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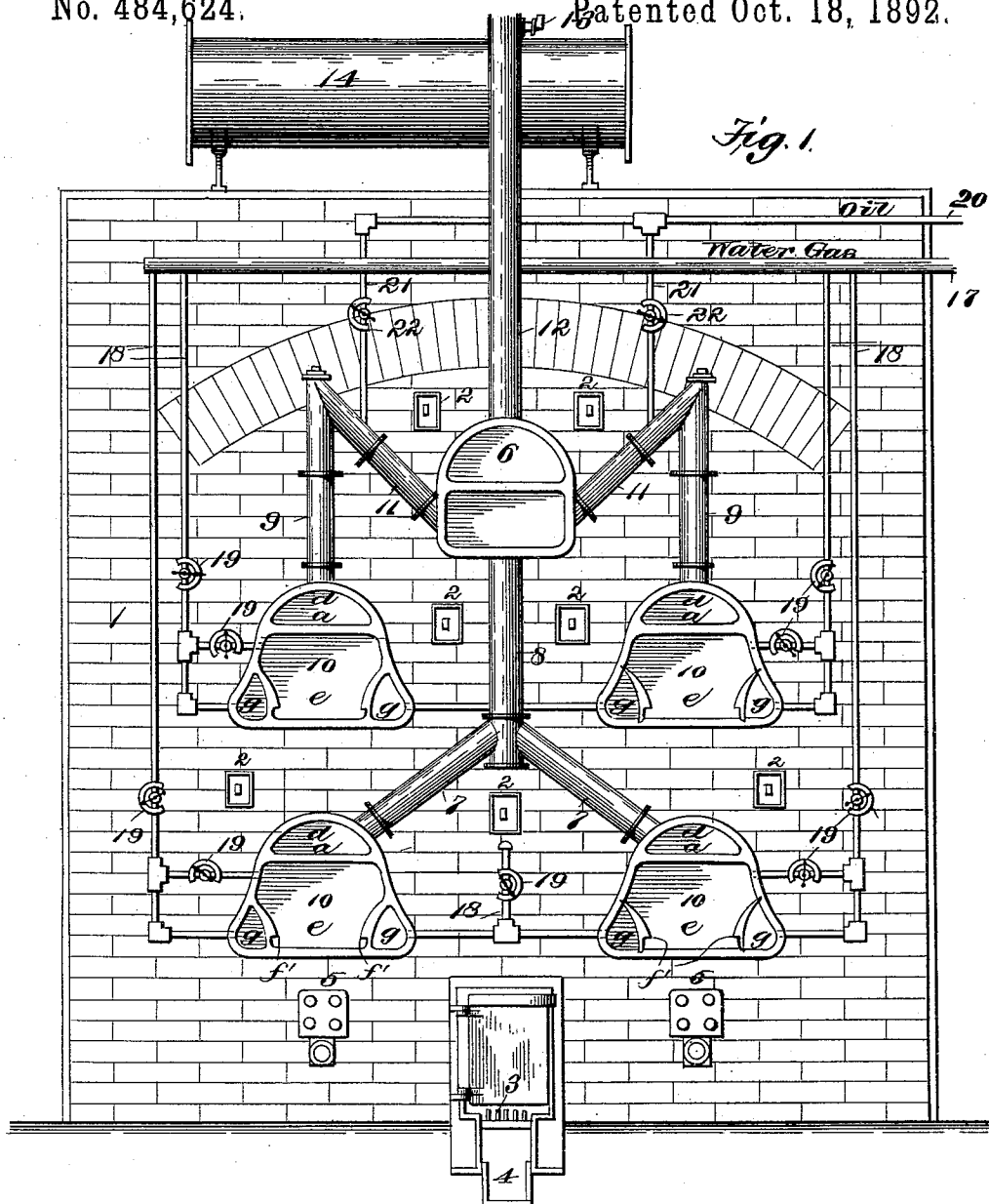
2 Sheets—Sheet 1.

A. L. ALLEN.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 484,624.

Patented Oct. 18, 1892.



Witnesses
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(No Model.)

