(No Model.) 3 Sheets—Sheet 1.

R. NORRIS.

METHOD OF AND APPARATUS FOR CARBURETING WATER GAS.

No. 563,300. Patented July 7, 1896.

Fig. 1.

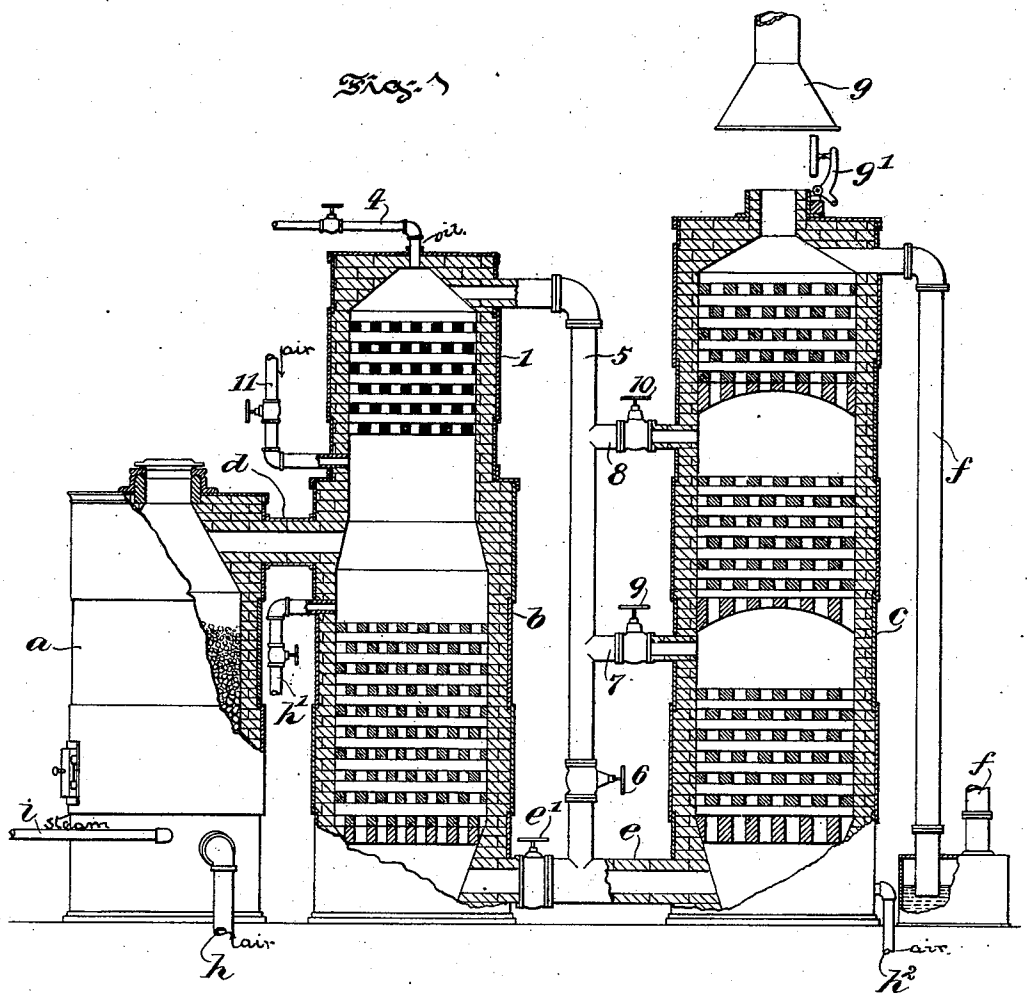

Fig. 2.

