Nov. 18, 1924.

1,516,217

L. S. STILES

WATER GAS APPARATUS

Filed June 23. 1921

3 Sheets-Sheet 1

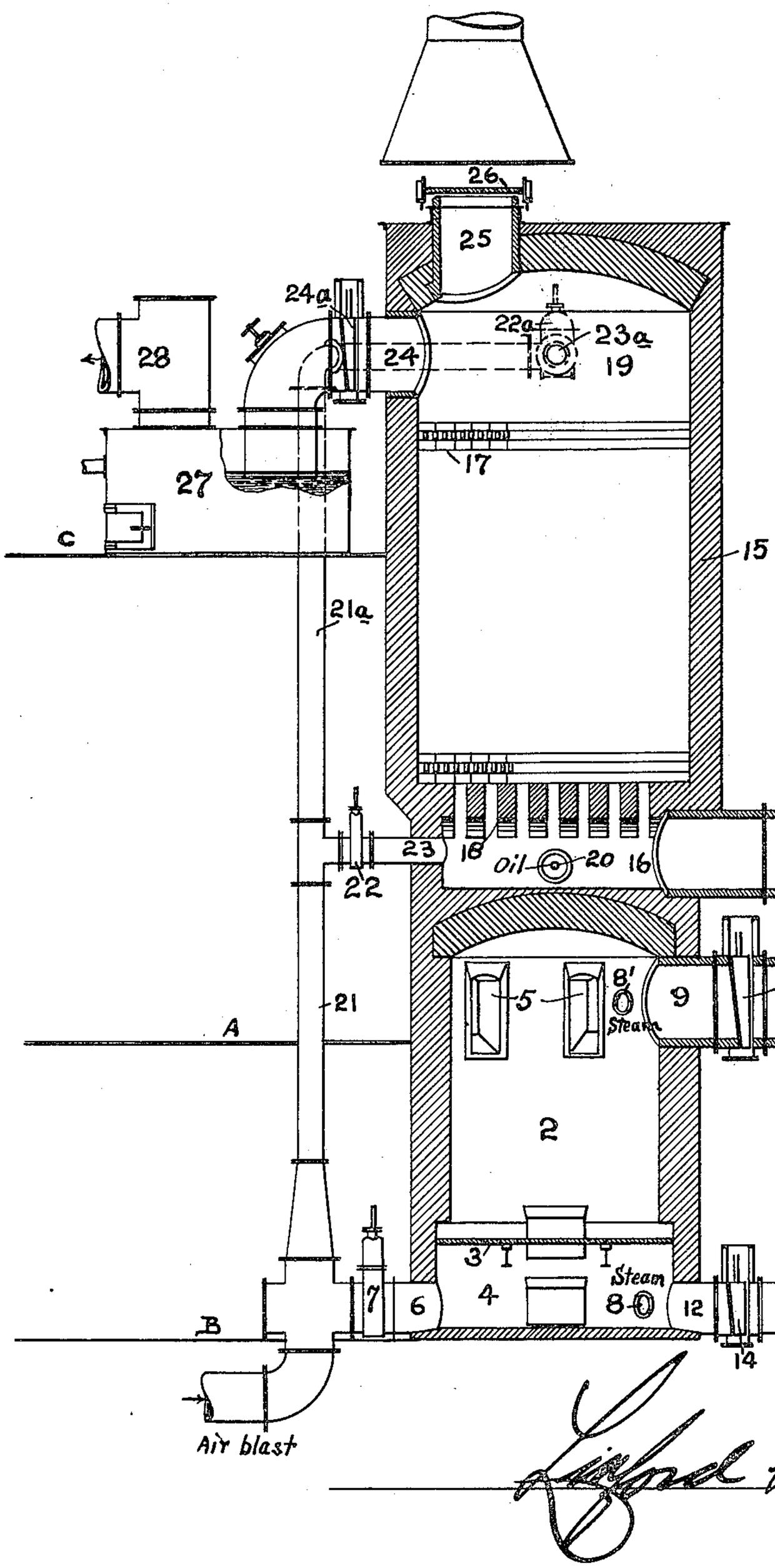

