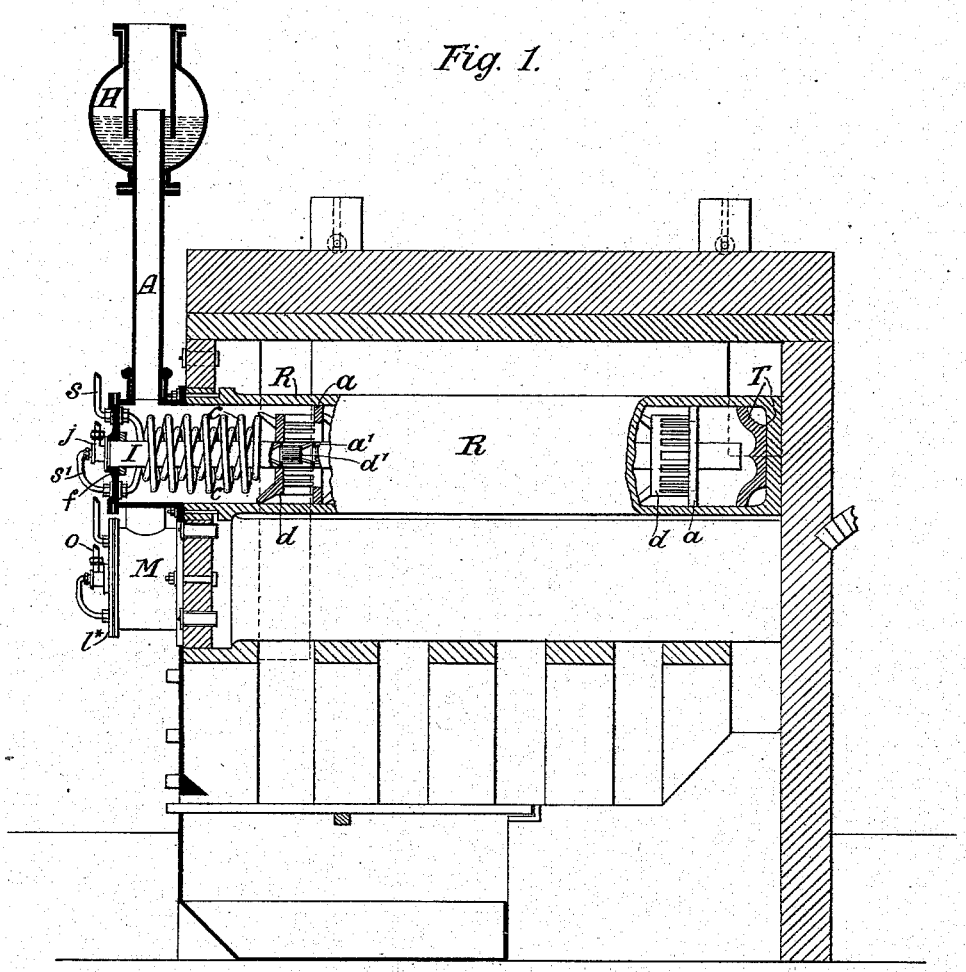
(No Model.) 5 Sheets—Sheet 1.

# A. G. MEEZE.

## APPARATUS FOR THE MANUFACTURE OF GAS.

No. 382,371. Patented May 8, 1888.

*Fig. 1.*




Witnesses.
Emil Herter.
C. L. Sundgren.

Inventor.
Arthur George Meeze.
by Attorneys
Ronn & Hall.