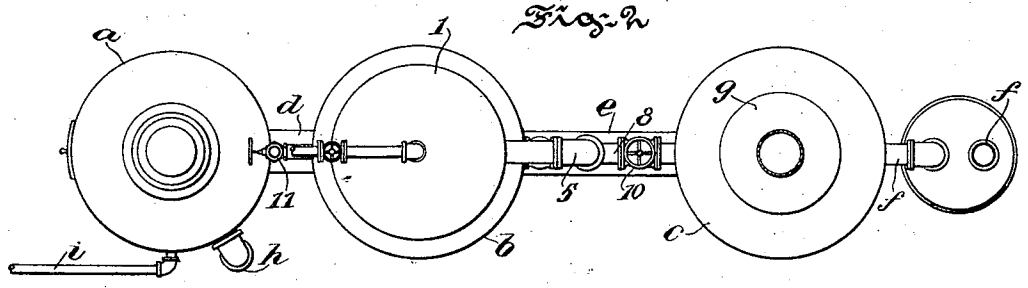

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Fig. 3

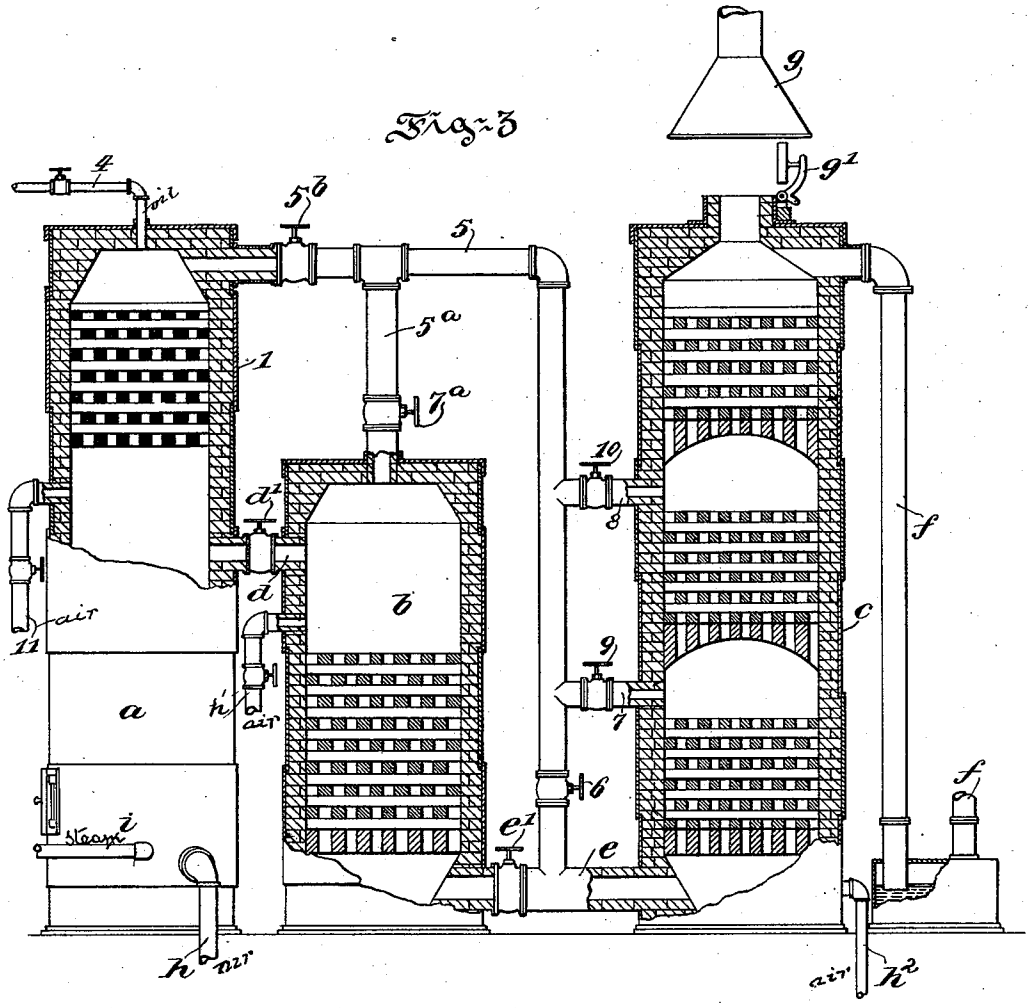

Fig. 4

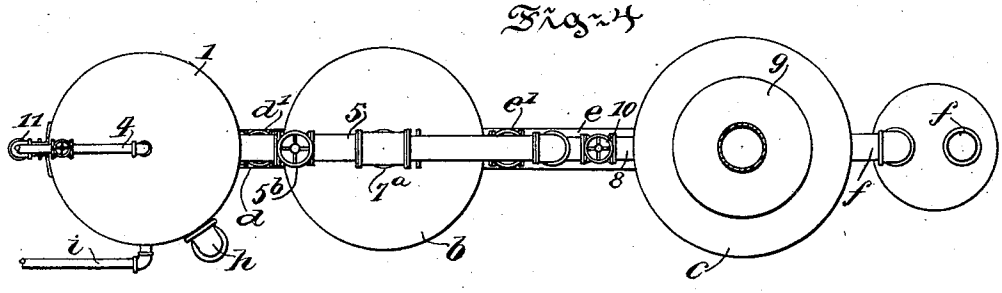

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Fig. 5

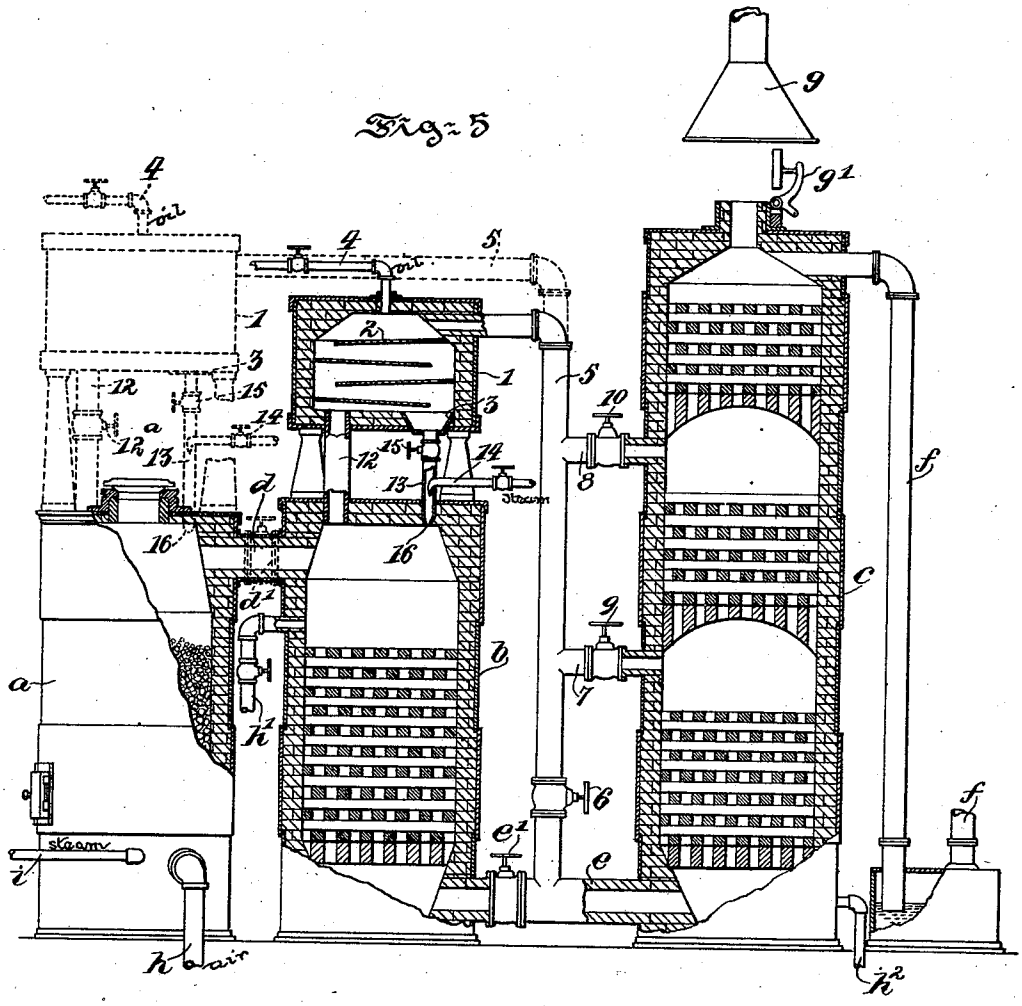
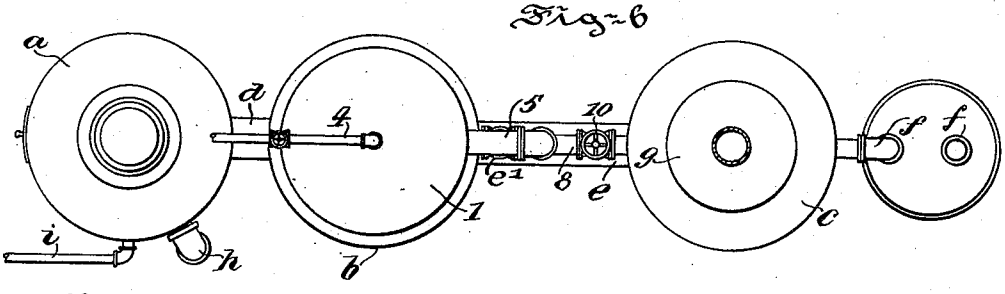


Fig. 6



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UNITED STATES PATENT OFFICE.

ROLLIN NORRIS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE UNITED GAS IMPROVEMENT COMPANY, OF SAME PLACE.

METHOD OF AND APPARATUS FOR CARBURETING WATER-GAS.

SPECIFICATION forming part of Letters Patent No. 563,300, dated July 7, 1896.

Application filed August 30, 1895. Serial No. 561,026. (No model.)

