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PROCESS OF GENERATING WATER GAS.

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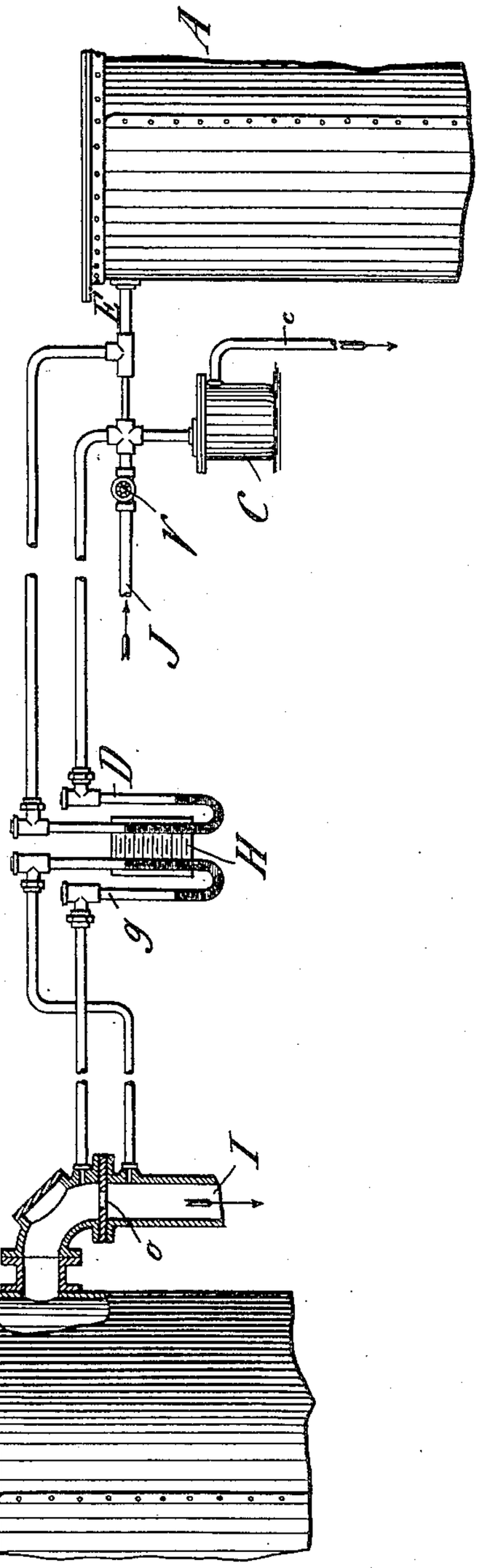
898,803. Patented Sept. 15, 1908.



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UNITED STATES PATENT OFFICE.

HUGO STRACHE, OF VIENNA, AUSTRIA-HUNGARY.

PROCESS OF GENERATING WATER-GAS.

No. 898,803. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed November 30, 1901. Serial No. 84,210.

To all whom it may concern:

Be it known that I, HUGO STRACHE, chemist, a subject of the Emperor of Austria-Hungary, residing in Vienna, IX, Alserstrasse 49, Austria-Hungary, have invented a new and useful Process of Generating Water-Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The invention consists in a process of forming water gas by which more profitable results are secured from the fuel than heretofore through a more economical manipulation during the blast. During the blast, as little heat as possible is allowed to escape with the gases, and, instead, the blast is so controlled that as much of the energy or heat of the burning material as possible is left behind, whereby, when the apparatus is reversed and the steam impelled through the fuel, an increased quantity of water gas will result.

In most of the processes heretofore known there is the great objection that an undue amount of blast air was necessary and that resulted in the objection that a very high temperature ensued. The result therefore was that the burning gases left the generator at a very high temperature—600° C.—1000° C., whereby, during the blast, a very great amount of heat was lost—an obviously unprofitable feature.

One of the main causes for the losses derived during the blast according to most of the processes heretofore used consists, as already stated, in that too great a blast of either long duration or high velocity, is used so that the upper part of the fuel layer becomes too hot if the blast is long continued, or, if the blast is of high velocity, the combustible gases do not have time to transmit their heat to the upper part of the fuel layer and therefore carry the heat away with them unused.

It being recognized that a certain temperature in the lower part of the generator makes itself evident through a given condition in the carbonic acid produced, said condition can be used as a measure for the temperature of the lower part of the generator. This experience is utilized to arrange the warm blasting by continuous observation of the amount of carbonic acid contained in the waste gases in such a way (by means of a specially built device) that a temperature most suitable for the making of gas is obtained by the warm blast.

It has become known, that if air is blasted into a generator, by the combustion, carbonic acid only is produced as long as the temperature of the burning fuel is low even if the column of the burning fuel be large and the velocity of the blast low. It is also well known that the production of the carbonic acid commences if the temperature of the superior layers has been raised so far that a reduction of carbonic acid ensues. Hence it follows that the amount of carbonic acid in the waste gases (the generator gas) constantly decreases during the first stages of warm blast.