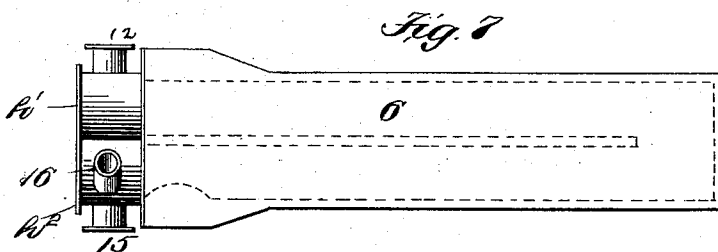
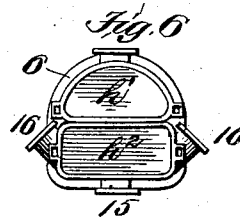
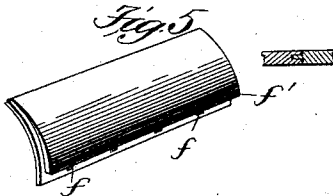
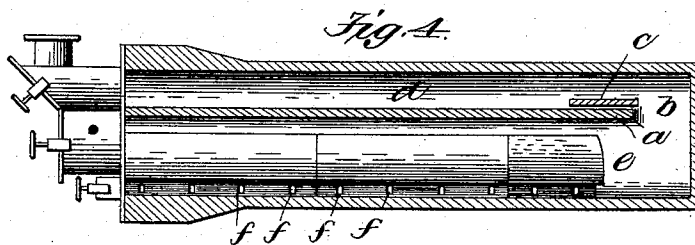
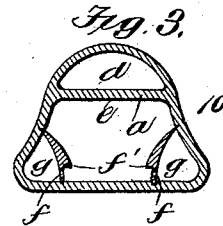
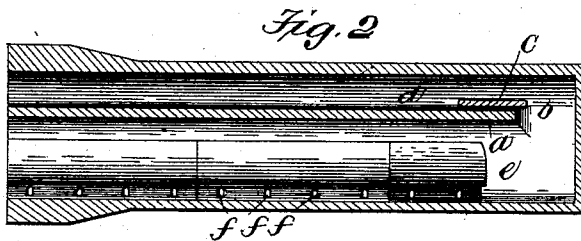
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A. L. ALLEN.

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Patented Oct. 18, 1892.



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UNITED STATES PATENT OFFICE.

AUGUSTUS L. ALLEN, OF POUGHKEEPSIE, NEW YORK.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 484,624, dated October 18, 1892.

Application filed June 7, 1892. Serial No. 435,801. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS L. ALLEN, a citizen of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a front elevation of a bench of five retorts embodying my invention, the mouthpieces of the retorts having been removed to show the interior arrangement of the several retorts and the relation of the water-gas pipes delivering into said several retorts. Fig. 2 is a longitudinal central section of one of the four lower retorts. Fig. 3 is a front elevation of one of the lower retorts embodying my invention, the mouthpiece removed, and showing the water-gas chambers *g*, formed by tile. Fig. 4 is a longitudinal central section of one of the four lower retorts, with the mouthpiece thereof in side elevation. Fig. 5 is a perspective front view of a tile for forming the side water-gas chambers of the lower four retorts, in case it is desired to use tiles therefor rather than to form the walls integral with the retort. Fig. 6 is a front elevation of the upper or carbureting retort, showing the mouthpiece with its upper, lower, and lateral bells or spigots; and Fig. 7 is a side elevation of said upper or carbureting retort.

Like symbols refer to like parts wherever they occur.

My present invention relates to certain improvements in the form, combination, setting, and fitting of horizontal retorts for the manufacture of gas for heating or illuminating purposes, as circumstances may require, and has for its object such an arrangement and combination of the parts that, without change or reorganization, the works shall be adapted to use anthracite coal or coke and bituminous coal, oil, and its products, and other carbonaceous material, separately or conjointly, during the process of manufacture, for the production of a more perfect illuminating-gas, or for the use of anthracite coal or coke or a cheap class of bituminous coals in the manufacture of a pure water or fuel gas, and also

for the production of either of said gases (fuel or illuminating) alternately, as desired.

