Feb. 20, 1934. N. E. RAMBUSH 1,947,614

MANUFACTURE OF WATER GAS

Filed March 31, 1930

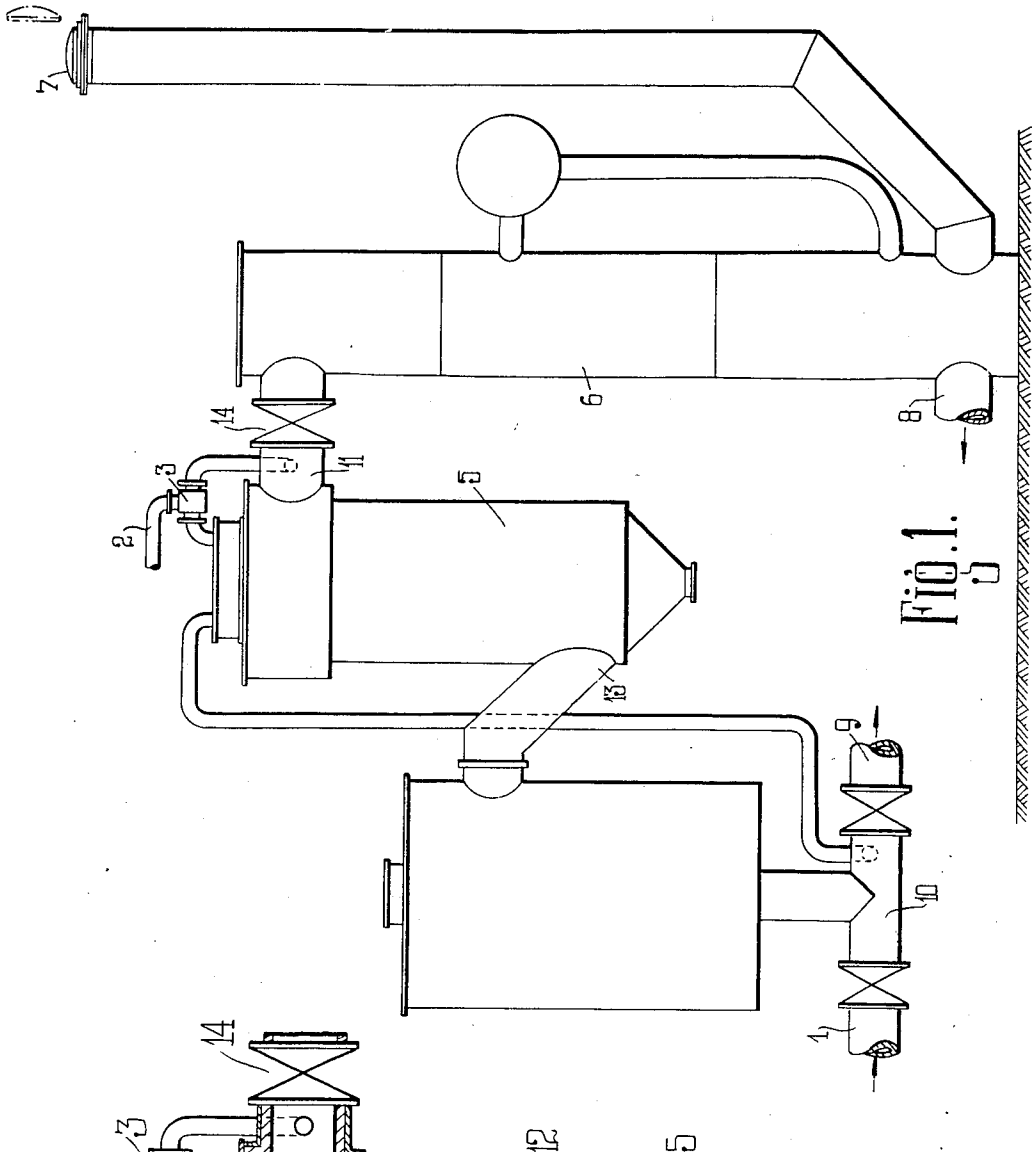


Fig. 1.