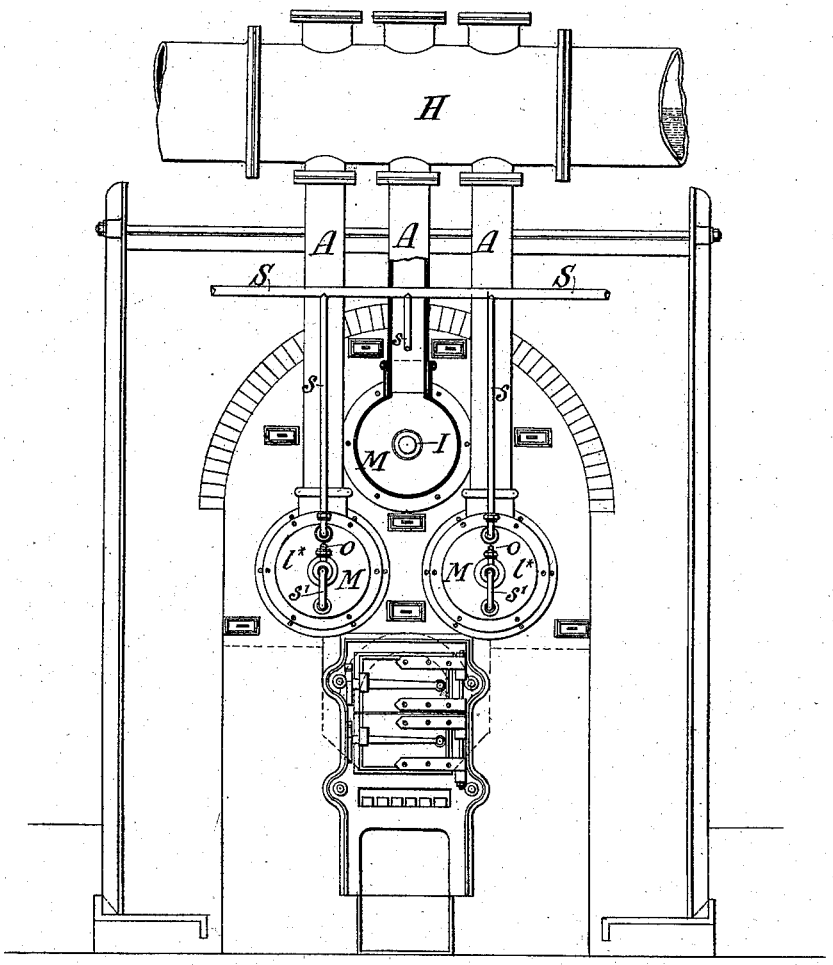
(No Model.) 5 Sheets—Sheet 2.

# A. G. MEEZE.

## APPARATUS FOR THE MANUFACTURE OF GAS.

No. 382,371. Patented May 8, 1888.

*Fig. 2.*




Witnesses.
Emil Herter.
C. L. Sundgren.

Inventor.
Arthur George Meeze.
by attorneys
Brown & Hall

(No Model.) 5 Sheets—Sheet 3.

# A. G. MEEZE.

## APPARATUS FOR THE MANUFACTURE OF GAS.

No. 382,371. Patented May 8, 1888.

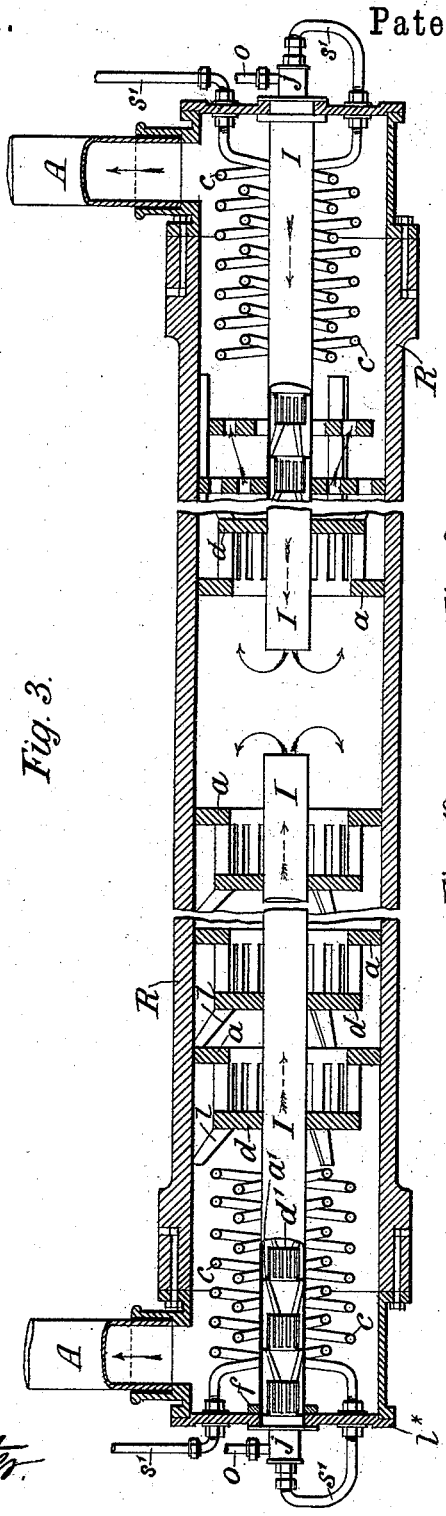



Fig. 3.

