No. 633,031. Patented Sept. 12, 1899.

H. NEUMANN.

PROCESS OF MAKING GAS.

(Application filed May 2, 1898.)

(No Model.)

Fig. 1.

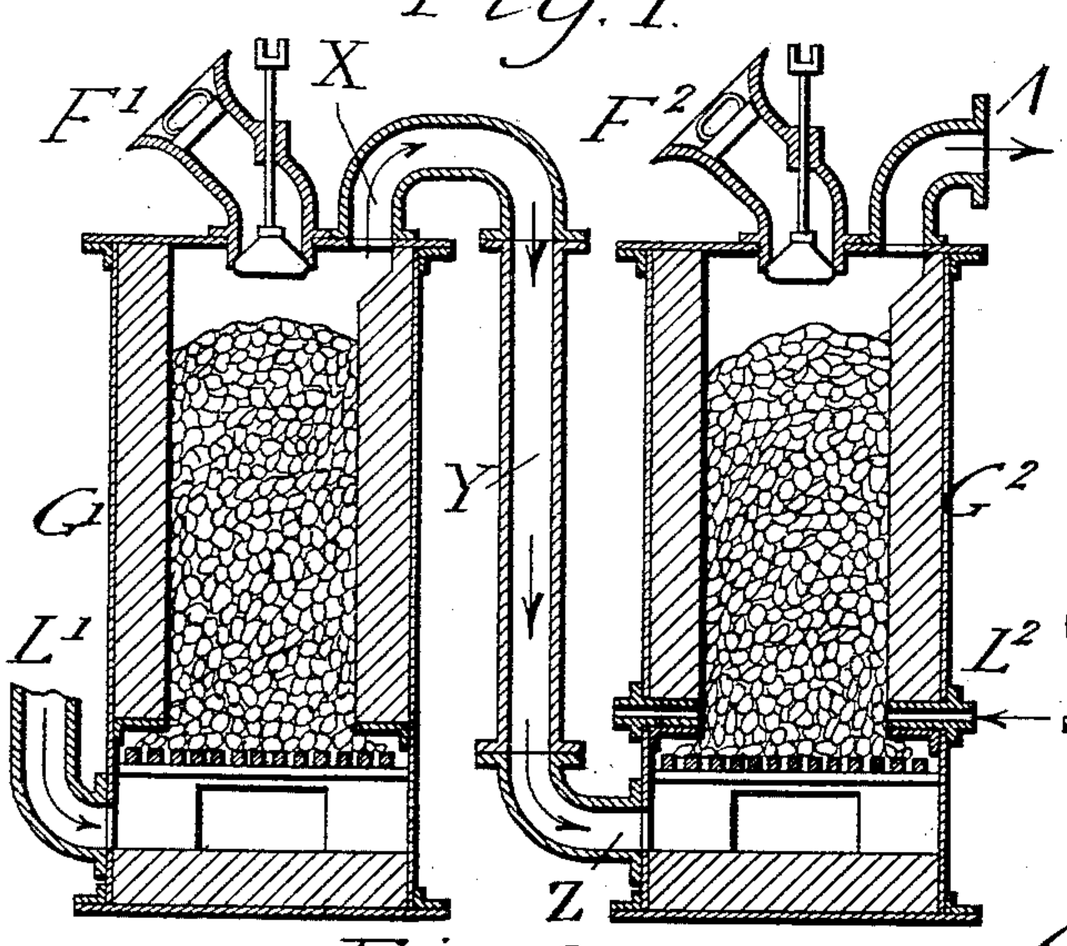


Fig. 2.