The apparatus hereinafter described is particularly designed to be employed in conjunction with the "Allen-Harris or American Hydrocarbon Process," and as far as possible perfect the means for carrying out processes of said general character. It is especially adapted for use in connection with the vertical retorts described in the patent to Allen and Harris, No. 440,456, dated November 10, 1890, and in conjunction with the horizontal retorts described in my former patent, No. 356,863, dated February 1, 1887, and while for purposes of illustration I shall herein adopt much that is shown and described in said Patent No. 356,863, I distinctly disclaim any matter shown in said patent, and, further, I do not limit my invention to use therewith.

The main feature of my invention, generally stated, embraces a retort adapted for solid carbons, said retort having on its interior side chambers oppositely placed along or parallel with and across the lower angles of the retort, said side chambers perforated at or near the floor of the retort, so as to deliver steam or water-gas into the carbon-chamber of the retort in lines parallel with and adjacent to the floor thereof. The walls of said chambers may be either formed integral with the walls of the retort or by means of detachable tiles, as may be desired, and as will hereinafter more fully appear. Finally, there are other minor features of invention, as will hereinafter more fully appear, and then be pointed out in the claims.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the drawings, 1 indicates the brickwork of a bench, within which the horizontal retorts embodying my invention are set, said brickwork having the spy-holes 2, grate 3, ash-pit 4, steam-drivers 5, upper retort 6, short stand-pipes 7 7 8 9 9 of the lower series of retorts 10 10 10 10, which, by means of connections 11 11, deliver into the lower chamber of the carbureting-retort 6, while the single stand-pipe 12, provided with a valve 13, connects the upper chamber of the carbureting-retort 6 with the main 14 and serves as a stand-pipe for the entire system.

17 indicates the main water-gas-supply pipe,

which connects directly (preferably by a covered and protected or well-heated conduit) with any suitable apparatus for producing water-gas—as, for instance, such as is shown and described in patent of Allen and Harris, No. 440,456, of November 11, 1890, hereinbefore referred to.

18 indicates suitable water-gas pipes and branches provided with index-valves 19, which lead from the main pipe 17 and deliver into the water-gas chambers *g* of the lower retorts 10 and also into the said retorts above the water-gas chambers *g* and over the beds of bituminous coal therein, as indicated in Figs. 1 and 3 of the drawings, so that the water-gas, &c., is injected not only into and through the carbon in the retort, but also into the space above the carbon.

20 indicates an oil-pipe, which connects with any suitable source of supply (said pipes being preferably incased and heated by the waste heat of the bench) and from which branches 21 21, provided with index-valves 22 22, lead to and deliver into connecting-pipes 11 11, which form the connections between the upper chambers of the retorts 10 and the lower chamber of the upper or carbureting-retort 6.

The arrangement and connection of the retorts and the oil and water-gas pipes of the system being such as hereinbefore specified, the construction and internal arrangement of the retorts will preferably be as follows: The upper or carbureting and fixing retort 6 (see Figs. 6 and 7) has a horizontal diaphragm which divides it into an upper and a lower chamber, which chambers communicate at the rear, so as to form a return-passage in the retort, and the mouth-piece thereof has independent lids *h'* *h'*, together with a bell or spigot above for the standpipe 12, a bell or spigot 15 below for connecting pipe 8, as well as lateral bells or spigots 16 16 for connecting pipes 11 11. If the combination is limited to three retorts, the lateral or side bells 16 may be omitted. The lower series of retorts 10, &c., are each constructed with a horizontal diaphragm *a*, (see Figs. 2, 3, and 4,) arranged in the upper third of the retort and extending backward sufficiently far to divide the retort into a lower carbon-chamber *e* and an upper perfecting-chamber *d*, said chambers connected at the rear by a throat or aperture *b*, which may be controlled by a suitable tile-valve *c*. The lower or carbon-chamber of said retorts 10 is divided into a central carbon-chamber, or that which receives the charge, and two side chambers *g g*, placed on opposite sides and adapted to receive superheated steam or water-gas and deliver it in fine jets into and through the carbonaceous matter contained in the central chamber *e*. Said chambers *g g* are preferably formed at and above the lower angles of the retorts, are about three (3) inches wide at the base and five or six (5 or 6) inches high up to the angle internally. They extend from the front of

