and forth a plurality of times through the burner.

2. The combination with a surrounding burner, of a gas generator comprising a liquid containing chamber extending through the burner, and a connected series of gas superheating chambers extending back and forth a number of times through the burner, the first chamber of the series being connected at its upper end to the liquid containing chamber but the lower portion thereof being separated from the liquid containing chamber by an air space.

3. A gas generator of the character described, including a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber but separated from the lower portion thereof, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, the upper end of one gas chamber and the upper end of the other gas chamber being connected by a passage, and a burner discharging heat against the walls of the several chambers.

4. A gas generator of the character described, including a substantially annular burner, a liquid fuel chamber connected to a supply source and disposed within the annular burner, a gas chamber connected at its upper end to the fuel chamber but separated from the lower portion thereof by an air space, and a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, both of said gas chambers extending through the burner, and a connection between the upper end of one gas chamber and the other gas chamber.

5. A gas generator of the character described, including a substantially annular burner, a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber and extending parallel thereto but separated from the lower portion of the fuel chamber by an air space, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, said last named gas chamber extending partly up the first named gas chamber, an outlet pipe connected to the last gas chamber of the series,

the gas chambers being connected to each other by a passage disposed opposite to the outlet pipe, the annular burner surrounding the several chambers and directing heat against the walls thereof.

6. A gas generator of the character described, including an annular burner, a liquid fuel chamber connected at its upper end and lower ends to a source of supply, a gas chamber integral with the liquid fuel chamber and connected at its upper end thereto but separated from the lower portion thereof by an air space, a gas chamber extending parallel to the first named gas chamber and integral therewith and connected at its lower end thereto, said last named gas chamber extending to a point midway of the length of the first named gas chamber and then being extended outward to connect with an outlet pipe, the upper end of the conjoined fuel chamber and first gas chamber being closed by a removable plug, a removable plug closing the lower end of the fuel chamber, and a removable plug closing the lower end of the conjoined gas chambers, the annular burner surrounding the several chambers and directing heat against the walls thereof.

7. A gas generator of the character described including a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber but separated from the lower portion thereof, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, a plug closing the lower end of the fuel chamber, a plug closing the lower end of the conjoined gas chambers, each of said plugs being formed with a drainage passage, and drainage pin plugs closing said drainage passages but removable therefrom.

8. In a gas machine the combination with a casing, of a generator disposed therein including a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, a plug closing the lower end of the fuel chamber, and a plug closing the lower end of the conjoined gas chambers, the lower end of the conjoined gas chambers projecting through the casing whereby to permit the plug to be removed from the gas chambers without removing the generator from the casing.

9. In a gas machine the combination with a casing, of a gas generator therein including a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, a plug closing the lower end of the fuel chamber, a plug closing the lower end of the conjoined gas chambers, each of said plugs being formed with a drainage passage, and drainage pin plugs closing said drainage passages but removable therefrom, the lower end of the conjoined gas chambers being extended below the lower end of the liquid fuel chamber and projecting through the bottom of the casing, the drainage plug of the fuel chamber also projecting through said casing whereby to permit the plug to be removed from the conjoined gas chambers without removing the generator from the casing and to permit the fuel chamber to be drained without like removal.

10. In a gas machine the combination with a casing, of a gas generator disposed within the casing and including a liquid fuel chamber connected to a supply source, a gas chamber connected at its upper end to the fuel chamber, a gas chamber extending parallel to the first named gas chamber and connected at its lower end thereto, both of said gas chambers forming together a cylindrical body extending below the fuel chamber, a plug closing the lower end of the fuel chamber, a plug closing the lower end of the conjoined gas chambers, each of said plugs being formed with a drainage passage, screw threaded drainage pin plugs closing the drainage passages but removable therefrom, the lower end of the conjoined gas chambers passing through the bottom of the casing and the drainage pin plug of the fuel chamber also passing through said casing, a nut on said last named drainage pin engaging the exterior of the casing and acting to support the same, an auxiliary casing inclosing the lower end of the conjoined gas chambers through which the drainage pin plug of said gas chambers passes, and a nut upon said drainage pin plug engaging the auxiliary casing to hold it in place.

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

SAMUEL N. NORTH. [L. S.]

Witnesses:
WILLIAM H. CLARK,
WILLIAM H. JOHNSON.