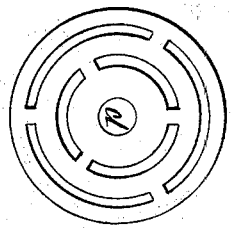


Fig. 9.

Fig. 10.

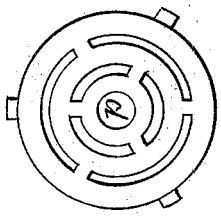


Fig. 7.

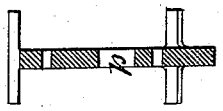


Fig. 8.

Witnesses.
Emil Herter.
C. L. Sundgren.

Inventor.
Arthur George Meeze.
by Attorneys.
Brown & Hall.

(No Model.) 5 Sheets—Sheet 4.

# A. G. MEEZE.

## APPARATUS FOR THE MANUFACTURE OF GAS.

No. 382,371. Patented May 8, 1888.

*Fig. 5.*

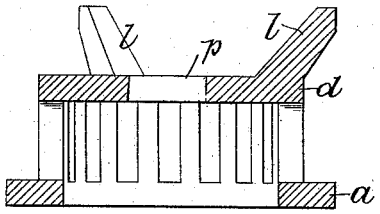



*Fig. 6.*

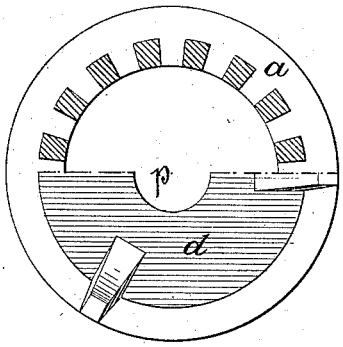
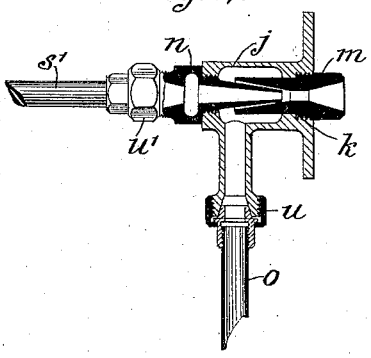



*Fig. 4.*




Witnesses.
Emil Herter.
C. L. Sundgren.