the retort back usually about three-quarters the length of the retort, and are provided with perforations *fff*, six or eight inches apart, on a level with or a little above the floor of the retort from a quarter ($\frac{1}{4}$) to a half ($\frac{1}{2}$) inch in diameter, beveled internally, and of the general outline indicated in the drawings. At the rear the inner wall or partition of chamber *g* is beveled back (see Fig. 2) to form a smooth surface with the side and floor of the retort. The inner wall or partition which forms the chamber *g* is cut back at the base a half an inch or more to form a perpendicular face of half an inch, more or less, and an overhang *f'*, which protects the outlets or perforations of the water-gas chamber, prevents them from becoming clogged by the carbon, and protects them from injury in charging or drawing the retort. In case the partitions forming the inner walls of the water-gas chambers *g g* are to be permanent, as shown at the left of Fig. 1, I commence, preferably, eight or ten inches above the bottom of the retort to gradually swell the shell outwardly and the partition inwardly to about three inches apart in the clear on the bottom of the retort, and then round the angles and finish off the retort, as desired. In case tiles are used to form the inner walls of chambers *g g*, (see Fig. 5 and right-hand retorts, Fig. 1,) they may be made of convenient size and of the same material as the retort and of a thickness to correspond with the partitions before described. They will be also formed with the overhang *f'* to protect the perforations *fff*, (at or near the baseline of said tile,) and will be beveled at top and bottom to set in grooves in the side and bottom of the retort, and with tongue and groove at the ends, so that when set in place and properly cemented a water-gas chamber the full equivalent of the integral walled chamber will be obtained.

The devices being of the general character hereinbefore specified, and combined and arranged to form an apparatus having the characteristics set forth, may be used to make either a fuel-gas from anthracite coal, coke, or a class of cheap bituminous coals, or illuminating-gas from bituminous coals, (and especially rich cannels,) oil and its products, and water-gas chemically combined during the process of manufacture.

First. In case water-gas or fuel-gas only is desired, the carbon-chambers *e e* in retorts 10 and the lower chamber of the upper retort 6 are charged with anthracite coal, coke, or other suitable materials, and when properly fired up steam which has been dried and superheated to a high degree is sent into the side chambers *g g* of retorts 10 and in finely-divided jets through the perforations *fff* up into and through the beds of carbonaceous materials in said several retorts, whereby said superheated steam becomes decomposed, forming hydrogen and carbonic oxide in about equal quantities or water-gas. The upper retort 6 is kept at a temperature of 1,500°

Fahrenheit or upward. It is therefore very evident that no carbonic acid or undecomposed steam can pass through this retort and out of the stand-pipe.

5 Secondly. If it is desired to change the fuel or water gas made as above into illuminating-gas by the use of oil or its products, then the chambers in the upper retort 6 are not charged, but the other retorts are charged, as
10 before, and the proper percentage of vaporized oil or naphtha is sprayed or fed from oil-pipes into branches 11 11 and passes into and through the return-chambers of the upper retort 6, where it travels about eighteen feet,
15 mingling and combining with the water-gas, and forms illuminating-gas of such candle-power as may be desired, which passes out of one stand-pipe to the main and holder, requiring little or no purification.

