No. 831,835. PATENTED SEPT. 25, 1906.

F. COTTON.

# PROCESS AND APPARATUS FOR GENERATING A COMBUSTIBLE GAS FROM CARBONACEOUS LIQUIDS.

APPLICATION FILED AUG. 18, 1904.

2 SHEETS—SHEET 1.

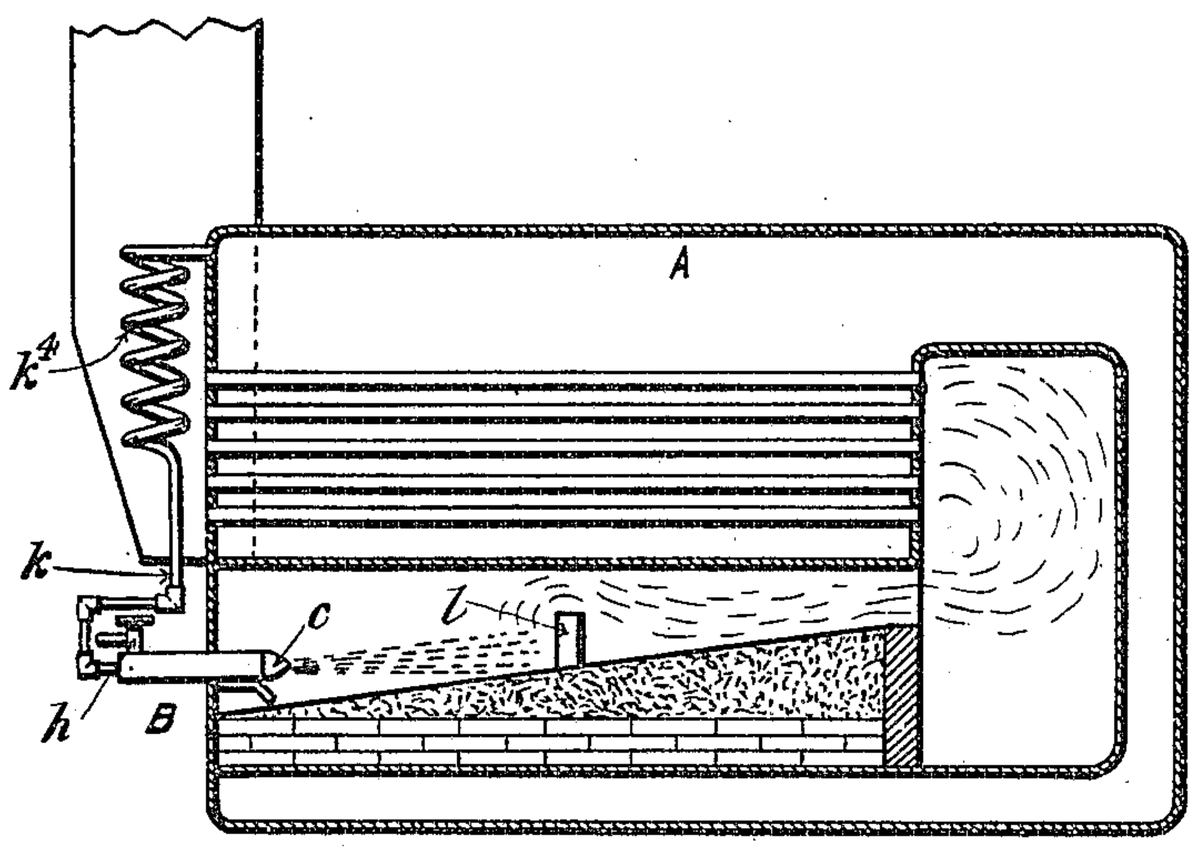


FIG. 1.