To all whom it may concern:

Be it known that I, ROLLIN NORRIS, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Method of and Apparatus for Carbureting Water-Gas, of which the following is a specification.

The principal object of my present invention is to subject oil to a rough fractional distillation and to subject the lighter vapors, after their admixture with the water-gas, to a different and milder treatment than is given to the heavier portions after their admixture with the water-gas for the purpose of economically and efficiently fixing the gaseous mixture or making the carbureted water-gas; and to this end my invention consists of the improvements hereinafter described and claimed.

The nature, characteristic features, and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part thereof, in which—

Figure 1 is an elevational view, partly in section, showing features of my invention in application to a well-known type of apparatus for producing carbureted water-gas. Fig. 2 is a top or plan view of Fig. 1. Fig. 3 is an elevational view, partly in section, showing a slightly different arrangement of the parts illustrated in Figs. 1 and 2. Fig. 4 is a top or plan view of Fig. 3. Fig. 5 is an elevational view, partly in section, illustrating a modification of my invention in application to a well-known type of apparatus for producing water-gas; and Fig. 6 is a top or plan view of Fig. 5.

In practicing my improved method of carbureting water-gas the oil is subjected to a rough fractional distillation and the current of water-gas is divided and a portion of it mixes with the heavier products of the rough distillation and traverses a considerable extent of preheated chambers, and another portion of it licks up the lighter products of the fractional distillation and joins the first-mentioned portion at various and different points in its travel through the preheated chambers. By this mode of procedure the water-gas and oil-vapors are satisfactorily fixed and the lighter oil-vapors are subjected to a different and milder treatment than are the heavier portions, whereby each portion of the oil is subjected, in company with the water-gas, to that degree of heat which is appropriate for the accomplishment of the best practical results, having reference to the quality and economy of production of the carbureted water-gas.

Referring to the drawings, *a* is a generator, and *b* and *c* are fixing chambers provided, respectively, with suitable checkerwork of refractory material.

d is a conduit by means of which the generator *a* may be caused to communicate with the fixing-chamber *b*, and *e* is a conduit by means of which the fixing-chamber *b* may be caused to communicate with the fixing-chamber *c*.

f is an eduction-pipe for the carbureted water-gas, and *g* is an off-take for the waste products.

h, *h'*, and h^2 are pipes for introducing air for the purpose of aiding combustion and in order to preheat the apparatus, the products of such combustion escaping at the off-take *g*.

i is a pipe for introducing steam to the generator for the purpose of generating water-gas, the gaseous products being first carbureted, as is hereinafter described, and then led off through the eduction-pipe *f*, and preserved.

Having thus described certain parts of a well-known type of apparatus for producing water-gas, I will proceed with a description of my invention.

1 is an oil-vaporizing chamber that may be internally supplied with checkerwork of suitable non-porous material, as shown in Figs. 1 and 3, or with inclined baffle-plates 2, and a drip-cup 3, as shown in Fig. 5. The oil-vaporizing chamber 1 may be mounted above the fixing-chamber *b*, as shown in Figs. 1 and 2, or it may be mounted upon the generator *a*, as indicated by dotted lines in Fig. 5 and as shown in Fig. 3.

4 is a pipe by means of which oil is admitted to the oil-vaporizing chamber 1.

5 is a pipe communicating with the upper portion of the oil-vaporizing chamber 1, and

with the conduit *e*, that connects the fixing-chambers *b* and *c*. This pipe 5 is provided with a valve 6, and with branches 7 and 8, having valves 9 and 10, and communicating with different portions of the fixing-chamber *c*. Moreover, in Fig. 3 this pipe 5 is also provided with a branch 5^a, having a valve 7^a, and adapted to communicate with the fixing-chamber *b*.

Referring to Figs. 1, 2, 3, and 4, the base of the vaporing-chamber is open and constitutes a passage and communicates directly with the interior of the fixing-chamber *b*, Figs. 1 and 2, or with the interior of the generator *a*, Figs. 3 and 4, and is or may be provided with an air-inlet pipe 11, for purposes to be hereinafter described.

Referring to Figs. 5 and 6, the base of the oil-vaporizing chamber 1 and the drip-cup 3 communicate by way of pipes or passages 12 and 13 with the interior of the fixing-chamber *b*, as shown in full lines, or with the interior of the generator *a*, as indicated by dotted lines.

14 is a steam-nozzle adapted to discharge into the pipe or passage 13 between its valve 15 and its contracted end 16, so that by opening or closing the valve 15 the quantity of the heavy portions of the oil sprayed by the steam-jet from the cup 3 to the fixing-chamber *b* may be regulated and controlled.