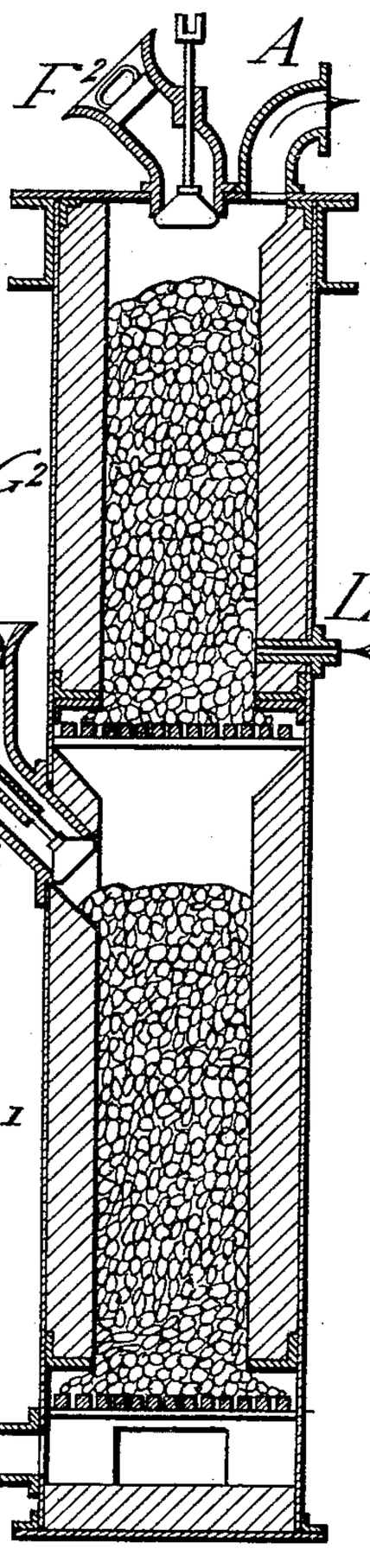
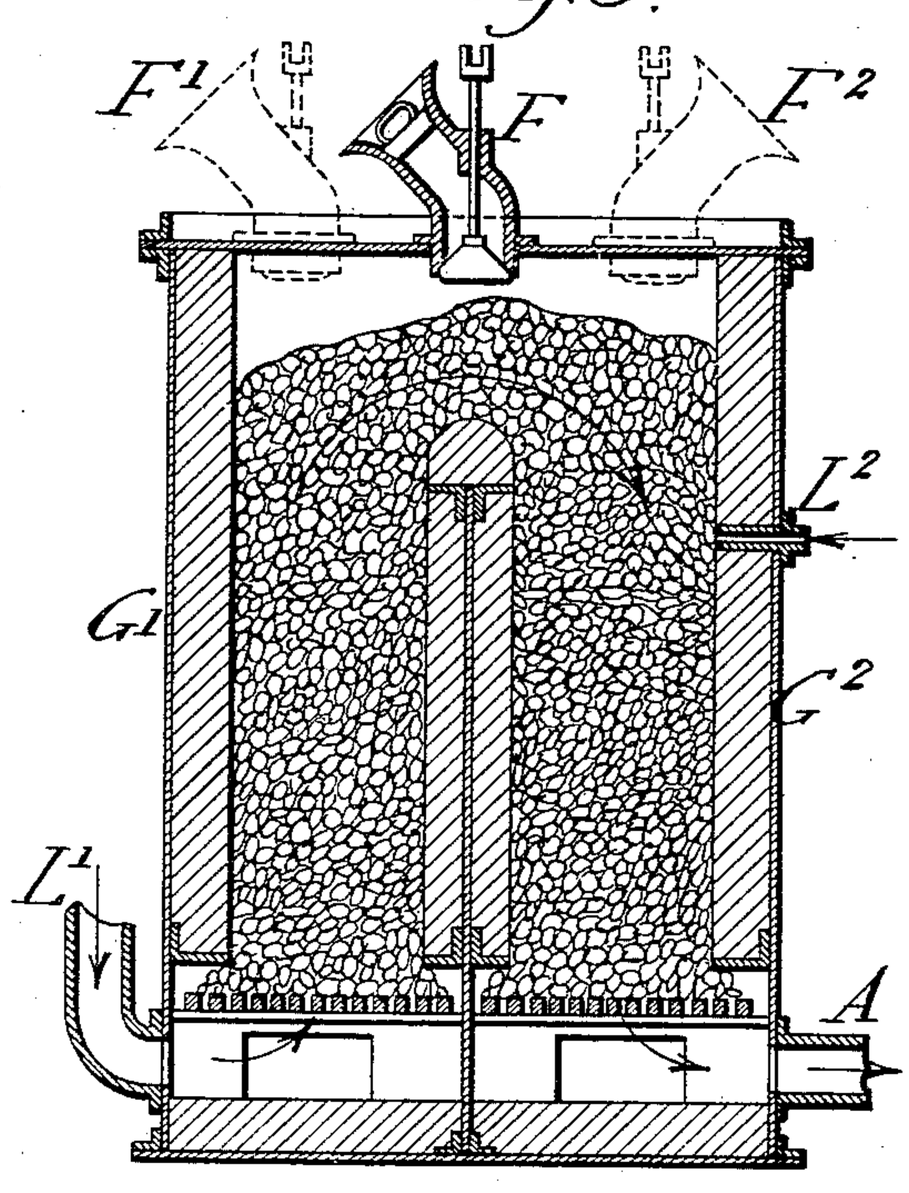