Inventor.
Arthur George Meeze.
by attorneys
Brown & Hall

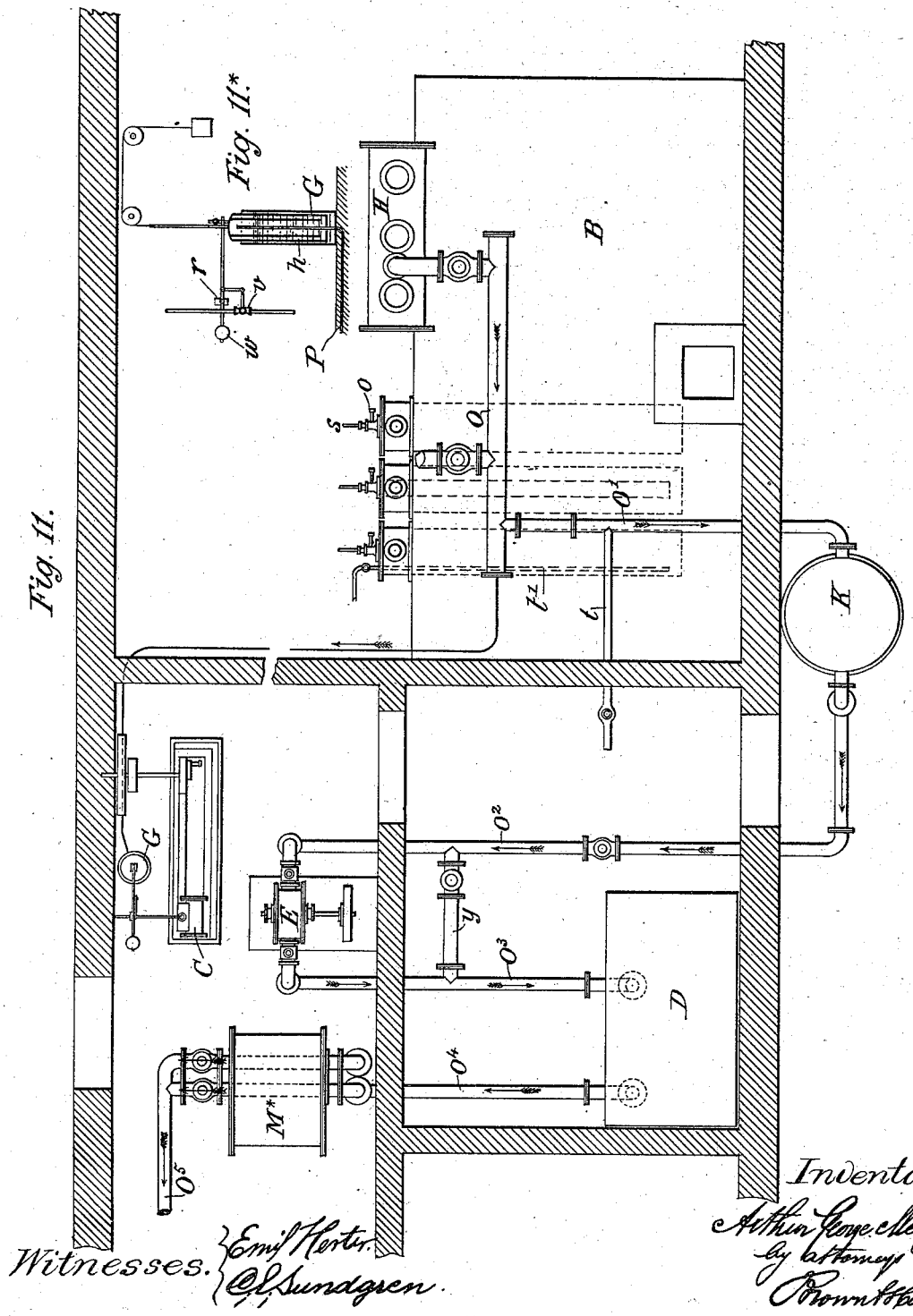
(No Model.) 5 Sheets—Sheet 5.

# A. G. MEEZE.

## APPARATUS FOR THE MANUFACTURE OF GAS.

No. 382,371. Patented May 8, 1888.

Fig. 11.




Witnesses. Emil Kortz. C. L. Sundgren.

Inventor. Arthur George Meeze. by attorneys Brown & Hall.

# UNITED STATES PATENT OFFICE.

ARTHUR G. MEEZE, OF REDHILL, COUNTY OF SURREY, ENGLAND.

## APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 382,371, dated May 8, 1888.

Application filed August 23, 1887. Serial No. 247,636. (No model.) Patented in England September 20, 1887, No. 12,340.

*To all whom it may concern:*

Be it known that I, ARTHUR GEORGE MEEZE, of Redhill, in the county of Surrey, England, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas, (for which Letters Patent were granted me in Great Britain, September 20, 1887, No. 12,340,) of which the following is a specification.

The object of this invention is to improve the construction and arrangement of apparatus for the manufacture of fixed illuminating-gas, and relates particularly to improvements in apparatus in which shale-oil, petroleum, and fluid hydrocarbons of a kindred nature are, together with highly-heated water vapor or superheated steam, injected into suitable retorts and dissociated at high temperatures.

By the simultaneous thermolysis of superheated steam and certain fluid hydrocarbons it is possible to make a fixed illuminating-gas of high candle-power. The apparatus heretofore employed for the purpose of carrying the process into effect consists, primarily, of a steam and oil injecting, aspirating, or spraying device and a decomposing-retort. To increase the thermolysing efficiency of the retort, it has been filled by some inventors with broken brick, or fitted by others with baffles or cones with serrated flanges, and similar crude and more or less unsystematic deflecting devices. Gas-making plant of this comparatively simple type has, however, proved up to the present time inefficient, in consequence of the difficulties experienced, first, in obtaining from reasonably-hot retorts a really fixed gas; second, in regulating and controlling the light-giving qualities of the product; third, in keeping the retorts and fittings free from obstructive deposit, and, fourth, in maintaining a regular action of the injector and consequently a continuous production of gas.

