

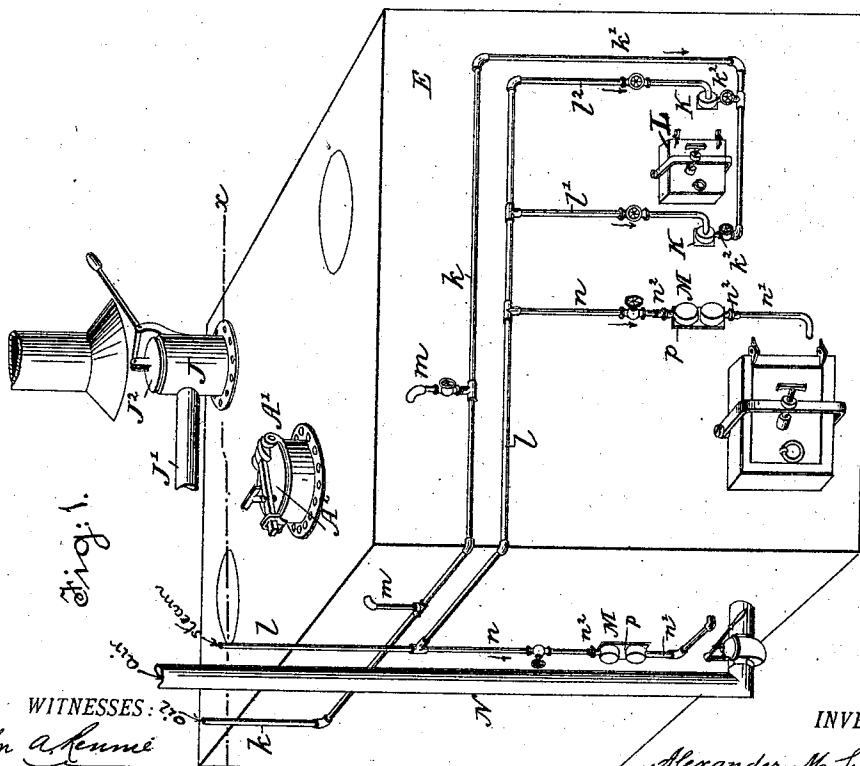
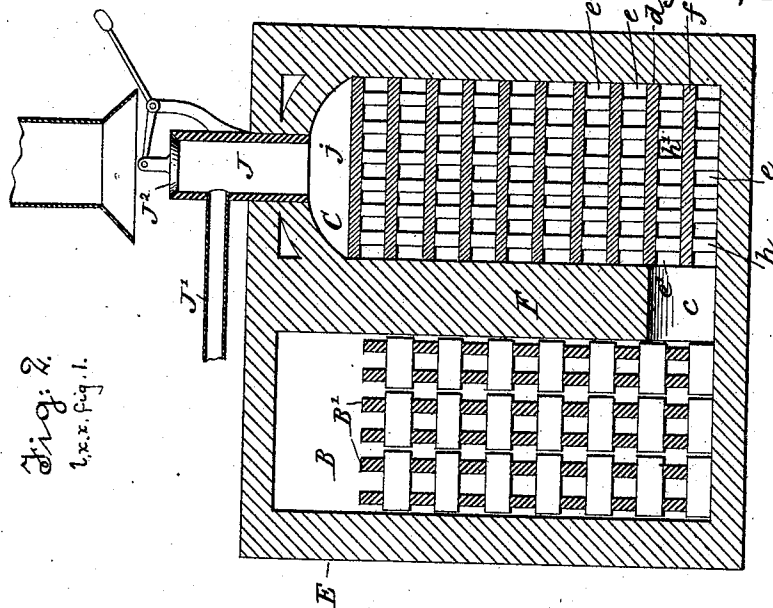
(No Model.)

A. M. SUTHERLAND.
GAS APPARATUS.

2 Sheets—Sheet 1.

No. 501,698.

Patented July 18, 1893.