The object of the invention consists in that the warm blast is interrupted as soon as the formation of carbonic oxid becomes so plentiful at the high temperature that the efficiency of the warm blast hereby becomes diminished. This is the case if the amount of the carbonic acid of the waste gases decreases to about 12%, the amount of the carbonic oxid being equal at this stage of warm blast to approximately 15%. If the amount of the carbonic acid further decreases, the efficiency of the warm blast becomes diminished. If a larger hourly output shall be obtained, the velocity of steam and therefore the temperature must be increased in such a way that by the blast a low amount only is present of the carbonic acid in the waste gases. Yet the amount of carbonic acid shall never become smaller than 6%. At the same time a lower velocity of the blasting air may be employed whence on the one hand the advantage of a low opposing pressure (required power) results, in spite of the large height of the fuel column (2,5 m height and 1,9 m diameter of the generator); on the other hand a most complete delivery of heat to the upper layers is hereby effected, with the result that the waste gases escape having a temperature of 200° C. approximately.

The process itself is put into practice in the following manner: The fuel is maintained to the height of about $2\frac{1}{2}$ m in a generator of the ordinary form. The blast is directed as usual from below, but the air pressure is less than that used up to the present time; the air pressure ought to be between 50 to 100 mm

water-column, whereby a blast velocity of 0.1 to 0.5 m per second is obtained. After starting the blast the quantity of carbonic acid and carbonic oxid contained in the waste gases is ascertained by a special apparatus which is inserted into the fuel, and as soon as the amount of carbonic acid, which is very high at the beginning, decreases to about 12%, and the amount of carbonic oxid, which is very small initially, rises to about 15%, the blast is stopped. The time for the blast is about 1 to 2 minutes, although it may be continued until the amount of carbonic acid falls to 6%, assuming that the amount of carbonic acid does not exceed 15%. Following the blast comes the gas-making period, and during this time the steam jet is directed in a well known manner from the upper part of the generator to the bottom. The steam is led through the layer of fuel with a smaller velocity than that used up to the present time, to wit, about 0.05 to 0.15 m per second, whereby a nearly perfect decomposition of the steam is obtained and no undecomposed steam flows into the gas piping. The gas-making period should continue for about 5 to 8 minutes.

By my process, the great loss of heat heretofore experienced during the blast is saved by maintaining a uniformly apportioned temperature in the lower as well as in the upper part of the generator, whereby there is still produced a large amount of carbon monoxid (more than 15%), but not near so much as by the processes heretofore known. Moreover, by my process the blast is interrupted at a higher amount of carbonic acid, that is, about 12% to 6%, while according to most of the previous processes the blast period is continued at a very high velocity and to the amount of 5%–2% carbonic acid; this increase of carbonic acid is, however, not the only advantage, for in my process a large amount of heat which would be otherwise carried away by the gases during the combustion in the lower part of the fuel layer is transmitted to the upper part thereof, and this is accomplished by keeping the upper part of the generator as cool as possible, *i. e.*, by using a blast of short duration and low velocity. The temperature condition of the fuel is light red.

To illustrate more specifically: A generator having an inner diameter equal to 1.9 m is filled with coke up to a height of 2,5 m. Air is then introduced from below for the purpose of warm blasting into the glowing coke, the quantity of air being 120 m and the speed preferably 0.5 m per second. The waste gases escape at a temperature of 200° C. and are continually examined by an apparatus provided for that purpose with regard to the amount of carbonic acid which they contain. If the latter becomes as low as 12%, the amount of carbonic monoxid rising at the same time to approximately 15%, the warm blast is interrupted so that steam may be admitted; but the blasting may be continued until the waste gases contain only 6% of carbonic acid. Hence the warm blast may continue for 1–2 minutes, according to the amount of carbonic acid corresponding to which the blasting has been carried out. With an opposing pressure of 100 mm, the power needed will be theoretically 3 and practically 5 H. P., while according to the older processes 20 H. P. would be needed for the same output.

After the warm blasting, steam is driven from the top and caused to pass toward the lower part of the apparatus through the glowing coke-column, becoming decomposed into water gas which escapes by a pipe provided in the lower part of the generator. The admission of steam is effected for from 5 to 8 minutes, the actual duration depending upon the time needed for admission of air. The steam is admitted through a pipe of 28 mm inner diameter, the steam pressure amounting in the pipe to 240 mm mercury-column and the steam velocity in the generator being as high as 0.05–0.15 m per second.

According to the old processes the blasting has been effected during say 6–10 minutes and the gasing during 5 minutes only. Hence 20–25 minutes have been available for passing the steam through the apparatus. Of course with my process the blast is effected during only 1–2 minutes and the gasing during 5–8 minutes, so that 40 to 50 minutes are available for passing the steam through the apparatus. Thus an increased hourly output of the generator is obtained.

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

The process of producing water gas which consists in first blasting air into the fuel until the average contents of the combustion gases amount to 12 to 6% of carbonic acid and at least to about 15% of carbon monoxid and while the temperature condition of the fuel is light red, and then blasting steam into the fuel, substantially as described.

In testimony, that I claim the foregoing, I have hereunto set my hand this sixth day of November, 1901.

HUGO STRACHE.

Witnesses:

C. B. HURT,

ALVESTO S. HOGUE.