My present invention relates generally to improvements whereby it is intended to obviate these difficulties, and particularly to improvements whereby existing coal-gas plant may, for the purposes of this invention, be utilized with ease and economy and new plant erected with the least possible departure from the standards of construction universally accepted and adopted by coal-gas engineers in the erection of works for the manufacture of gas by the destructive distillation of coal. To these ends I take an ordinary coal-gas retort, preferably one made of fire-clay set in a bench in any known and efficient way, with the usual mouth-piece, stand-pipe, hydraulic main, and appurtenances as in apparatus for the destructive distillation of gas coal. Instead, however, of charging the retort with coal, I fit it up in connection with an arrangement of apparatus consisting of first, a steam-boiler; second, a steam-superheater; third, an oil-tank; fourth, a steam and oil injector or spraying device; fifth, a small internal retort or "ingression-pipe;" sixth, a complement of "deflectors;" and, seventh, a suitable exhauster and motor.

In the accompanying drawings, Figures 1 and 2 are respectively a longitudinal section and a front elevation of a bench of three ordinary end-stopped gas-retorts fitted up in accordance with my present invention. Fig. 3 is a longitudinal sectional view of a through or double-mouthed retort, showing how I adapt my invention to retorts of this construction. Fig. 4 is a detail section of the injector. Figs. 5 and 6 are respectively a sectional elevation and a plan, partly in section, of one convenient form of impact device or deflector, with central perforation for passage of ingression-pipe. Figs. 7 to 10 are illustrations, on a small scale, of variously-modified forms of deflector. Fig. 11 is a general plan of an arrangement of gas-making apparatus according to my system. Fig. 11* is a small sectional elevation of a gas-governor used for controlling the engine and exhauster.

S is a steam-supply pipe by which steam is brought from a suitable boiler, (not shown in the drawings,) and *s s s* are branch pipes fitted with the usual valves, taps, and connections for conducting and regulating the supply of steam to the superheating-coil *c* and thence by the pipe *s'* to the injector *j*. The boiler may either be entirely separate from the retort-setting or mounted so as to utilize the waste heat therefrom, and by preference should be capable of supplying steam at sixty to seventy pounds' pressure, though very much lower pressures suffice. The superheater *c*, I prefer to make in the form of a double coil, and to mount it in connection with the lid *l**

of the retort mouth-piece M, as shown in the drawings, so that it may be inserted into the retort or removed therefrom with facility when required. In some cases, however, I insert the superheater into a separate fire clay tube or retort arranged in the same bench as the gas retorts, and sometimes I use a worn-out or disused gas-retort for the purpose of inclosing the superheater. When I employ a separate superheater, the dry steam is conveyed to the injector by pipes that replace the branches *s' s' s'*. The oil tank or reservoir (not shown in the drawings) may be mounted in any convenient position, and the shale-oil, crude petroleum, or other fluid hydrocarbon brought therefrom by suitable pipes and fittings to the supply branch *o o o*, and thence to the injector *j*. This injector may be any known and approved form of steam and oil spraying device—such as one made on the aspirator principle—so constructed that the current or jet of high-pressure superheated steam, in expanding as it passes from the injector-nozzle to the ingression-pipe, creates a partial vacuum and induces the flow of a fine stream of fluid hydrocarbon, and projects it forward in the form of a spray or intensely-heated vapor; but by preference I use an injector, constructed as shown in sectional elevation in Fig. 4, where *j* is the body of the injector, to which the oil is supplied by the pipe *o* and union *u*, and *n* is the steam nozzle-piece, joined by the union *u'* to the steam-pipe *s'*.

*m* is the muzzle or mouth-piece, which is internally biconical in shape and made easy of removal and adjustable by the screw *k*, so that it may be readily placed in the most efficient position when changes are made in the oils or the steam-pressure.

The ingression-pipe or internal retort shown at I, Figs. 1, 2, and 3, is a thin tube, of wrought-iron or other suitable material, of, by preference, about one-fourth to one-sixth the diameter of the outer or surrounding retort, R, and long enough, when the latter is sealed at the rear, as shown in the sectional view, Fig. 1, to reach nearly to its closed end.

T is a deflector-tile to protect the sealed end.