20 Thirdly. But the primary object of this invention and arrangement of apparatus being the economical and efficient manufacture of illuminating-gas from bituminous coals, (and especially rich cannels,) oil, and its products,
25 and water-gas, chemically mixed during the process of manufacture, as producing the most satisfactory illuminating-gas of medium specific gravity, with not exceeding ten per cent. of carbonic oxide, and requiring but little or no purification. I observe, first, that
30 the production of pure water-gas requiring great care in the use of driers, superheaters, and apparatus, I greatly prefer the use of a separate bench or "gas-generator" for that
35 purpose; second, it is well known that the luminants in bituminous coals are greatly in excess of the non-luminants or permanent gases, hydrogen, carbonic oxide, and marsh gas, which form the basis or substratum of
40 illuminating-gas, which is composed of about seven per cent. of illuminants and ninety-three per cent. of non-luminants; third, also that many of the carbons in bituminous coals are very volatile, and are volatilized and
45 wasted before any of the permanent or absorbing gases are made under the ordinary system of carbonizing coals; fourth, I have learned the importance of saturating the bituminous coals with the permanent gases
50 having a high temperature the moment that the carbons are being volatilized, in order to absorb and utilize the same before any objectionable combinations can be formed, and thereby greatly increase the yield of
55 high-candle gas from the same weight and measure of materials used; fifth, but the manner of delivering the permanent gases in and through the carbonaceous materials has heretofore been imperfect and objectionable.
60 I have therefore changed the form of the retorts 10 10 from those heretofore used by omitting the lower diaphragm and ash-chamber and thereby reducing the height of the retort without reducing its working capacity
65 by forming the superheated steam and water-gas chambers *g g* on opposite sides at and

above the lower angles of the retorts 10 10, having perforations *fff*, protected by an overhang, by which superheated water-gas can be more certainly and uniformly delivered in
70 finely-divided jets in and through the beds of bituminous coals with which the chambers *e e* in retorts 10 10 are charged.

The mode of operation under the third head is as follows: First, the bench being properly
75 fired up, the carbon-chambers *e e* in retorts 10 10 are charged with bituminous coals, a little superheated water-gas being allowed to flow through the apertures *fff* during the operation, and the moment that the lids are closed
80 an abundant supply of superheated water-gas, which is regulated by index-valves, is sent through the side chambers *g g* and apertures *fff* into, through, and over the materials therein contained, absorbing and protecting
85 the illuminants from being decomposed or wasted in passing, even from the center of the deepest beds of the richest coals which the largest retorts can hold, and utilizing and
90 carrying them off as high-candle gas, requiring but little or no purification; second, all the gases formed in the lower four retorts 10 10 are carried up through increasing heats into the lower chamber, then back and into
95 the upper chamber of the upper retort 6 and forward to the stand-pipe, of which, there being only one, it is evident that all the gases made are subjected to one uniform quality, the materials used being the same; third, by
100 the free use of hot water-gas heavy charges of coal can be easily burned off in three hours; fourth, as the flush of yield of gas from the coals is passing off, the supply of water-gas will be gradually reduced, and in case the
105 desired candle-power of the gas becomes reduced by the use of inferior coals or the too free use of water-gas more or less oil or its products can be sprayed or injected into the lower chamber of the upper retort 6 through
110 the branch pipes 11 11, and its quality be thereby quickly and easily restored; fifth, care should be observed to use perforated furnace-blocks and vaporizers and to cover exposed pipes and conduits with sheet-iron or other suitable material. It should, however,
115 be here stated that in the operation of the present system the upper retort 6 or carbureting and fixing chamber is never drawn nor the heats lowered, and that thereby a perfect chemical combination of all the gases during
120 the process of manufacture is secured by subjecting them to a longer contact with the permanent gases through continuous, uniform, increasing heats, so that no smoke, soot, or objectionable combination or impurities can
125 be formed in the gas or pass off through said fixing-chamber.

A continuous uniform production of gas is instantly secured by simply turning on a valve, and the entire working of the plant is
130 stopped by simply turning off a valve. It is therefore evident that no intermediate gas-

holder is required, as the quantity of gas to be produced per hour or day is entirely under control.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A retort adapted for solid carbons, said retort having side chambers oppositely placed on its interior, each of said side chambers perforated at or near the floor of the retort and provided with an overhang or projection which guards the perforations in the walls of the side chambers, substantially as and for the purposes specified.

2. A retort adapted for solid carbons, said

retort provided with inner walls or partitions arranged across the lower angles of the retort to form oppositely-placed side chambers, and said side chambers provided at or near the bottom of the retort with perforations of general angular shape, substantially as hereinbefore shown and described, and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 6th day of June, 1892.

AUGUSTUS L. ALLEN.

Witnesses:

JONATHAN DICKINSON,
A. L. CAOTLAND.