

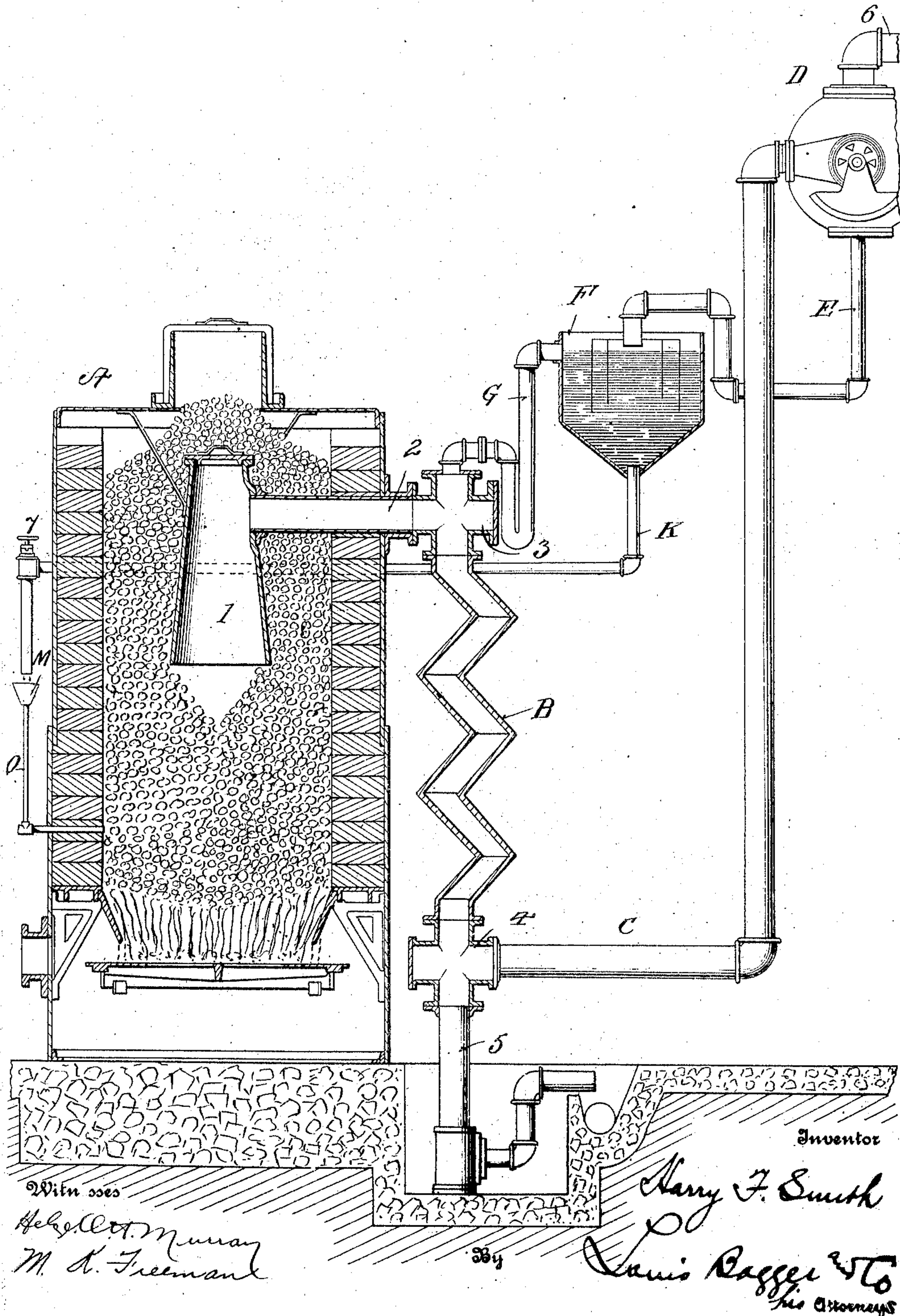
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APPARATUS FOR CONVERTING VOLATILE HYDROCARBONS INTO FIXED GAS.

APPLICATION FILED JULY 30, 1906.

928,076.

Patented July 13, 1909.





# UNITED STATES PATENT OFFICE.

HARRY F. SMITH, OF LEXINGTON, OHIO.

## APPARATUS FOR CONVERTING VOLATILE HYDROCARBONS INTO FIXED GAS.

No. 928,076.

Specification of Letters Patent.

Patented July 13, 1909.

Application filed July 30, 1908. Serial No. 446,153.

*To all whom it may concern:*

Be it known that I, HARRY F. SMITH, citizen of the United States, residing at Lexington, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Apparatus for Converting Volatile Hydrocarbons into Fixed Gas, of which the following is a specification.

My invention relates to an improvement in apparatus for gasifying the volatile hydrocarbons contained in coal, the object being to obtain a fixed gas, and it consists in means for converting tar and volatile matters contained in coal, such for instance as bituminous coal, which are ordinarily condensable by separating the tar and volatile matters from the coal and thereby generating fixed gas.

