Sept. 27, 1932. W. BENNHOLD 1,880,010

WATER GAS GENERATOR

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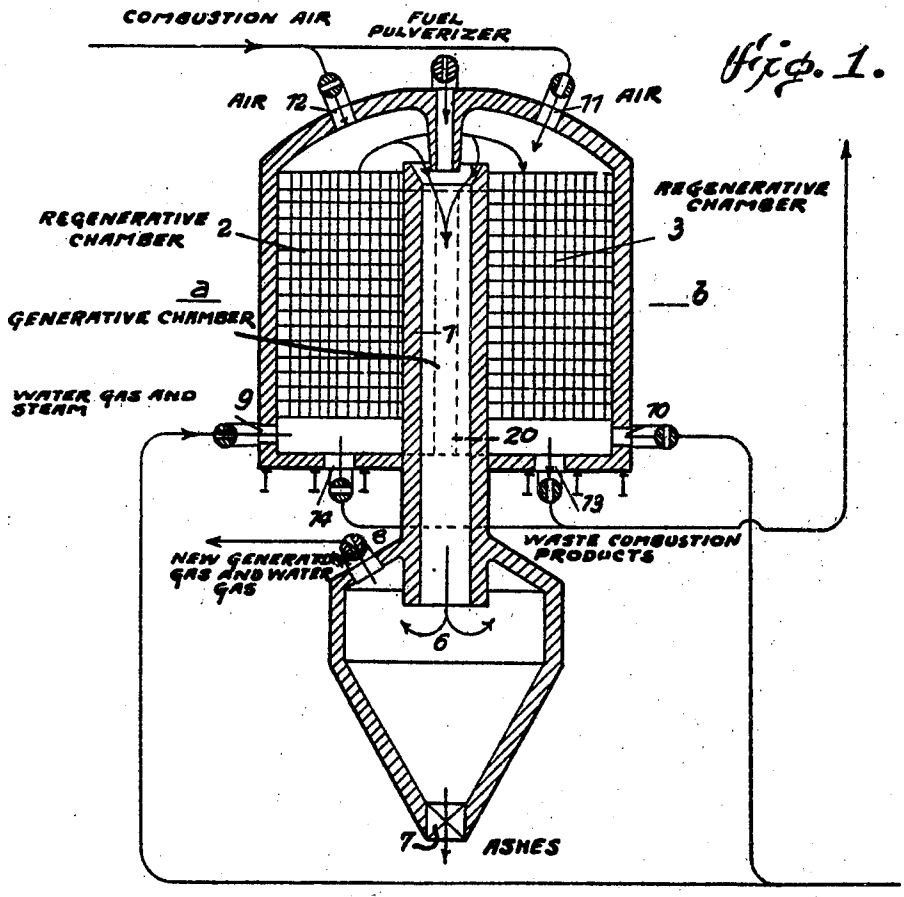


Fig. 1.

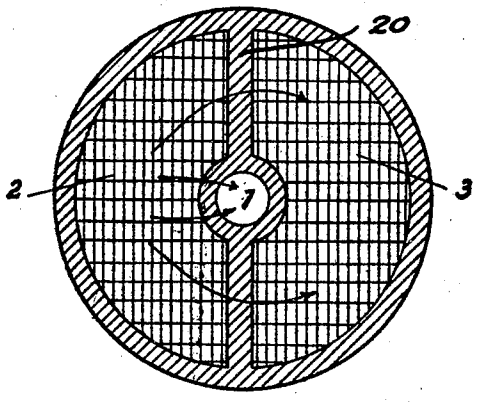


Fig. 2.

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UNITED STATES PATENT OFFICE

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WATER GAS GENERATOR

Application filed August 15, 1928, Serial No. 299,789, and in Germany August 19, 1927.

This invention relates to a water-gas generator for the gasification of pulverulent or granular fuels in continuous operation.

It is known in the case of water-gas generators operating in continuous process to charge a current of water gas or a mixture of water gas and steam with the heat necessary for forming the gas, the said current or mixture respectively—heated in a special heating apparatus—conducting the heat to the gas generating shaft.

