Gumz, Wm.

Criticism of Rittershaussen's process.

The idea to make watergas by electric heat is not new. Yet the watergas production could not be adopted from economic reasons in any considerable extent. Only in Norway and in an experimental scale in Upper Italy small plants have been errected, wherefrom it may be seen that economy seems to be bearable only with cheap water power. The proposal to gasify powdered coal in suspension by internal electric heating is not new and already contained in the Winkler patent of I.G. Farben but not realized in practice.

The Rittershaussen process.

Rittershaussen proposes to introduce superheated steam of 1000°C (= 1832 °F), alternatively 400°C (= 752 °F) to a producer internally heated by electric current while finely ground coke or powder, preheated to 600°C (= 1112 °F) will be fed from the top, both technical proposals which are by no means easy to be solved with high requirements to the building materials. Nothing is said about how this high preheating practically should be done which is necessary to realise this preheating and in which way this demand will be covered. In order to examine the proposals some more technical details must be available.

The internal heating ist not an easy task, because the dusty steam-gas-mixture must flow around the heating coil, so that a heavy tear and wear may be expected. Radiation of heat cannot be sufficient to deliver the necessary heat of reaction to the suspending powdered coke. At the other hand slagging of the coil may upset the efficiency and the endurance of the heating system.

Rittershaussen is right that fine grinding is essential but when using coke an extra power consumption and a considerable tear and wear of the mill (high cost of repair and conservation) will take place. Yet his proposals show that he has not a clear conception how the process of gasification in suspension will go on if he writes in his paper that "steam velocity will be regulated in such a way that a steady falling down of the particles is reached until their complete dissolution".

It has been overlooked that the product of the mill is by no means an equal - sized powder but a broad range of grain sizes In consequence it will not be possible to prevent that with a steam velocity according to the suspension velocity of the biggest particles which should not come down the finest particles will be discharged too quickly from the reaction zone. One must be afraid that with this proposal of R. a big part of the coke dust will not reach the reaction space at all but will be lifted. In this case the capacity of the producer (Nm^3/m^2 h) would be only small and the carbon consumption only poor. The gas output is estimated too high by the author as may be seen, and carbon losses not considered in due course.

Comparison with electric shaft producers.

The Hole-producer (named after its Norwegian interventor Mr.Hole) which may be considered in comparison, reaches a gas output of 3 Nm^3/kg (= 48 cb.ft./lb) (N.T.P.) at an exit temperature of 400 - 500°C (= 752 - 932°F) and a current consumption of 1,5 kWh/Nm^3 (= 0,044 kWh/cbft) or 4,5 kWh/kg fuel (= 2,09 kWh/lb). With a powder fuel producer with at least 900°C (= 1652 °F) exit gastemperature and substantially higher carbon losses gas output may be estimated to about 2 - 2,5 Nm^3/kg (= 32 - 40 cbft/lb), current consumption to 1,8 - 2,25 kWh/Nm^3 (= 0,051 - 0,064 kWh/cbft.) of water gas, that is more than double the amount as Rittershaussen has calculated.

It should be examinated how the optimistic dates of Rittershaussen came along, if there are erroneous assumptions of the losses or if they are based on experiments. The latter may not be expected.

Economy.

Following the calculations of R. there is no economical advantage from the point of view of present coal economy as he gets a surplus of coal consumption himself compared with present-day methods of water gas production.

If we take even a coke consumption of only 0,4 kg/Nm^3 0,025 lbs/cbft. water gas and a power consumption which favourably may be 1,5 kWh/Nm^3 (= 0,044 kWh/cbft) (as reached in the Hole producers but probably not with the R. process) the total fuel demand to produce 4.10^6 Nm^3 (= 141.10^6 cbft.) of water gas (according to the example of R.) amounts to 4 600 t/a (5070 short tons/year). It is composed of 1600 t/a (1763 sh.t/year) powdered coke and 3000 t/a (3307 sh.t./year) coal for the production of 6.10^6 kWh. This means double the sum necessary for the same amount of water gas.

Conclusions.

The proposal of R. is very interesting for the equalization of energy between gas work and power station, that is from the point of view of public utilities, although the production peaks cut off by gas accumulators (gasholders) means an enlargement of first cost of gas, as the accumulation of such a low grade gas needs more gasometer space.

From a technical point of view the process is not mature for practical use. If ever semi-technical tests have been made cannot be concluded from the dates available, it cannot be assumed.

From an economic point of view, especially from fuel economy considerations, the process has no interest at all, not even in an experimental scale.

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