Fig. 3.



Witnesses
H. B. Keeler
V. Coonley

Inventor
Hans Neumann
By James L. Norris
Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HANS NEUMANN, OF COLOGNE-DEUTZ, GERMANY, ASSIGNOR TO THE GAS-MOTOREN FABRIK DEUTZ, OF SAME PLACE.

PROCESS OF MAKING GAS.

SPECIFICATION forming part of Letters Patent No. 633,031, dated September 12, 1899.

Application filed May 2, 1898. Serial No. 679,529. (No specimens.)

To all whom it may concern:

Be it known that I, HANS NEUMANN, a citizen of Germany, residing at 31 Neuhofferstrasse, Cologne-Deutz, in the Empire of Germany, have invented a certain new and useful Process for the Continuous Production of Gas, (for which I have applied for a patent in Germany, dated October 10, 1897,) of which the following is a specification.

Producer-gas generated from bituminous coal by the forcing in of air with or without the addition of steam cannot be used for gas-motor engines, as the tarry constituents contained in the gas in becoming deposited clog the supply-channels and working parts of the motor.

The present invention relates to the continuous production of a gas from bituminous coal that shall be practically free from tar and other condensable constituents by so arranging the process of manufacture that after the gases have been produced from bituminous coal in a gas-producer in the ordinary way they are subjected to a second operation in a second producer, whereby the tarry constituents, &c., are converted into permanent combustible gases. For this purpose the bituminous coal is first treated in the ordinary way in a gas-producer for the production of generator-gas by the introduction of air-blast with or without the addition of steam, which gas will consequently contain all the distillation products of the coal—namely, hydrocarbons, tars, and ammonia. These mixed gases are then forced through an incandescent body of coke into which air is at the same time forced. The tarry constituents are by this means decomposed, the hydrogen being set free and the carbon converted into carbonic oxid. Also the other hydrocarbons are partially decomposed in a similar manner and the ammonia is decomposed into hydrogen and nitrogen. The heat absorbed by these chemical operations is replaced by the combustion of the excess of the entering air, which forms producer-gas with the incandescent coke.

The end product is a gas consisting mainly of carbonic oxid, hydrogen, and nitrogen. It may, however, contain small quantities of unreduced tar, and other hydrocarbons, as also ammonia and carbon dioxid, are still contained therein. The process is most advantageously carried out in two producers that are in connection with each other, but the invention is not limited to such an arrangement. On the accompanying drawings are shown, by way of example, various arrangements of gas-producers for this purpose.

Figure 1 shows a vertical section of an arrangement in which the two producers are arranged side by side. Fig. 2 shows a vertical section of an arrangement in which the two producers are arranged one above the other; and Fig. 3 shows a vertical section of a single producer divided by a partition into two chambers, each containing a body of incandescent coke, the gases produced in the one chamber being made to pass through the second chamber.