The mode of operation of the apparatus above referred to may be described as follows: Air is admitted to the generator by way of the pipe *h*, and the gaseous products are subjected to secondary combustion by means of air introduced by way of the pipes *h'* and h^2, in order to preheat the chambers *b* and *c* by internal combustion. If required, the oil-vaporizer 1 (illustrated in Figs. 1 and 3) may also be preheated during the blow and before the admission of the oil by choking or partially closing the valve *e'*, Fig. 1, or *d'*, Fig. 3, and opening the valve 6, Fig. 1, or 5^b and 7^a, Fig. 3, in order to divert a portion of the blast-gas into the oil-vaporizer where it is burned by means of air introduced through the pipe 11. When the required parts of the apparatus have been sufficiently heated by internal combustion, the admission of air is interrupted, the valve *g'* is closed, oil is admitted by way of the pipe 4, and steam is admitted by way of the pipe *i*, so that water-gas is generated in the generator *a*. It may be remarked that the valves 12^a or 6, 9, and 10, Fig. 5, are closed during the blow. The water-gas is divided and a portion of it passes through and from the bottom to the top of the oil-vaporizer 1, and another portion of it passes to and through the fixing-chamber *b*, and thence to the conduit *e* and fixing-chamber *c* to the eduction-pipe *f*. This relative division of the water-gas may be controlled so as to send more or less of it through the oil-vaporizer by manipulating the valves *e'* and 6, 9, and 10, Fig. 1, or the valves *d'* and 5^b, or *e'*, 6, 9, and 10, Fig. 3, or *e'* and 6, 9, and 10 in both constructions, Fig. 5, or 12^a and *e'* or 12^a and *d'* in dotted-line construction, Fig. 5. Some of the heat of the portion of the water-gas that enters the vaporizer 1, in connection with heat stored in the vaporizer by optional internal combustion of part of the blast-gases, causes the oil to be separated into light vapors and heavier products. The latter pass into the generator *a*, Fig. 3, and dotted construction, Fig. 5, or into the fixing-chamber *b*, Fig. 1, and full-line construction, Fig. 5. Referring to the construction shown in Fig. 5, these heavier products pass over the baffle-plates 2, and collect in the cup 3, from which they are drawn in regulated quantities by the steam-jet 14, as has been already explained. In either case the heavier products join one of the divisions of the current of water-gas comparatively near its point of generation and travel in its company through a comparatively large extent of preheated chambers, namely, the chambers *b* and *c*. The current of water-gas that is by-passed through the vaporizer 1 licks up the lighter oil-vapors and carries them off near the top of the vaporizer. This current of gas and lighter oil-vapors may be permitted to join the current of gas and heavy products at different and appropriate stages of their journey through the internally-preheated apparatus, as may be found desirable. This result may be accomplished by manipulating the valves 6, 9, and 10.

From the foregoing description it appears that the current of water-gas is divided, that one branch of it receives the heavy products of vaporized oil and travels in their company the entire preheated interior of the apparatus, and that the other branch of it licks up the lighter vapors of the vaporized oil, and is permitted to join the first-mentioned current of gas and heavy products at different stages of its journey through the apparatus, whereby the oil is subjected to a rough fractional distillation and the heavy and lighter vapors are subjected to different and appropriate treatment.

It will be obvious to those skilled in the art to which my invention relates that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction hereinabove set forth, and illustrated in the drawings; but,

Having thus described the nature and objects of my present invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The improvement in the art of carbureting or enriching water-gas with oil, which consists in generating blast-gas and internally heating fixing-chambers by its secondary combustion, then generating water-gas and subdividing it, passing one of these subdivisions in contact with oil or liquid hydrocarbon to lick up the more-volatile vapors thereof, passing the other of these subdivisions through

said previously-heated chambers and introducing the less-volatile components of the oil or liquid hydrocarbon into it near its point of generation, and reuniting the said subdivisions comparatively far from the point of generation of the water-gas and permitting them to travel together portions of the said chambers comparatively remote from the point of generation of the water-gas substantially as described.

2. In combination, a generator, an oil-vaporizer, refractory material contained in a fixing-chamber having provisions for heating it by direct internal combustion of waste gas, and the described valved pipe connections and their branches for passing a part of the water-gas through the vaporizer to lick up the lighter components of the oil and hence through portions of the checkerwork and for passing the rest of the water-gas and the heavy components of the oil through all the checkerwork, substantially as described.

In testimony whereof I have hereunto signed my name.

ROLLIN NORRIS.

In presence of—
A. B. STOUGHTON,
A. M. LEWIS.