FIG. 1

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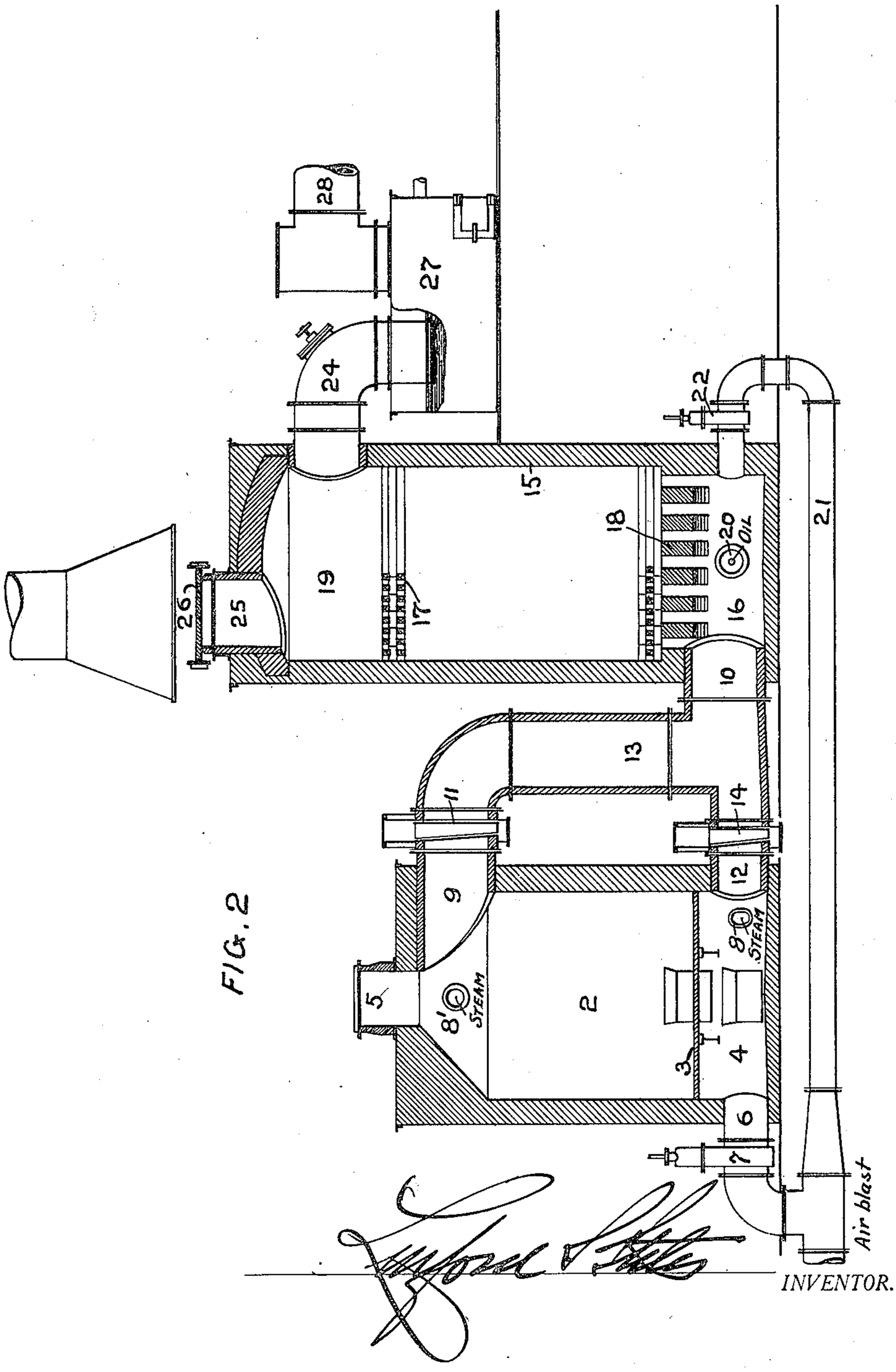