The invention consists in certain novel features of construction and combinations of parts which will be hereinafter described and pointed out in the claims.

In the accompanying drawing I have shown a view partly in section of my improved form of apparatus.

A represents the producer, which is of the general type of producer furnaces, but which is adapted to carry a deep bed of fuel. Supported from the top of the producer and in the center of the furnace is a tubular receptacle 1, from which a pipe 2 extends through the side of the producer which carries the gas from the producer. A coupling 3 is connected to the pipe 2 and extending downwardly and connected to the coupling is a zig-zag pipe B for scrubbing and cooling the gas. The gas as it passes from the furnace is subjected to a treatment of water and by the zig-zag formation of the pipe the gas is cooled by coming into contact with the water and at the same time the coarse dirt is washed from the gas. A coupling 4 is connected to the pipe B and from this coupling a drain pipe 5 is connected, through which the dirty water passes to the sewer or drain. Pipe C is connected to the coupling 4 and conveys the gas to a tar extractor D, which may be of any approved form. The tar and the water associated with it are extracted from the gas and the clean gas will pass out from the extractor through the pipe 6. The tar and water will pass out of the extractor D through a pipe E and will be conducted to a separator F. The tar, being heavier than the water, will go to the bottom

of the separator, where it passes through a pipe K and from this pipe it empties into a funnel M connected to a pipe O, the pipe O leading into the producer at a sufficient height above the grate to discharge the tar into the mass of incandescent coke that lies within the lower part of the producer, and in contact with this hot coke the tar is broken up, being then decomposed in the fixed gases and discharged as such from the top of the producer. Any portion of the tar which might not be decomposed by this process is separated from the gas again by the tar extractor D and returned to the fire in the manner above explained. The tar is admitted to the furnace through the pipe O by the operation of a regulating valve 7 connected to the pipe K.

A pipe G is connected to the separator F, which conveys the water from the separator to the coupling 3, to which the pipe is connected, and this water from the separator passes through the scrubber B for washing and cooling the gas, thereby using the same water twice, in the tar extractor and the scrubber. The fuel is blasted with air or air and steam continuously but means for accomplishing this is not shown, thus keeping the temperature of the fuel bed uniform, giving a continuous and proper operating temperature.

The gas and water are thrown from side to side by the zig-zag scrubber B and in this way thoroughly mixed. The gas after being cooled is treated to a second cleaning operation for removing the tar by the extractor D, where any condensable substances, such as tar, which are detrimental to the use of the gas are extracted. From this extractor clean gas is passed to the gas tanks or any suitable receptacles for use. The tar extracted from the gas together with the water which may be associated with it, providing water is used in the tar extractor, will pass through the pipe to a separator where the tar and water are separated, the water passing from the separator to the scrubber and the tar to the furnace.

By this system I have provided means whereby the gas can be thoroughly cleaned and the tar and other condensable substances are conveyed to the furnace after the gas and tar have been separated. In this manner not only a convenient means is provided for disposing of the tar, but also for increasing the producer efficiency by con-



verting into gas its thermal energy, and by this method the calorific intensity is also increased since the gas resulting from the decomposition of the tar in contact with the  
5 hot coke consists almost entirely of gas of high calorific intensity, such as marsh gas and olefiant gas, and these constituents are very desirable in the producer gas for whatever purpose it may be employed.

10 The advantages of this method are immediately apparent for the reason that in most instances the tar is disposed of as a by-product and is never converted into fixed gas in the producer. In many instances and  
15 under certain conditions the disposition of a quantity of tar as a by-product in this way is a difficult and expensive matter, and even could it be disposed of, it is on account of its high heating value much more valuable  
20 as a gas producing agent than as a by-product for other uses, and the manner of returning the tar to the producer as outlined not only makes a convenient way to dispose of the tar, but increases the producer effi-  
25 ciency by converting the tar into gas.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

30 1. An apparatus for converting volatile hydro-carbons into fixed gas which consists of a producer, a cooling and scrubbing means connected to the producer, an extractor connected to the cooling means for separating the gas and tar, a separator connected to the

extractor for separating the tar from water 35 and any foreign matter, and means for conveying the tar from the separator to the producer where it is converted into gas.

2. An apparatus for converting volatile hydro-carbons into fixed gas which consists 40 in a producer, means connected to the producer for scrubbing and cooling the gas, an extractor connected to the cooling means for separating the tar and water from the gas, a separator connected to the extractor for 45 separating the tar and water, means for conveying the tar to the producer and converting it into gas, and means for conducting the water from the separator to the scrubbing and cooling means. 50

3. An apparatus for converting volatile hydro-carbons into fixed gas which consists in a producer, a pipe connected to the producer for conducting the gas from the producer, an extractor connected to the pipe 55 for separating the tar from the gas, a separator connected to the extractor for separating the tar and water, and means for conducting the water from the separator to the pipe connected to the producer for scrub- 60 bing and cooling the gas.

In testimony whereof I affix my signature, in the presence of two witnesses.

HARRY F. SMITH.

Witnesses:

A. B. BEVERSTOCK,  
R. B. HUNTER.