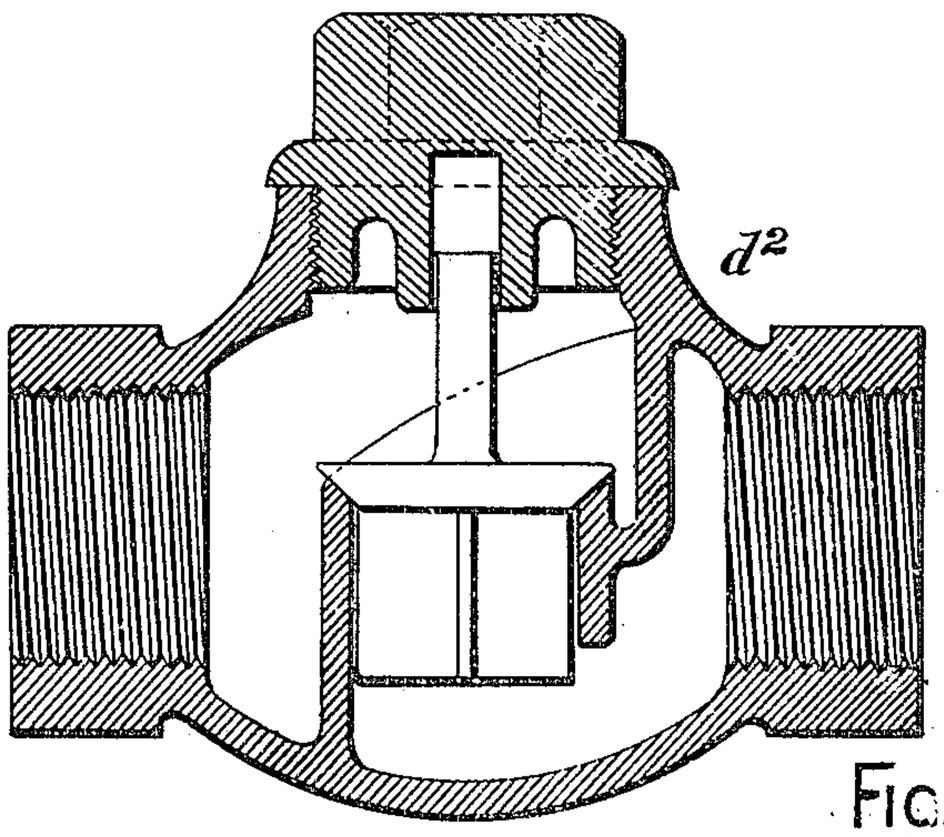


FIG. 2.

Witnesses

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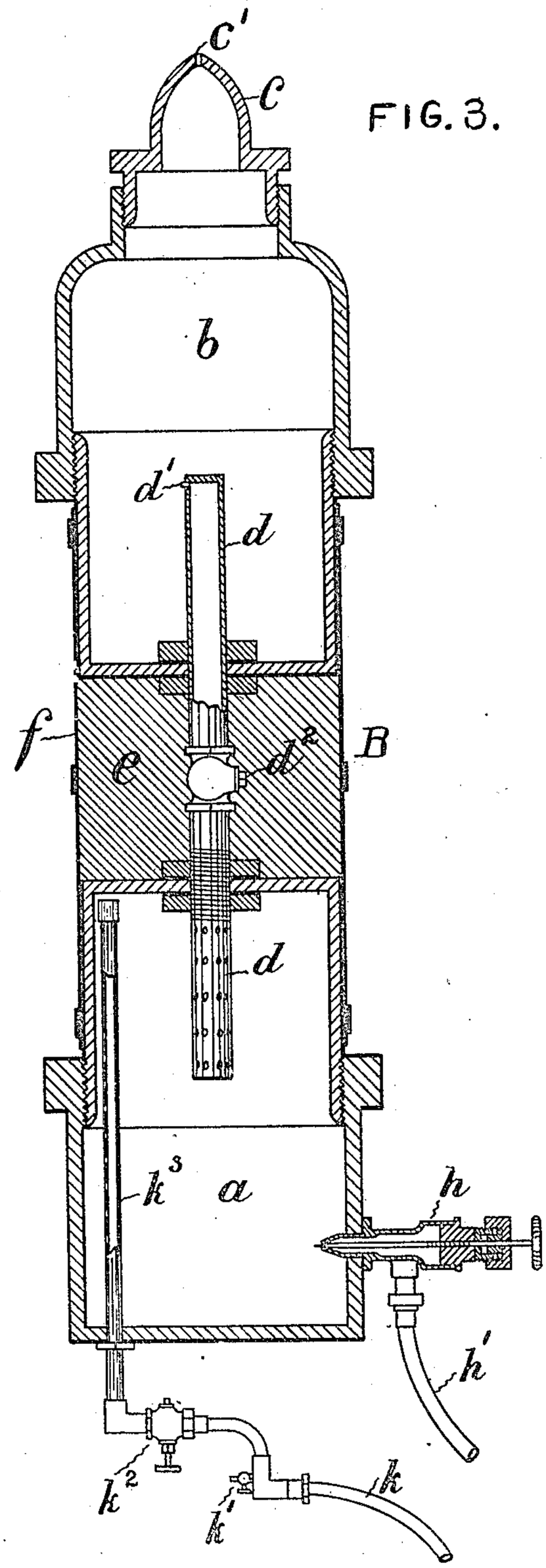
FIG. 3.