FIG. 2

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3 Sheets-Sheet 3

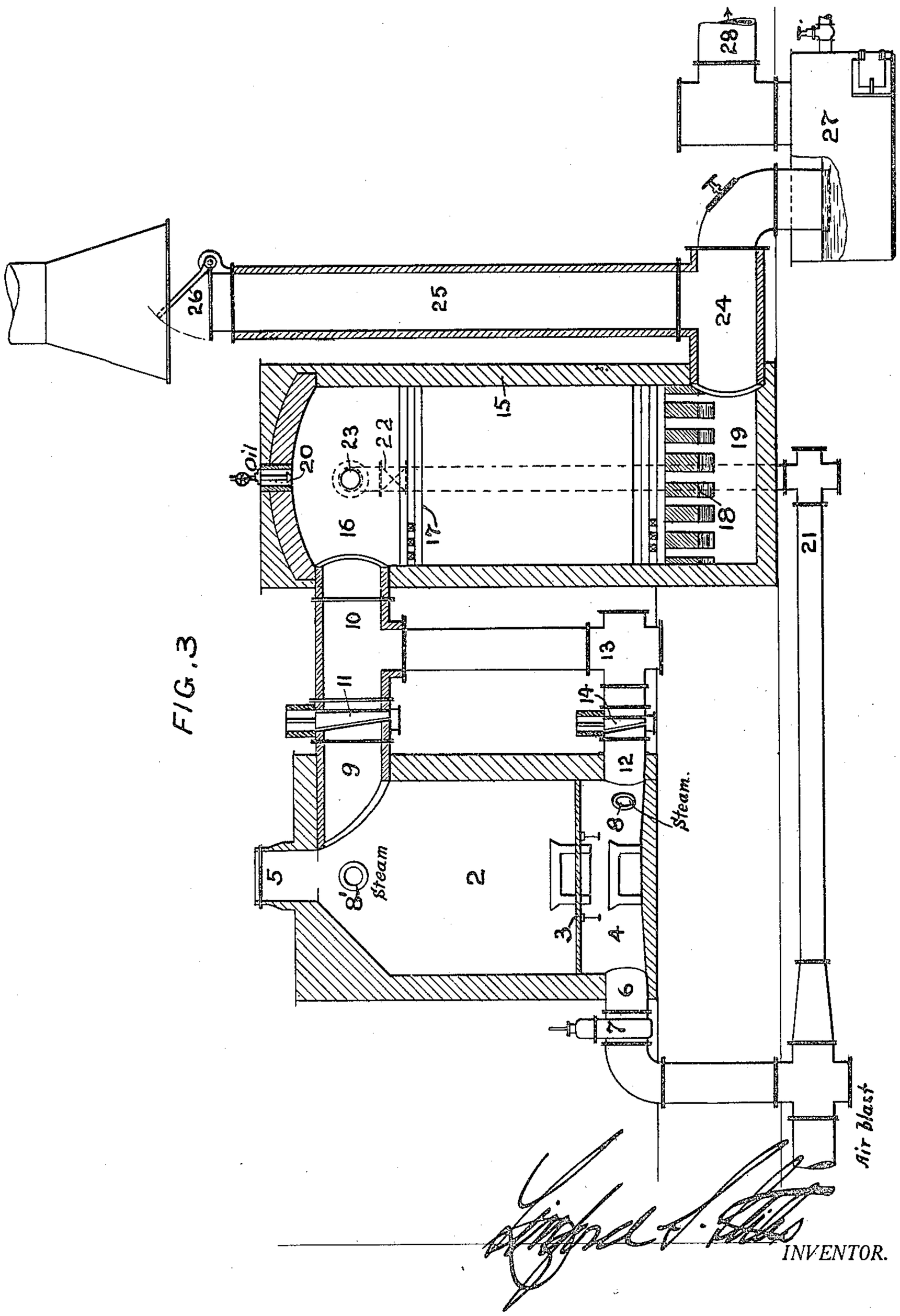

FIG. 3

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Patented Nov. 18, 1924. 1,516,217

UNITED STATES PATENT OFFICE.

LINFORD SPEARING STILES, OF BROOKLYN, NEW YORK.

WATER-GAS APPARATUS.

Application filed June 23, 1921. Serial No. 479,724.