When the outer retort, R, is open throughout, as in Fig. 3, I employ two ingression-pipes, I I, entering at its opposite ends and reaching nearly to its middle. To the front end of the ingression-pipe is affixed a suitable device, preferably a flange, *f*, shrunk thereon, capable of being connected with the retort lid or cover *l** when the latter is bolted or otherwise fixed in its position on the mouth-piece. The injector is also arranged in connection with the ingression-pipe, and for that purpose is preferably constructed with a wide flange and bolted through the lid *l** to the flange *f* of the ingression-pipe by nuts and bolts. By this device I am able easily to remove the lid, together with the attached superheating-coils, when necessary, without disturbing the ingression-pipe and deflectors, and I also insure that when the spray of superheated steam and hydrocarbon fluid is injected the mixed vapors shall travel along the ingression-pipe to its rear end before escaping to the surrounding retort R, and then return by way of the space between the retort R and the ingression-pipe I before finally leaving by the ascension or stand pipe A to the hydraulic main H.

In mounting the ingression-pipe I prefer to make it occupy as nearly as possible a central position in the retort, that it may be uniformly heated by radiation from the surrounding hot surface. In this manner I convert the ingression-pipe into a sort of mixing and vaporizing chamber, which I fill with deflectors *a' d' a' d' a' d'*, the elements of which are the annuluses *a' a' a'* and the disks *d' d' d'*, held in effective positions by suitable lugs, *l l l*, and I convert the outer retort, preferably made of fire-clay, that it may stand the necessary high temperature, into a fixing-chamber, which I likewise fill with deflectors *a d a d a d*. These deflectors, which may vary considerably in the details of their construction, are of the first importance, as in order to carry the thermolytic process into effect continuously, efficiently, and with sufficient rapidity for economic results, it is necessary to provide reliable and systematic means for raising every particle of the mixed hydrocarbon fluid and superheated steam to a suitably high temperature, and to otherwise facilitate their uniform gaseous thermolysis and chemical decomposition. This can be most efficiently done by utilizing the principle of direct and repeated impact in apparatus consisting of a large number of auxiliary surfaces systematically disposed and arranged, so as to repeatedly break up the passing current of fluid and at the same time suffer continuous moler and molecular bombardment by the particles of the vapors present.

The deflecting devices wherewith the ingression-pipe I is fitted are preferably made of cast-iron. The deflectors *a d a d a d* of the outer retort are constructed with a supplementary perforation, *p*, in the central disk for the passage of the ingression-pipe, as shown more fully in Figs. 5, 6, 7, 8, 9, and 10. These deflectors *a d a d a d* (which serve for supporting the ingression-pipe in position, as shown in Figs. 1 and 3) I prefer to make of fire-clay or other suitable refractory material. I have found that fluids, and particularly gases, are not effectually heated for dissociating purposes by the radiation from contiguous hot surfaces, however close these are hugged by the passing current, and that nothing is effective but direct impact, moler or molecular. This result I obtain in perfection by my deflecting device with its large number of auxiliary surfaces, and by the arrangement and construction of apparatus, as above described, I am enabled to make a perfectly fixed gas from fluid hydrocarbons and to achieve greater economy than heretofore.

By the combination of the above-mentioned

devices with other improvements which I am now about to describe I can make a gas of more manageable and merchantable density, obtain a larger volume, a greater aggregate candle-power, and assimilate more steam per gallon of oil than has hitherto been possible. I have discovered, after considerable and costly experimenting, that I can dissociate mixed hydrocarbon and water vapors into a permanent fixed gas with the above-mentioned economic results, if I by means of a suitable motor and exhauster maintain the pressure in the retorts somewhat below that of the atmosphere.

I am aware that the use of an exhauster for removing the gases from ordinary gas-retorts is not a new device, and therefore, in order to make quite clear what I regard as novel in my present use of an exhauster, I will describe fully the nature of this part of my improvements and the way in which they overcome difficulties heretofore experienced.

The purpose for which exhausters have hitherto been used has been to remove the gas already made, thus relieving the retorts of undue pressure and preventing the gases from being in prolonged contact with their heated sides, which are apt to induce unprofitable decomposition. Consequently the object has been principally to keep a level (or nearly level) gage on the retorts. According, however, to this part of my invention, I work and produce gas under a partial vacuum, which varies somewhat with the oils used, and is often of considerable amount. By this means I am able to accomplish, in a degree never before attained, the fixing of so-called "oil-gas." At the same time I also overcome other difficulties incidental to the process of making gas from steam and fluid hydrocarbons, such as the removal of back-pressure, which, by a serious retarding action on the rate of dissociation, has hitherto interfered with the economical production of gas from fluid hydrocarbons. Moreover, by thus reducing the pressure I can fix the gas at a lower and less destructive temperature than heretofore, and thus effect a great saving in wear and tear of plant, as well as economically use iron retorts where fire-clay retorts would otherwise only be eligible.