In order to ensure as little loss of heat as possible, it is quite essential to arrange the heating apparatus as far as possible in direct vicinity of the generator. It might, therefore, seem obvious to dispose the heating apparatus annularly about the gas generating shaft, but this is accompanied by the disadvantage that the outer jacket of the heating apparatus and the base area of the total arrangement are very large. The arrangement in question moreover results in the fact that the lower parts of the distilling shaft, including for example the ash-removing means, are situated in an extremely unfavorable position, and are not very readily accessible.

The disadvantages in question, however, do not occur if pulverulent or granular fuel is employed as in this case the shaft may be substituted by a pipe having a relatively small interior diameter. An extremely simple arrangement is obtained if, for example, the heated gas is allowed to emerge from the two-chamber heating apparatus at the top and then passed perpendicularly into the centrally situated conversion pipe, after the pulverulent fuel has previously been continuously added. The inner position of the pipe ensures that practically no heat whatever is discharge towards the outside.

The lower end of the pipe may in very simple and effective manner be constructed as ash discharging or separating means.

The construction according to the invention is extremely compact having a relatively small base area.

The invention will now be described more fully with reference to the accompanying drawing, which shows the apparatus in vertical section in Fig. 1 and in Fig. 2 in horizontal section along line *a*—*b* of Fig. 1.

Referring now to the drawing, 1 is the centrally arranged tubular generative chamber for water gas, which is surrounded by the two-chamber regenerator comprising the compartments 2 and 3 divided by partition 20. The heated water gas or mixture of gas and steam enters at 4 at the upper open end of said chamber, proceeding either from the chamber 2 or the chamber 3, while the pulverulent carbonaceous fuel such as coal dust, for instance, is continuously introduced at the top inlet at 5 in a known manner, or by the use of known supply means respectively. The heated mixture of gas and steam is brought from the hot regenerative chambers at a temperature necessary for the reaction. Immediately after the fuel meets with the hot mixture of steam the water gas commences to form. With the arrangement selected sufficient time will be available for the complete conversion, as the process may be extended over a relatively long period of time without any disadvantages being incurred.

The tubular chamber 1 may be widened at the bottom at 6, thus reducing the speed of the generated water gas, so that the ash and the gas will readily separate. The ash may be removed at 7 by means of a valve or in any other suitable manner. The widening of the chamber and the reduction in the speed of the gas thus caused results in an additional important feature, viz., that any particles of fuel in the upper part of the tubular chamber which have not been consumed are provided sufficient time for complete conversion into gas, so that, therefore, a fully degasified ash is formed. The gas generated is discharged at 8.

The hot gas mixed with steam and fuel may also be allowed to enter at the bottom, the resulting products being removed from the pipe at the top. This arrangement, however, appears to be less favorable in view of the removal of the ash and the necessity for injecting the fuel with the gas into the pipe. In the case of the first construction the fuel enters the pipe under its own weight.

Should particular importance be attached

to a thorough mixing of the fuel and mixture of gas and steam, or if the particular coal employed distills very slowly, no objection exists, even in the case of the construction as shown in the drawing (in which the gas passes from the top to the bottom), to mixing the coal with the gas prior to the introduction into the gas generative chamber 1, and to injecting the same into the chamber in the same manner as would be done in the second form of construction (passage from the bottom to the top).

Referring to the heating or regenerative apparatus, the gas to be heated, or the steam respectively, is introduced at the bottom at inlet 9, or 10. The heated mixture flows at 4—as already mentioned—partly into the pipe 1 and partly into the second chamber 3 in order to heat the same after the addition of combustion air through the admissions 11 and 12. The resulting products of combustion are discharged at 13. After the heating of the chamber 3, or the cooling of the chamber 2 respectively, a reversal is effected. Despite the alternate operation of the regenerative chambers the gas generation in the tubular chamber 1 proceeds without interruption.

What I claim as new and desire to secure by Letters Patent is:

An apparatus for continuous generation of water gas by the use of pulverized fuel, comprising a tubular water gas generating chamber having an enlarged portion at its lower end forming a gas and ash separating receptacle, a double-compartment regenerative heating chamber surrounding said generating chamber, means for feeding pulverized fuel and steam to the upper end of the gas generating chamber, and other means at the lower end of said heating chamber for feeding gas and steam thereto, whereby heat is supplied for generating the water gas.

In testimony whereof I have affixed my signature.

WALTER BENNHOLD.