To all whom it may concern:

Be it known that I, LINFORD S. STILES, a citizen of the United States, and resident of Brooklyn, county of Kings, State of New York, have invented an Improvement in Water-Gas Apparatus, of which the following is a specification.

The object of my invention is to provide an improved construction and mode of operation of water gas apparatus with the purpose of increasing the output with a given size of apparatus, and especially in those cases where a reduction in the oil required for a candle power unit is reduced in producing and supplying gas on a B. t. u. basis which is now coming largely into use by way of displacement of the candle power unit. By elimination of a portion of the oil heretofore employed, a very material reduction in the volume of gas results and consequently to maintain the maximum output from a given apparatus under the reduced use of oil in association with the water gas, it becomes necessary to change or modify the internal construction of the parts heretofore constituting the carburetter and superheater or fixing chamber with a corresponding modification in the process, and it is with the special purpose of increasing the output efficiency of the carburetted water gas of the lower B. t. u. standard from the same general gas apparatus heretofore in common use supplemented by modifications therein that my invention is concerned.

More particularly, it is my purpose to eliminate the employment of a distinct carburetting chamber in relation to a superheating chamber in the former of which the oil is sprayed for carburetting the water gas received from the generator and which, after passing in a downward direction, is caused to pass into the bottom of the superheating chamber and thence upward therethrough for fixation and thereafter delivered through the wash-box to the gas main, and in lieu thereof, convert the carburetter and superheater chambers into a single chamber into the bottom of which the water gas from the generator together with the oil is delivered and which in gaseous form pass upward through the fixation chamber and delivered to the water seal box and mains as before, in this case more greatly reducing the resistance to the expansion and passage of the gas than has heretofore occurred, with the result that a greater volume of gas from the oil is produced and less objectionable carbon deposit and clogging of the checker brick work in the fixation chamber is produced, and consequently a greater output of gas is insured from a given quantity of material; and in addition thereto, the periods of gas production between necessary cleaning and repairing of the checker work in the fixation chamber is considerably increased, thereby providing additional economy in the operation of the plant.

With the above and other objects in view, the nature of which will be more fully understood from the description hereinafter, taken in connection with the drawings, the invention consists in the novel construction of gas producing apparatus and mode of operation of the process conducted therein, as hereinafter more fully described and defined in the claims.

Referring to the drawings: Fig. 1 is a sectional elevation of a gas apparatus embodying my improvements and adapted for the practice of my improved process; and Figs. 2 and 3 are similar sectional elevations illustrating modified forms of my apparatus also adapted for carrying out the essential features of the process.

Referring more particularly to the structure shown in Fig. 1, 2 is the generator or "blue gas" producer, and is preferably arranged at the lower part of a tall sheet metal casing within the upper part of which is arranged a combustion chamber 16 and a combined carburetter and fixing chamber 15. By suitable flues and valves, the gaseous products from the generator during its blowing up process may be supplied to the combustion chamber and the heat produced thereby passed upward for heating the interior checkered brick work of the combined carburetter and fixing chamber, for highly heating it, whereas the water gas (blue gas) produced in the generator may be supplied to the same combustion chamber wherein it is mixed with sprayed oil and the mixture then passed upward through the combined carburetter and fixing chamber and thence to the wash-box on its way to the holder.

The generator 2 may be of any ordinary construction, being provided with a grate 3, ash pit 4, and charging doors or flues 5 near the top through which coal may be supplied. Air blast is supplied to the ash pit 4 by a blast pipe 6 and controlled by a valve

7. Gas may be taken off on the "up run" from the upper end of the generator by a flue 9 having a control valve 11 and on the "down run" by the flue 12 having a control valve 14, said flue opening from the ash pit. The generator is further provided with a steam pipe 8 opening below the grate 3 and discharging into the ash pit during the "up run" and is also provided with a steam pipe 8′ discharging into the upper part of the generator during the "down run." During the generation of the water or "blue gas," whether on the "up run" or "down run," the blast from pipe 6 is shut off and steam from either pipe 8 or 8′ admitted, as the case may be; but when heating up, the steam is shut off and blast turned on and the producer gas so provided is conveyed upward and carried off by flue 9. The general construction and mode of operation of the generator is well known and will need no further explanation.