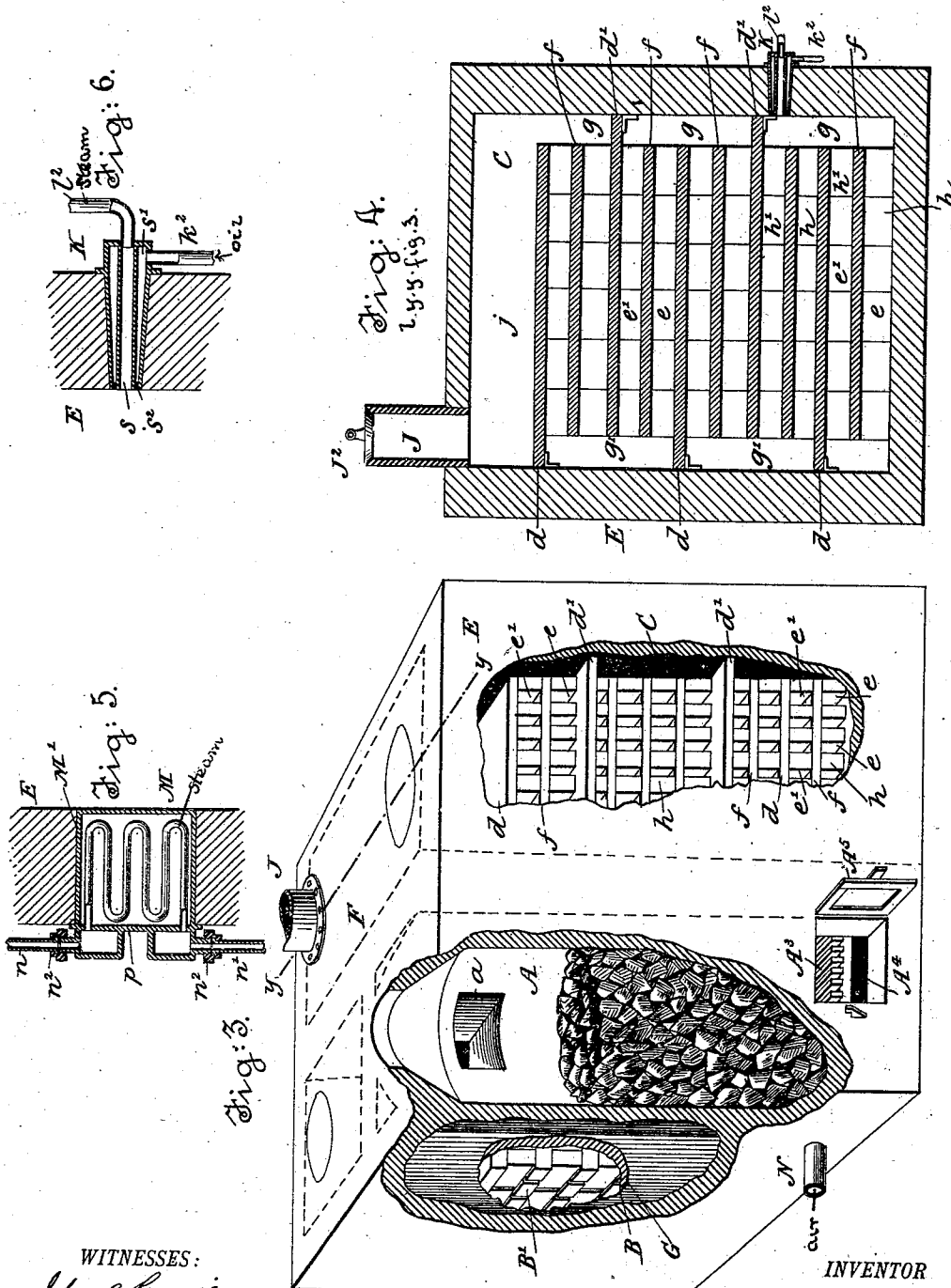
WITNESSES:
John A. Kenne
Geo. Sutherland

INVENTOR
Alexander M. Sutherland
BY
Wm. A. Sutherland
ATTORNEY

A. M. SUTHERLAND.
GAS APPARATUS.

No. 501,698.

Patented July 18, 1893.



WITNESSES:
John A. Lennie
Ed. Sutherland

INVENTOR
Alexander M. Sutherland
BY
Wm. H. Appleton
ATTORNEY

UNITED STATES PATENT OFFICE.

ALEXANDER M. SUTHERLAND, OF ORANGE, NEW JERSEY.

GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 501,698, dated July 18, 1893.

Application filed August 22, 1892. Serial No. 443,781. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER M. SUTHERLAND, a subject of the Queen of England, and a resident of Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Gas Apparatus, of which the following is a specification.

The object of my invention is to produce a water gas generator which shall have advantage in cheapness and compactness of construction, and which at the same time shall be efficient in producing a well fixed gas enriched by low grade hydro-carbon oils.

It is well known that hydro-carbons of low specific gravity, while frequently yielding a more luminous and a greater volume of gas from a given quantity than those of the lighter specific gravity, require a higher degree of heat in their transformation than those of the lighter grades of oil.