In retorts fitted with deflectors or impact devices, which are a practical necessity to insure efficient and rapid thermolysis, the back-pressure is much increased, and speedily results in the formation of a serious obstructive deposit—such as tar, lamp-black, and hard carbon. By decomposing the vapors under a partial vacuum this difficulty is removed. Moreover, back pressure not only acts directly on the rate of dissociation, and thus interferes with the continuous production of gas, but also acts indirectly by disturbing the regular action of the injector.

In the part of my invention here employed I cause the exhauster to assist the injector, and may even use the exhauster alone as an oil or an oil and water vapor feed. By admitting air at some convenient point between the exhauster and the hydraulic main, or into or near the last retort, I can, by a suitable valve, regulate the supply, and thus bring the gas down to any standard candle-power desired. Sometimes I admit hydrogen, water-gas, or a little air simultaneously with the oil and steam. Thus, I use the exhauster to draw air, hydrogen, or water-gas at various points for diluting and chemically influencing the gas in process of manufacture.

Fig. 11 shows, in general plan, part of a gas-works constructed on my system.

E is an exhauster driven by the small steam-engine C, from which the motion is communicated by means of an overhead counter-shaft. (Not shown in the drawings.)

G is the tank of a small governor shown in plan view, Fig. 11, and separately in vertical section at Fig. 11*, consisting of a gas-pressure holder, *h*, balanced by a counterpoise, *w*, and communicating, by means of a pipe, P, with the hydraulic main and retorts, so that it varies in position with the vacuum in them and in thus varying actuates the rod *r* and the steam or throttle valve *v*, so as to regulate and control the speed of the engine and maintain a constant pressure or vacuum in the retorts under varying conditions in the feed of steam and oil.

With reference to the other parts of Fig. 11, B is the plan of the retort-setting with some of the parts removed, consisting of two benches of three each.

O is the principal gas-main, leading by the main O′ to the condenser K, and thence to the exhauster E by the main $O^2$. From the exhauster the gas is taken by the main $O^3$ to the drying-box D, and thence by $O^4$ to the meter M*, and from the meter by the main $O^5$ to the holder. Between $O^2$ and $O^3$ is inserted a by-pass, *y*, with check-valve, allowing the gas to shunt from $O^2$ to $O^3$ when the exhauster is not operating.

*t* is an air inlet or induction pipe, supplied with a regulating-tap for admitting air, hydrogen, or water-gas into the main O′. The inlet-pipe, particularly when conveying hydrogen or water-gas, may open directly into the retort, as shown at *t′*, Fig. 11.

In operating my above-described apparatus for the manufacture of gas the retorts are fired in the ordinary way, and when the usual gas-making temperature is attained a supply of high-pressure steam from the boiler is admitted by the pipe *s*, through an ordinary regulating valve or tap, to the superheater *c*, and thence to the injector. The oil or hydrocarbon fluid is then admitted by the pipe *o* to the injector in regulated quantity from the reservoir, and the mixed oil, vapors, and steam are driven through the ingression-pipe, where they are mixed and thoroughly vaporized, and poured from its rear end into the surrounding retort, where the production of fixed gas at once begins.

The exact proportions of oil and steam are readily determined by the operator, and will be found to vary considerably with the character of the hydrocarbon oils used.

In starting the apparatus, I prefer to first turn on the steam gently and, before admitting the hydrocarbon fluid, to start the engine and exhauster. The amount of exhaust giving the best results has to be determined by a few practical trials, as it varies with the temperature of the retorts and the character of oil and proportions of steam used. The steam-valve *v* must be set in some suitable relative position to the rod *r* for the vacuum required, so that an increase of pressure in the retorts—*ergo*, in the governor—will open the steam-valve and make the engine go faster, and thus adjust the exhauster to the work in hand and keep the requisite low pressure in the retorts constant. When the pressure in the retorts falls, the action of the governor will of course be reversed.

I claim—

1. In apparatus for the manufacture of gas from fluid hydrocarbons, the combination, with a double-mouthed retort, of two ingression-pipes, one extending from each end of the retort into its central portion for discharging opposing streams of fluid against each other and causing uniform mixture thereof.