Referring more in detail to the construction of the combined carburetter and fixing chamber 15, the same is greater in cubical capacity compared to what has heretofore been the combined cubical capacity of both the carburetter and the fixing chamber relative to the generator capacity, so that there is far less resistance to the flow of both the heating gas and the carburetted water gas through the combined carburetter and fixing chamber than was heretofore the case where the gas was required to flow first through the carburetter and then through the fixing chamber. The interior of the combined carburetter and fixing chamber is filled with checker brick work 17 from the perforated arch 18 at the bottom to a distance somewhat below the top so as to leave a chamber 19 thereabove, said chamber being provided with an escape flue 25 provided with a cover or valve 26 which is employed to close the said escape flue when the carburetted water gas is required to pass through flue 24, valve 24ª, and wash-box or seal 27 to the gas conduit 28 by which the gas is conveyed to the holder. The perforated arch 18 constitutes a crown or roof to a combustion chamber 16 into which the gases from the generator are delivered by flues 10. The flue 9 from the upper part of the generator 2 opens into the flue 10 through the valve 11; and similarly flue 12 from the bottom of the generator is also connected with the flue 10 by an L shaped flue 13, the flow therethrough being controlled by the valve 14. The latter flues 12 and 13 convey water or "blue gas" alone to the flues 10 leading into the combustion chamber 16, whereas flue 9 opening from the upper part of the generator conveys all products of combustion when the generator is being blown for bringing its contents to incandescence and at other times conveys the water or "blue gas" alone. The combustion chamber 16 is also provided with a blast pipe 23 which receives air from main 21 under pressure and controlled by a valve 22, the air thus supplied being employed with the products of combustion which pass from the generator at the time it is being blown, for raising its contents to incandescence, the combustion taking place in the chamber 16 providing heated products which pass through the perforated arch 18 and into the combined carburetter and fixing chamber and therein employed for raising its temperature. The combustion chamber 16 is also provided with an oil spray nozzle 20, whereby when the blast is shut off and the "blue gas" is supplied from the generator 2, the same is intermingled with the oil spray in the heated chamber, the oil being vaporized and intimately associated with the "blue gas" to carburet it, and in this condition, said gases pass upward through the carburetter and fixing chamber 15 expanding thereinto and rising therethrough at a speed which enables the thorough carburetting of the "blue gas" and the final fixing of the same.

The upper part of the combined carburetter and fixing chamber, and heretofore designated as 19, is provided with a blast pipe 23ª having communication, by a pipe 21ª, with the compressed air main 21, the supply of air from said pipe 21ª into the chamber 19, being controlled by a valve 22ª. By means of this blast pipe 23ª, the products of combustion employed in heating up the combined carburetter and fixing chamber may be supplied with additional air before they escape from the escape flue 25 during the heating up process, and in this manner insure a relatively high temperature within the said chamber portion 19 and thereby enable it to provide additional heat as a final means of fixation of the carburetted gas at a time when the said blast is shut off.

It will be understood that in the operation of the apparatus just described, the resistance to the flow of the gases, both heating gas and carburetted water gas, through the combined carburetter and fixing chamber, is considerably less than the same exists in the modern types of water gas apparatus wherein the carburetter and the fixing chamber are operated in series, and for this reason, the quantity of gases, whether produced when glowing up the generator or when generating water gas therein, are considerably increased in volume, during the normal operation of the apparatus, over what they were formerly in a modern gas apparatus of the same size; and consequently a greater output of gas in cubic feet is obtained with the apparatus constructed as herein set out, in a given period of time and with the same coal consumption, than has

heretofore been possible wherein the carburetters and fixing chambers have been employed to operate in succession.