To obtain the necessary heat for the purpose of obtaining fair results from heavy hydro-carbons by the generator hitherto used, the fixing space has to be raised to so high temperature that a part of the best of the gas is lost during the first part of the run by being formed into "lamp black," while toward its close the temperature is so rapidly lowered that another part of the gas is so imperfectly fixed as to be lost in condensation.

By my invention I provide the fixing chamber with a supplemental hydro-carbon heater or heaters by which I heat that portion of the fixing chamber which is farthest from the cupola, and by this means, while I am not compelled to raise any part of the generator to such a heat as to be destructive to itself or to be wasteful to both the carbon and the oil, I obtain and maintain an aggregate of such well distributed heat as effects the best results. I also provide the fixing chamber with a series of horizontal flues, and end spaces at front and back joining the flues in sets, so that the gas passes back and forth through the flues, which construction not only gives extensive fixing surface and enables me to make the generator of small dimensions, but prevents radiation and loss of heat, and enables me to uniformly heat the fixing chamber throughout by supplemental heaters which force the products of combustion therefrom through the flues.

In the accompanying drawings, Figure 1 is an isometric projection of an apparatus constructed in accordance with my invention. 55 Fig. 2 is a vertical section of the apparatus taken in the plane $x-x$ of Fig. 1. Fig. 3 is a perspective view thereof with a portion of the casing broken away to show the interior of the cupola and fixing chamber. Fig. 4 is a 50 vertical section taken in the plane $y-y$ of Fig. 3. Fig. 5 is an enlarged detailed view of one of the movable super-heaters, and Fig. 6 is an enlarged view of one of the hydro-carbon supplemental heaters.

A represents the cupola, B the primary and C the secondary fixing chamber. These are inclosed by a continuous casing, E, constructed of fire brick or other refractory material, incased in a gas tight covering preferably of boiler iron, and are separated from one another by the main partition F, which reaches from the front to the back wall, and the lateral partition G, which reaches from the main partition F to the adjacent side wall of the casing. 75

The cupola is formed at the top with a fuel-supply opening, A', closed by an exposed gas-tight cap, A², and is provided at the bottom with a series of grate bars, A³, elevated slightly from the floor of the casing, to form an ash-pit, A⁴, which is closed by a door, A⁵. The top of the cupola A is put in communication with the top of the fixing chamber B by a flue, a , formed in the partition G, and in said fixing chamber B, are placed refractory brick or tile B' cross laid and spaced to form interstices for the free passage of gas down among them to the flue c formed in the main partition F, which connects the fixing chamber B, with the fixing chamber C, at the bottom. 85

Within the fixing chamber C is placed a series of plates or shelves $d d'$ of tiling or other suitable material. These are of less length than the length of the chamber, but have the same width, and are set alternately against the front and back walls of the chamber, as shown. The spaces between these plates are divided to form flues $e e'$, the division being such preferably as to form two sets of flues for greater sub-division of the gas and to gain greater fixing surface. The division is made by intermediate plates or shelves 95 100

f, also of tiling or other refractory material, and the spaced tiers of brick *h h'*. The said shelves or plates *f* are of less area than the plates *d d'*, and the brick work and intermediate plates are spaced from the front and back walls of the chamber to form the vertical end space *g g'*, through which the gas and also the products of combustion from the supplemental heaters pass from the lower to the next upper set of flues until they reach the top space *j*, from which they pass through the dome *J* and pipe *J'* to a hydraulic seal (not shown), and thence through condensers, scrubbers, and purifiers to the holder.

15 The flues *e e'* may be multiplied to any extent desired, or a less number than here shown may be used.

K K represents hydro-carbon burners by means of which the heating of the flues of the fixing chamber C, at the beginning of the run, is assisted. These burners are preferably of the "steam injector" type, and are each provided with an inner orifice or nozzle *s* and an outer orifice or nozzle *s'*. Through the inner orifice or nozzle *s* steam is forced when the burner is in operation, while through the outer orifice *s'* hydro-carbon oil is drawn by the action of the steam as it issues from its nozzle. In the disposition of these burners, I prefer to arrange them on opposite sides of the door L and at points slightly below the next to the lowermost plate *d*, whereby to cause them to discharge their flames in the same direction as the products of combustion from the cupola are moving to thereby not only apply their heat in the most efficient manner, but also to cause them to aid in forcing such products of combustion through the machine by creating a draft therethrough.