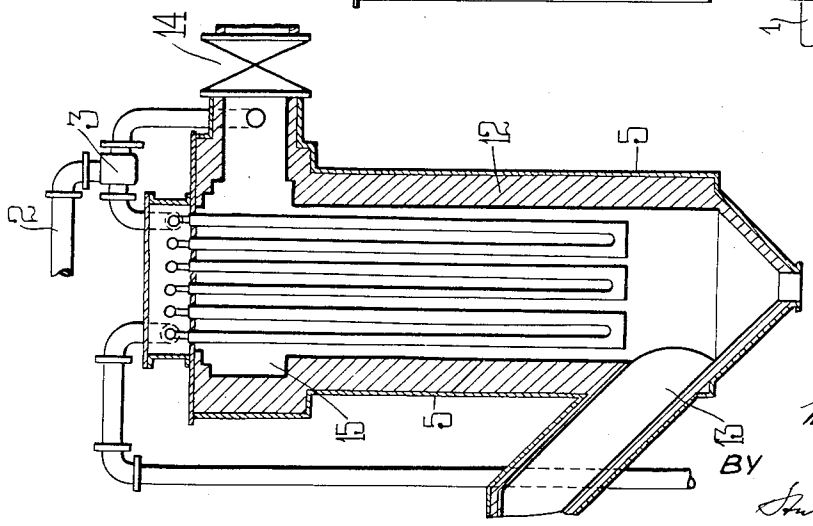


Fig. 2.

INVENTOR
Niels E. Rambush,
BY
Strauch & Mann,
ATTORNEY

Patented Feb. 20, 1934 1,947,614

UNITED STATES PATENT OFFICE

1,947,614

MANUFACTURE OF WATER GAS

Niels Edward Rambush, Stockton-on-Tees, England, assignor of one-half to The Power Gas Corporation Limited, Stockton-on-Tees, England, a British company

Application March 31, 1930, Serial No. 440,398, and in Great Britain April 23, 1929

1 Claim. (Cl. 48—204)

This invention relates to improvements in processes and apparatus for generating water gas.

The water gas process consists in treating fuel with alternate currents of air and steam. The gas made from the steam is collected whereas that made from the air is blown into the atmosphere. The steam may be passed alternately in an upward direction (the "up-run") and in a downward direction (the "down-run").

A certain amount of waste heat may be contained in the "blow" gases and it is usual to pass such gases through heat absorbing apparatus so as to make this loss as small as possible. The steam introduced into the generators is very often wet and it has been found of general advantage to superheat this steam previous to its entry to the generator.

The steam may be superheated by direct contact with chequer brickwork, or indirectly as in British Patent No. 288,463 complete accepted April 12, 1928 by passing through tubes covered with sleeves of a non-metallic material of high heat storage capacity.

The present invention has for its object the combination in one apparatus of the advantages of both systems of steam preheating.

It has been proposed to insert a steam superheating coil in a passage between two generators, the steam being passed alternately up and down through the generators and therefore through the passage connecting them, but in this case the steam water gas mixture passing externally of the superheater tube is not superheated by its passage, but serves to superheat the internal steam.

According to the invention steam is superheated alternately or simultaneously inside and outside the tubes of a water gas generator tubular superheater.

The steam superheated may be partly or entirely the steam employed in the process. That is to say the waste heat may be used partly for superheating the steam employed in the process and partly for superheating steam obtained from another source, or destined for another end, or it may be entirely used for superheating the process steam.

A waste heat boiler may be provided and the waste heat boiler steam may be kept separate from the process steam or may be employed in the process either during the up run or during the down run, or during both.

According to a further feature of the invention, the superheater tubes are first heated by the blow gases, with or without the introduction of secondary air, steam is then superheated by passing internally through the tubes during the up-run, and then when the up-run is ended, steam is passed round the outside of the tubes, as well as inside them, preferably until the end of the down-run.