In a gas apparatus of the general arrangement of Fig. 1, so far as relates to the position of the generator below the carburetting and fixing chamber means, the construction thereof is similar to the Williamson type of gas apparatus embodied, for example, in the apparatus set out in Letters Patent No. 767,217, to Eustace dated August 9, 1904; and when the same is to be converted into a gas system embodying my improvements, the dividing wall in the chamber 15 between the carburetter and fixing chambers is removed, thereby materially increasing the available cross section of the combined carburetting and fixing chamber; and among other changes, the oil is supplied in the chamber 16 below the arch 18 instead of at the top and within the chambered portion 19 corresponding to the carburetter, and further, the gas pipe or flue from flues 10 to the chamber 19 of the carburetter is removed and the gases of all characters supplied to the chamber 16 below the arch and caused to pass upwardly through the same and the checker brick of the combined carburetter and fixing chamber. In this way, the Williamson type of apparatus may be readily changed to enable the more modern apparatus to be improved to meet the requirements of my invention and increase its efficiency in quantity production of a 550 B. t. u. per cubic foot standard of gas production.

Where floor space is available, my improved apparatus may be so constructed that the generator, and the combined carburetter and fixing chamber may be arranged on independent foundations on the same level, as shown in Fig. 2. In this construction, the generator 2 is in all material respects the same as in Fig. 1, though the coal may be charged through a central top charging passage 5 provided with suitable covering or valve means. Similar numerals as reference designations are employed in Fig. 2 for corresponding parts shown in Fig. 1. The combined carburetter and fixing chamber 15 is similar in respect to the corresponding portions shown in Fig. 1.

In view of the fact that the combined carburetter and fixing chamber 15 sets upon a foundation on the same level with the generator and the products of combustion and gas are to be delivered from the generator in the chamber 16 at the bottom thereof, connection is made with the upper gas outlet of the generator 2 by a downwardly extending pipe or flue 13, which is in communication with the chamber 16 by means of a horizontal flue 10 and which, with flue 13, is in communication with the lower part of the generator by a flue 12 containing the valve 14. The valves 11 and 14 of the outlet flues of the generator 2 are employed alternately and correspond to the similar valves shown in Fig. 1. In Fig. 2, the oil spray is supplied by a spray pipe 20 into the combustion chamber 16 at the bottom of the combined carburetter and fixing chamber 15, said combustion chamber also acting as a highly heated oil vaporizing chamber wherein the oil vapor is intimately mixed with the water gas passing from the generator and before passing upwardly through the combined carburetter and fixing chamber. The combustion chamber 16 is also provided with an air pipe 21 having a control valve 22, said air pipe supplying air blast to the combustion chamber 16 as in the case of Fig. 1. The upper part of the combined carburetter and fixing chamber is provided with an outlet chimney flue 25 which is controlled by a valve or cover 26, the latter being open during combustion of the gases and their upward passage through the chamber 15 for the purpose of heating it, but closed when the carburetted water gas is passing through the carburetter and fixing chamber. The carburetted water gas escapes from the upper chamber 19 of the combined carburetter and fixing chamber and passes by pipe 24 into the wash-box or seal 27 and from there it escapes through a pipe 28 and is conveyed to the holder or other apparatus, such as the scrubbers, as may be required. In a general way, if the combined carburetter and fixing chamber of Fig. 2 were placed on top of the generator 2, maintaining the connections 10 and 13 as shown, we would have a very similar construction to that shown in Fig. 1.

I will now refer to the modification of my invention shown in Fig. 3. In this construction, the generator 2 is similar to that shown in Figs. 1 and 2, but in this case the connections with the combined carburetter and fixing chamber are reversed, in that the combustion chamber 16 is arranged at the upper part of the chamber 15 and corresponding to the part indicated at 19, in Figs. 1 and 2, whereas, the chamber 19 below the perforated arch 18 which carries the checker brick work 17 is connected by a flue 24 with the wash-box 27 from which the gas passes by a pipe 28 to the holder. The flue 24 is provided with an upright flue 25 having at its upper end the cover or valve 26. This flue 25 corresponds to the flue 25 in Figs. 1 and 2. Furthermore, the oil is sprayed by a spray nozzle 20 into the combustion chamber 16 at the upper part of the carburetter and fixing chamber, providing the hydrocarbon vapor which is to carburet the "blue" or water gas, said gas passing downward through the checker brick work 17 and the perforated arch 18 at the bottom and thence by cham-