WITNESSES:

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# UNITED STATES PATENT OFFICE.

FRANK COTTON, OF HORNSBY, NEW SOUTH WALES, AUSTRALIA.

## PROCESS AND APPARATUS FOR GENERATING A COMBUSTIBLE GAS FROM CARBONACEOUS LIQUIDS.

No. 831,835 Specification of Letters Patent. Patented Sept. 25, 1906.

Application filed August 18, 1904. Serial No. 221,218.

*To all whom it may concern:*

Be it known that I, FRANK COTTON, a subject of the King of Great Britain, residing at Hornsby, in the State of New South Wales, in the Commonwealth of Australia, have invented a certain new and useful Apparatus for Generating a Combustible Gas from Carbonaceous Liquids, of which the following is a specification.

This invention relates to an apparatus by means of which carbonaceous liquids, such as the residuum of petroleum and other liquids of like nature, may be so treated that a highly-combustible gas is produced. The apparatus for this purpose consists of a pair of preferably cylindrical metal vessels connected together and communicating one with the other by means of a perforated pipe having therein a check-valve. These two vessels or chambers are insulated one from the other in the manner and for the purpose hereinafter described. The forward chamber is provided with an outlet-nozzle and the rearward is in communication with an oil and steam supply.

In using the apparatus for generating gas oil and steam are introduced simultaneously into the rearward or receiving chamber of the apparatus in such relative quantities and in such a manner that the resulting mixture shall have as near as possible a temperature of 300° Fahrenheit. For this purpose the steam is superheated prior to being introduced into the chamber to such a degree as to give when mixed with the oil in the chamber the desired temperature. The superheating of the steam prior to being introduced into the apparatus has also the effect (and this is essential) of drying the steam, so that there may be no condensation within the chamber. The oil-supply is forced into the apparatus through a controlling-valve of any well-known construction, such as that shown, by any suitable means, such as a force-pump. The steam and oil now thoroughly mixed and atomized in the rearward chamber of the apparatus passes through the freely-perforated end of the connecting-pipe which is within the said chamber and after passing the check-valve is delivered into the forward chamber through a single aperture in the forward end of the connecting-pipe. The forward chamber is now or has previously been raised to a temperature as near as possible to 800° Fahrenheit, but not exceeding this temperature. This rise of temperature after the steam and oil have been thoroughly mixed and atomized under pressure, as before described, has the effect of converting the mixture into a gaseous state, so that a continuous stream of a highly-combustible gas is projected from the nozzle in the forward chamber, which may be termed a "retort."

There are many ways by which the temperature of the retort may be raised to the desired degree; but in practice it will be found that the utilization of the reflected heat from the furnace in which the gas from the apparatus is being burned is the simplest way. For this purpose the apparatus is placed on the dead plate or floor of conduit, with the retort projecting within the furnace and the escaping gas so directed as to play upon a brick pier or other suitable mass of non-fusible material, which soon becomes incandescent and the reflected heat therefrom soon raises and maintains the retort at the desired temperature. Should the heat not be great enough for the purpose, the apparatus may be inserted farther within the furnace, or should it be too great the apparatus may be withdrawn slightly. By this means the temperature of the retort may be maintained at or near 800° Fahrenheit.

When the apparatus is used in connection with steam-generating furnaces, the relative proportions of steam and oil which should be introduced to give the best results are five parts, by weight, of steam to six parts, by weight, of oil; but when the apparatus is used in other classes of furnaces where a very high temperature is required the relative proportion of steam to oil may be considerably increased with advantage.

Experiments carried out by me have proved that when the temperature of the furnace in which the gas from the apparatus is being burned has reached approximately 3,000° Fahrenheit the relative proportion of steam to oil introduced into the apparatus may be increased to two parts, by weight, of steam to one part, by weight, of oil, with the result that the temperature of the furnace is increased.