Steam may be sent through the tubes during the blow period though of course such steam is not employed in the generator to which the superheater is attached. It may however be used in another generator.

The steam, preferably from the waste heat boiler may be passed continuously through some of the tubes.

The waste heat boiler steam may also pass through the whole of the tubes when these are not occupied by process steam.

In one preferred modification of the invention, the steam from the waste heat boiler is superheated inside the tubes, and may be used in the water gas process or not, while the process steam is heated outside the tubes, preferably during the down run.

Preferably the steam is superheated inside the tubes during the up-run and outside the tubes during the down-run. Preferably also the inside and outside heating are obtained in the same superheater, though two different and separate superheaters may also be employed. In this case the steam will be passed through the inside of the tubes of the one superheater and round the outside of the tubes of the other alternately.

The preferred apparatus according to the invention comprises therefore, a generator, a tubular superheater, and suitable valves and connections for passing the steam during the up run through the tubes, and during the down-run outside the tubes.

According to a further feature of the invention, the gases from the generator are introduced into the preheater at the bottom thereof and preferably in a downward direction so that they do not impinge directly on the tubes and thus cause damage. The gases may be introduced tangentially as in a cyclone separator. An enlargement in the diameter of the outer casing and brickwork lining may be provided to effect a good distribution of gases around the preheating elements.

The appended figures illustrate the preferred form of the invention.

Figure 1 is an elevation of a water gas plant according to the invention while Figure 2 is a vertical section of the preheater.

1 is the air inlet, 2 the steam inlet, 3 a valve for deflecting the steam so that it can be made to flow in either an upward or downward direction through the generator at will as is well understood, 4 is a water gas generator, 5 the preheater, 6 the waste heat boiler, 7 the outlet to the atmosphere for waste gases produced during the air blow period, 8 and 9 the outlets for water gas produced during the up and down run periods respectively. 10 is the point of admission of preheated steam to flow in an upward direction through the generator and 11 the point of admission of steam to flow in a downward direction through the generator.

In Figure 2 there is shown a brick lined steel vessel 12 having at its lower end a downwardly inclined gas inlet 13 and near the top a gas outlet valve 14, though preferably the valve 14 is not as shown on the pipe 11 connecting the waste heat boiler and superheater but on the pipe 8. An enlargement in the diameter of the outer casing and brick lining to give an annular space 15 is provided to effect a good distribution of gases round the preheating element.

A number of preheating elements 16 as described in British Patent No. 288,463 are disposed inside the brick lined vessel 12. The steam to flow in an upward direction through the generator will enter the system at 2 and flow through the three-way valve 3 which will be set to deflect the steam to flow through inside the preheating elements 16, leave these at 17 and enter the bottom of the generator at 10 (Figure 1). During the steam "run" period the three-way valve 3 will be changed over. The steam to flow in a downward direction through the generator will also enter the system at 2 flow through the three-way valve 3 which will now be set to deflect the steam to flow inside the brick vessel 12 and round the outside of preheating elements 16 leave the vessel 12 through the inclined connection 13 to generator 4 and so in a downward direction through the generator. The steam during the whole of the "run" period will therefore be preheated. The water gas leaving the generator at 9 may be passed to a waste heat boiler.

While have described my invention more particularly with reference to the tubes having covers of fire-brick or other non-metallic material, illustrated and claimed in British Patent No. 288,463, I wish it to be understood that I do not confine myself thereto, since in many cases metallic coverings may be advantageous.

I claim:

In a process of manufacturing water gas, passing primary air through a coke bed, leading off the air blow gases thus produced, burning same in contact with preheater elements by means of secondary air, while avoiding the direct impingement of said blow gases on said elements, at the same time passing steam through said elements, cutting off said primary and secondary air, leading steam through said elements to super-heat same, and up through said coke bed, cutting off said steam, and leading steam around said preheater elements to superheat same and down through said coke bed.

NIELS EDWARD RAMBUSH.