ber 19 and flue 24 to the wash-box 27. When the blowing up process of the generator is being conducted, the products of combustion from the generator pass through valve 11, and flue 10 into the chamber 16 at the upper end of the carburetter and fixing chamber and they are there burned by the addition of an air blast from nozzle 23 under the control of a valve 22, said nozzle supplied by air blast from a conduit 21. The heated products thus provided are passed through the checker brick work, perforated arch 18, chamber 19, and by flue 24 pass upward through the chimney flue 25 and permitted to escape into the chimney or atmosphere, under the control of the cover or valve 26. The only difference between the constructions shown in Figs. 2 and 3 reside in the fact that in Fig. 2 there is an upward flow of the gases through the combined carburetter and fixing chamber, whereas in Fig. 3 the direction of flow is downward. However, the presence of the perforated arch, the checker brick work and the chamber above the brick work are all maintained in a similar manner, though the connection with the generator chimney flue and wash-box are somewhat transposed to meet the contingencies of the changed direction of flow of the gas through the combined carburetter and fixing chamber.

In all cases, there is a unitary highly heated chamber performing simultaneously the combined functions of carburetter and fixing chamber, the same being provided with checker brick work of usual construction and having a cross sectional area or passage greatly in excess of what has heretofore been the cross sectional area of either the carburetter or fixing chamber where the said chambers were connected in series, as is customary in the commercial forms of water gas apparatus. By this construction, the shape of the chamber is maintained circular and is, therefore, best suited for thorough utilization of the checker brick work and with the greatest production of carburetted gas with a given size of carburetting and fixing chamber, whereby a maximum output may be obtained. The construction furthermore provides one in which the first function, namely, carburetting, is performed upon the "blue" gas to the fullest extent required, and thereafter the second function, namely, the fixing of the gas, takes place during the further continuous passage of the carburetted gas through the checker brick work, there being no restriction as to which portion is for supplying the heat for carburetting of the gas and which part is for fixing purposes. By performing the two functions, carburetting and fixing, in one chamber, they automatically take place in accordance with requirements, that is to say, the function of the fixing chamber begins sooner or later in the passage of the gas, as may be required, thereby avoiding any loss of utility of the checker brick work and at all times utilizing the same with the highest efficiency. It will be further understood that as there is a direct passage through the combined carburetter and fixing chamber wherein the gases all pass in the same direction there is a tendency of a uniformity in the flow of gases through the carburetter and fixing chamber and thereby unaffected by reverse changes in the direction of flow and the consequent variation in pressures resulting therefrom.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. An improved water gas apparatus comprising a generator, an upright combined carbureter and fixing chamber, and a wash-box acting as a seal, characterized by the combined carbureter and fixing chamber formed as a single compartment having at one end a combustion chamber provided with oil and blast pipes and in communication with the generator and said compartment having at the other and distant end a valve controlled escape flue for waste products of combustion and an outlet leading to the wash-box, and the generator being provided with means for supplying air and steam alternately thereto.

2. The invention according to claim 1, wherein the combined carburetter and fixing chamber is arranged immediately above the generator, and in which the cross sectional area of the interior of the combined carburetter and fixing chamber is greater than the cross sectional area of the generator.

3. The invention according to claim 1, wherein the generator is provided at its upper and lower portions with gas flues both in communication with the combustion chamber of the combined carburetter and fixing chamber and also with steam pipes for delivering steam into the upper and lower part of the generator alternately, valve devices in the flues leading from the generator whereby they may be alternately closed in reversing the gas generating operation of the generator, and a valve controlled blast pipe opening into the generator at its lower portion, the construction being such

that the generator may be caused to operate in the blowing up and generation of water gas alternately in the up direction and also generating water gas in the down direction, and whereby the products of combustion and the carburetted water gas may be caused to alternately pass wholly upward through the combined carburetter and fixing chamber.

4. The invention according to claim 1, wherein the combined carburetter and fixing chamber at its super portion adjacent to the valve controlled escape flue is further provided with a valve controlled blast pipe for producing additional combustion in said portion and whereby all of the combustive gases may be consumed before escaping.

In testimony of which invention, I hereunto set my hand.

LINFORD SPEARING STILES.