In the drawings, Figure 1 represents a furnace having the gas-generating apparatus applied thereto. Fig. 2 is a detail view of a check-valve employed in connection with the apparatus, and Fig. 3 is a longitudinal section of the apparatus.

A represents a steam-generating furnace, and B the apparatus for generating the gas.

As shown in Fig. 3, *a* is the rearward chamber. *b* is the forward chamber or retort. *c* is the outlet-nozzle. *c'* is an aperture therein. *d* is the connecting-pipe. This pipe is closed at both ends, the portion within the chamber *a* being freely perforated, as shown, while the portion within the retort *b* is provided with a single aperture *d'*. $d^2$ is a check-valve in pipe *d*, placed midway its ends. *e* is insulating material, such as asbestos or the like, surrounding the middle portion of the pipe *d*, which is without the chambers *a* and *b*. This insulation is provided for the purpose of preventing the high temperature of the retort from extending to the receiving-chamber *a*. The check-valve $d^2$ is provided for the purpose of preventing any back pressure in the event of the pressure in the retort exceeding that in the chamber *a*. *f* is a covering of sheet metal confining and protecting the insulating material *e*. *h* is an oil-controlling inlet-valve. This valve may be of any well-known construction, but preferably of the type shown—namely, a cone-valve. *h'* is an oil-supply pipe communicating with the force-pump or other appliance for forcing the oil within the chamber *a* against the pressure of steam therein. *k* is a steam-supply pipe from the generator. This pipe is provided with an intermediate superheater for the purpose hereinbefore mentioned. The superheating of the steam may be accomplished by a coil $k^4$ in the smoke-box of the furnace, as shown in Fig. 1, or by any other suitable means. *k'* is a small drip-tap provided for the purpose of ascertaining that the steam is sufficiently dry to be admitted into the chamber *a*. $k^2$ is a steam-controlling valve. $k^3$ is a steam-delivery pipe within the chamber *a*. This pipe has a single row of perforations along its under side, as shown. *l* is the non-fusible material within the furnace, upon which the escaping gas from the retort is directed.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. An apparatus for generating a combustible gas, comprising a receiving-chamber, a retort spaced from the receiving-chamber and in line therewith, the retort having an outlet-nozzle at one end, heat-insulating material held in the space between the receiving-chamber and the retort, a perforated pipe extending through the insulating material and connecting the receiving-chamber and the retort, the said pipe being provided with a check-valve located between the retort and the receiving-chamber, an oil-supply pipe communicating with the receiving-chamber, an inlet-valve for controlling the supply of oil to the chamber, and a steam-supply pipe extending into said chamber and provided with a valve for controlling the steam-supply.

2. In an apparatus for generating a combustible gas, a receiving-chamber, a retort in line with the receiving-chamber and spaced therefrom, the said retort being provided with an outlet, heat-insulating material located in the space between the retort and chamber, a covering connected with the retort and chamber and inclosing the insulating material, a valve-controlled pipe extending through the insulating material and connecting the retort and receiving-chamber, and means for supplying oil and steam, to the receiving-chamber.

3. An apparatus for generating a combustible gas comprising a receiving-chamber, a retort spaced from the receiving-chamber and having an outlet-aperture, a perforated pipe provided with a check-valve and connecting the chamber and the retort, insulating material surrounding the connecting-pipe between the chamber and the retort, a covering connected with the chamber and retort and confining and protecting the insulating material, a perforated steam-delivery pipe within the receiving-chamber, means for superheating the steam before it enters the receiving-chamber, and an oil-supply pipe communicating with the receiving-chamber and provided with a controlling-valve.

4. The combination with a furnace, of an apparatus for generating combustible gas, the said apparatus comprising a receiving-chamber, a retort projecting into the furnace and arranged in line with the receiving-chamber and spaced therefrom, the said retort having an outlet-opening, a valve-controlled pipe connecting the retort and the receiving-chamber, insulating material surrounding the connecting-pipe between the receiving-chamber and the retort, and held between the adjacent ends of said chamber and retort, means for supplying oil and steam to the receiving-chamber, and means for superheating the steam before it enters said receiving-chamber.

Signed at Hornsby, Australia, this 7th day of June, 1904.

FRANK COTTON.

Witnesses:
JAMES P. CHALMERS,
THOMAS SULLIVAN.