In the arrangement shown in Fig. 1 G′ and G^2 are two gas-producers, of which G′ is charged with bituminous coal through hopper F′, while G^2 is charged with coke or anthracite through hopper F^2. When in normal working condition, the producer G′ contains incandescent coke in its lower part, while the upper part is filled with freshly-charged coal. G^2, on the other hand, is entirely filled with incandescent coke. If now air be forced through the pipe L′ into the bottom of G′ with or without the addition of steam producer-gas will be generated, composed of carbonic oxid, nitrogen, and possibly some hydrogen, which gases, heated to a red heat, drive off the distillation products from the upper layers of coal and convert the coal into coke. As the coke lying on the grate becomes consumed by this process fresh coal is introduced through the feeding-hopper F′, which is in its turn converted into coke. The distillation products pass, together with the ordinary producer-gas, through the opening X at top into the pipe *y*, connecting the producer G′ with the bottom of producer G^2, which the gases enter at Z below the grate, whence they pass up through the mass of incandescent coke. At the same time air enters the lower part of producer G^2 at any desired point through the nozzles L^2. By this means the above-described decomposition of the gases is made to take place in producer G^2, the distillation products being made to combine with

the coke, forming carbonic acid and water, which are again converted in the upper part of the producer into carbonic oxid and hydrogen, in which form they pass off through the discharge-pipe A to wherever required.

In the modification shown at Fig. 2 the coke-producer G^2 is arranged immediately over the coal-producer G', so that the gases pass directly from the latter into the former, thus avoiding the use of the pipe *y* of the first arrangement. The ashes of the coke-producer G^2 in this case fall directly into the coal-producer. L' and L^2 are, as before, the air-supply pipes, and F' F^2 the feeding-hoppers.

In the arrangement at Fig. 3 the second producer G^2 is again arranged at the side of G', and the gases after rising up through the charge of the latter are made to travel in a downward direction through G^2. In consequence hereof the air-supply L^2 is arranged at the upper part of the producer and the discharge-pipe for the gases A at the lower end thereof. The producers can be constructed either separate from each other and connected by a pipe or channel or they can be combined to form a single producer, as shown. The first producer G' is again supplied with coal and the second G^2 with coke, there being arranged a separate feed-hopper over each chamber, as indicated by the dotted lines at F' F^2. In the arrangement shown in full lines a single feed-hopper F is provided intermediately between the two chambers, in which chambers both chambers are charged with bituminous coal. With this arrangement when in working condition both chambers will contain incandescent coke in their lower part and fresh coal in the upper part. The producer-gas generated in producer G' must be sufficiently hot to raise the coal in the upper parts of both producers to incandescence and to distil off their volatile constituents. At a suitable point of the producer G^2, below which the coal is already deprived of such constituents, a fresh air-supply is admitted through L^2 and the above-described action for the decomposition of the distillation products then takes place as they descend through the lower part of G^2. As the coke is gradually consumed at the grate of each producer the column of fuel sinks down and a fresh supply of coal is introduced through the hopper F and is equally distributed in both chambers.

For maintaining the working condition and for producing the requisite degree of heating in the two chambers the air-supply introduced through L' and L^2 can either be previously heated, or, on the other hand, steam can be introduced into the producer at suitable points, whereby, as is known, the temperature is reduced by the decomposition of the steam and formation of water-gas.

I am aware that it has already been proposed to cause the volatile constituents distilled off from the upper layers of fuel of a gas-producer to be brought into intimate contact with the layers of incandescent fuel in the lower part of the same producer for their conversion into permanent gases, but without the introduction of a special body of air for this purpose and I do not claim such a mode of operation as part of my present invention.

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

1. The method described for the continuous production of combustible gas from bituminous coal, which consists in forcing air through a body of incandescent bituminous coal, and then forcing the gases produced thereby through incandescent coke, together with an additional quantity of air and converting the volatile constituents into permanent gases, substantially as described.

2. The method described for the continuous production of combustible gas from bituminous coal, which consists in causing the volatile constituents carried along by the other gases to enter immediately into combination with an additional air-supply while passing through a body of incandescent fuel and thereby converted into permanent gases, all of said steps taking place consecutively in one continuous operation in the same gas-current, as set forth.

3. The method described for the continuous production of combustible gas, which consists in producing bituminous volatile gases mixing the same with volatile and carbonaceous gases, mixing the same with a second supply of air and converting the volatile constituents into permanent gases all in one continuous operation in the same gas-current, substantially as specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HANS NEUMANN.

Witnesses:
WILLIAM H. MADDEN,
GERDRUT STENZ.