40 To supply oil to the burners K K, I employ the branch pipes *k' k'* which lead from the main oil supply pipe *k* thereto, while to supply steam to such burners I make use of the branch pipes *l' l'* which extend from the main steam pipe *l* to said burners, as shown.

The main oil supply pipe *k* is provided with branches *m m*, which enter the top of the cupola, for supplying the hydro-carbon thereto in the form of a spray for enriching the gas, and the steam pipe *l'* is provided with branches *n n* which connect with the super-heaters M, and from the super-heaters extend pipes *n' n'*, through which the super-heated steam is conducted to the bottom of the cupola beneath the charge of fuel.

The super-heaters M are fitted in recesses M', formed in the walls F and G adjacent to the cupola to be heated therefrom, and are each composed of a coil of pipe placed therein, the ends of which are connected to the pipes *n n'* by screw couplings or unions *n''*, by which the pipes *n n'* may be readily attached to and detached from the inclosed pipe, thus adapting the super-heater to be easily taken from the recess and replaced.

Leading to the ash-pit below the grate bars is a suitable pipe N by means of which, and

under pressure, air may be supplied in starting.

In operation a fire is first kindled in the cupola, a charge of carbonaceous material supplied thereto, and the air blast started. At the same time the supplemental burners K are started, and the door L and the cap J² of the dome J opened to admit the necessary supply of air, and permit of the products of combustion and heat being forced through the flues of the fixing chamber and out into the air. By this operation I am enabled to heat the flues thoroughly and uniformly throughout, and thereby avoid not only the evils of lamp black and the consequent loss of gas, but also the excessive heating of the other parts of the generator. Further than this, when the fixing chamber is thus heated I am enabled by the more thorough and uniform distribution of heat, to make longer runs between heatings than with the common forms of generators, and by forming the fixing chamber with back-and-forth flues I obtain and maintain such uniform and well distributed heat in the brick and tile work of the chamber C as to give the best results. When the fixing chambers B and C are thoroughly heated, and the charge in the cupola well ignited, the door L, and cap J², will be closed, the air-blast and burners K cut off, and steam and oil admitted to the cupola. The steam thus admitted will then pass up through the incandescent material contained in the cupola, and, in its passage there-through, will be decomposed. The gases resulting from this decomposition and passage through the incandescent material arriving at the top of the cupola will commingle with the products of the combustion of the hydro-carbon supplied at that point and will pass on therewith through the primary and secondary fixing chambers B C, and become thoroughly fixed by the heat therefrom. Having passed through the fixing chambers and arriving at the dome J, the resulting gas will be conducted off through the pipe J' as a fixed and permanent gas.

In the foregoing I have described the best means contemplated by me for carrying my invention into practice, but I wish it distinctly understood that I do not limit myself strictly thereto, as it is obvious that I may modify the same in various ways without departing from the spirit thereof.

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

1. The combination, with a cupola in which the heating and decomposition of the materials entering into the manufacture of the gas are effected, a fixing chamber B fitted with refractory material down through which the products coming from the cupola pass, and a fixing chamber C formed with a series of horizontal flues of extended areas joining end spaces, of flues for connecting the cupola and chambers, and supplemental heaters arranged

to discharge their heat in the line of the flues in the fixing chamber C, substantially as described.

2. The combination, with a main continuous casing, a cupola A and fixing chambers B C, formed therein and separated from one another by partitions F G, of the flue *a* for connecting the top of the cupola with the top of the fixing chamber B, flue *c* for connecting the bottom of fixing chamber B with the bottom of fixing chamber C, and supplemental heaters K K arranged to discharge their heat in the fixing chamber C in the same direction as the products of combustion coming from the cupola are passing, to both aid in heating such chamber and assist in creating a draft through the machine, as and for the purposes described.

3. The combination, with a cupola A in which the heating and decomposition of the materials entering into the manufacture of

the gas are effected, fixing chambers B and C, a continuous casing in which the cupola and fixing chambers are arranged, flue *a* for connecting the cupola with the fixing chamber B, and flue *c* for connecting the fixing chamber B with the fixing chamber C, of longer and shorter plates *d d'* arranged alternately in the fixing chamber C to form end spaces and flues between them, and supplemental heaters arranged to discharge their heat in the line of these last mentioned flues, to both aid in heating the same and assist in creating a draft through the machine, as and for the purposes described.

In testimony whereof I have hereunto set my hand this 16th day of August, 1892.

ALEXANDER M. SUTHERLAND.

Witnesses:

WILLIAM H. CLARKSON,
F. W. HASTINGS.