2. In apparatus for the manufacture of gas from fluid hydrocarbons, the combination, with a retort and its inwardly-extending ingression-pipe, of a complement of deflecting and impact devices provided with alternating annuluses and disks arranged in the retort, whereby gaseous fluids discharged within the retort are deflected against numerous heated surfaces for better combining and fixing them.

3. In apparatus for the manufacture of gas from fluid hydrocarbons, the combination, with a retort and an ingression-pipe extending into it, of a steam-superheater coiled about and connecting with the ingression-pipe, for the purposes set forth.

4. In apparatus for manufacturing gas from fluid hydrocarbons, the combination, with a retort, of an apparatus consisting of an ingression-pipe extending into such retort, a steam-superheater, an injector connecting with the superheater and the ingression-pipe, and deflecting and impact devices disposed around the ingression-pipe, substantially as herein described.

5. In apparatus for the manufacture of gas from fluid hydrocarbons, the combination, with a retort and its inwardly-extending ingression-pipe, of deflecting and impact devices consisting of a large number of auxiliary surfaces systematically disposed and arranged, whereby the passing current of fluid is repeatedly broken up and at the same time made to suffer continuous moler and molecular bombardment by the particles of the vapors, said deflectors being provided with openings for the passage of the ingression pipe, substantially as described herein.

6. In combination with a retort, an ingression-pipe extending into such retort and provided internally with deflecting and impact devices consisting of annuluses *a'* and disks *d'*, and a fluid-supply pipe connecting with such pipe, as and for the purposes herein described.

7. In combination with a retort, an ingression-pipe fitted internally with deflecting and impact devices consisting of annuluses *a'* and disks *d'*, and an injector, *j*, connecting with its inlet end, substantially as described, and for the purposes herein set forth.

8. In apparatus for the manufacture of gas from fluid hydrocarbons, a retort fitted internally with deflecting and impact devices, in combination with an inwardly-extending ingression-pipe, also fitted internally with deflecting and impact devices, and a fluid-supply pipe connecting with the ingression-pipe, whereby the gas-making fluids are first heated and intimately mixed and then discharged into the retort and against its heated deflecting-surfaces for conversion into a fixed gas.

9. In combination with a retort, a connected steam and oil injector, a connected induction-pipe for supplying a diluting fluid, an exhauster and motor connecting with the gas-outlet pipe, whereby steam and oil supplied to the retort are decomposed and a diluting agent is mixed with the resulting gas and the mixture drawn off without injurious decomposition, as described.

10. In combination with a retort, a connected steam and oil injector, an exhauster connecting with the outlet-pipe of such retort, a motor for operating the exhauster, and a governor for regulating and controlling the action of the exhauster and motor, whereby gas of a uniform quality may be made and withdrawn from the retort in regulated quantities independent of the rate of feed of the gas making fluids, and of variations in the temperature of the retort.

11. In apparatus for the manufacture of gas from fluid hydrocarbons, the retort R, fitted with deflecting and impact devices *a d a d*, in combination with a connected exhauster, E, and motor, substantially as herein described, whereby the gas is subjected to extended heating-surfaces and better fixed at reduced pressure and temperature, and obstructive deposits thereby prevented.

12. In apparatus for manufacturing gas, a retort, R, fitted with deflecting and impact devices *a d*, in combination with an exhauster, E, and motor, and a governor, G, substantially as herein described, whereby gas-making fluids are drawn into the retort in automatically-regulated quantities, the resulting gas is subjected to extended heating-surfaces and better fixed at reduced pressure and temperature, and is drawn off from the retort without injurious decomposition.

13. In apparatus for making gas from steam and fluid hydrocarbons, the combination, with a retort and its inwardly-extending ingression-pipe, of a complement of deflectors placed

in the retort about the ingression-pipe, a steam and oil supply-pipe connecting with the ingression-pipe, a pipe for supplying a diluting fluid connecting with the retort, a connected exhauster, a motor for operating the exhauster, and a governor for regulating and controlling the action of the motor and exhauster, whereby the gas-making fluids are drawn into the retort and its eduction-pipe in automatically-regulated quantities, the vapors and gases generated subjected to extended heating-surfaces and better fixed at reduced pressure and temperature, and the fixed gas drawn off from the retort without injurious decomposition.

ARTHUR G. MEEZE.

Witnesses:
H. K. WHITE,
G. H. G. MATHIESON,
6 *Bream's Buildings, London, E. C.*