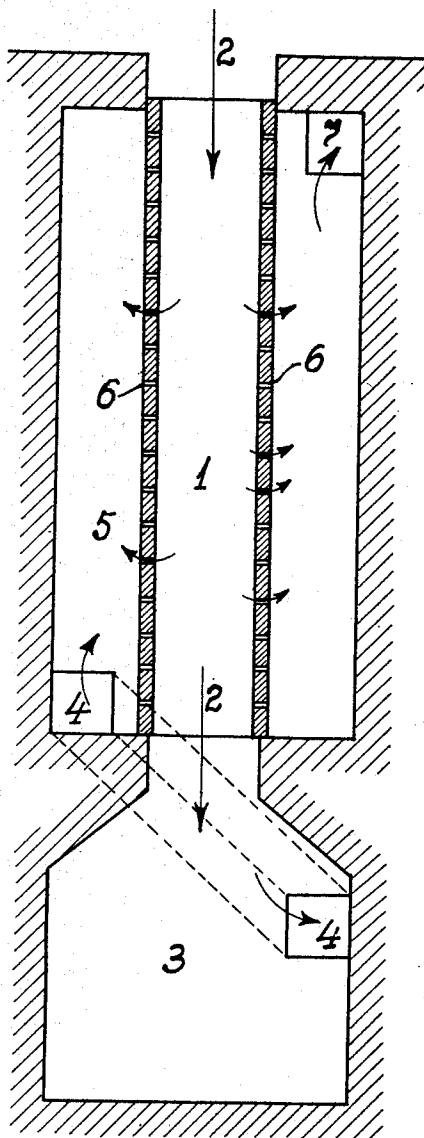


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PROCESS FOR THE THERMAL DECOMPOSITION OF GASEOUS HYDROCARBONS,
NATURAL GAS, OR THE LIKE BY HEAT
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UNITED STATES PATENT OFFICE.

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PROCESS FOR THE THERMAL DECOMPOSITION OF GASEOUS HYDROCARBONS, NATURAL GAS, OR THE LIKE BY HEAT.

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This invention relates to a process of decomposing gaseous hydrocarbons, such as natural gas or the like, by heat.

When effecting the decomposition of gaseous hydrocarbons, natural gas or the like in practice by heat, in order for example to obtain soot (carbon black), electrode-carbon, and the like, the aim has always been to make the walls separating the heating chamber from the decomposition chamber, for example the retort walls or chamber walls, as tight as possible, in order on the one hand to prevent the inflow of air or heating gases into the decomposition chamber, and on the other hand to prevent the decomposed gas from entering the heating chamber.

The use of retorts or chambers with gas-tight walls is however attended with many disadvantages. If the retort is glazed, the cost of production is increased, and opportunity for the reduction of silicic acid is afforded. If, on the other hand, the retort is constructed of a material of a porcelain-like character sintering only at a high temperature waste takes place when firing the retorts or chambers which are generally of considerable length, 5-6 metres in consequence of their great shrinkage and deformation, and thus an increase in the cost of production is unavoidable. Moreover owing to such shrinkage, such retorts had to be provided with walls of comparatively considerable thickness and thus an inferior heat transference had to be taken into account. Finally retorts with gas-tight walls were very sensitive in practice owing to the fluctuations in temperature caused by draughts of air or jets of flame.

The invention enables the aforesaid disadvantage to be obviated and to this end consists essentially in effecting one part of the heating of the decomposition chambers in a known manner by means of the products of decomposition led from the decomposition chambers through conduits—and if desired through regenerators—into the heating chamber, whilst effecting the other part by means of the decomposition gases, passed directly from the decomposition chamber through the walls thereof.

In order to understand more clearly the in-

vention reference is made to the accompanying drawing which shows a diagrammatic section of an apparatus suitable for carrying the invention into practical effect.

1 is the decomposition chamber through which the natural gas is passed, for instance in the direction of the arrow 2, and is thus more or less decomposed. The gas mixed with soot, carbon and the like, passes into the soot chamber 3, where the greater part of the solid decomposition products are deposited whilst the decomposition gases are conducted into the heating chamber 5 through the conduit 4, and are there burnt in admixture with air, whereby the wall 6 separating the heating chamber 5 from the decomposition chamber 1 is heated. The gases are finally conducted away through the flue 7.

Hitherto the walls 6 have been made of material which is as tight as possible, and the process has been conducted in such a way as to allow no gas to pass from one chamber into the other.

It is however possible to provide the walls of the decomposition chambers with openings and to supply the gaseous hydrocarbons, natural gas or the like to the decomposition chamber at a higher pressure than that of the heating chamber so that initially part of the gaseous hydrocarbons, natural gas or the like flows directly through the perforations of the walls into the heating chamber where it burns in immediate proximity of the walls, thus heating the decomposition chamber to the desired temperature.

In consequence of thermal decomposition the openings are gradually blocked by the carbon, so that after some time practically no more undecomposed gaseous hydrocarbons, natural gas or the like can escape through the openings of the walls into the heating chamber. However hydrogen still diffuses into the heating chamber through the openings blocked by porous carbon and burns in immediate proximity of the walls of the decomposition chamber in the same way as before, whilst the excess of decomposition gases flows in a manner known per se from the decomposition chamber through conduits, into the heating chamber, to which naturally a corresponding amount of combustion air must be supplied.

Inasmuch as part of the decomposition gases burns in immediate proximity of the walls of the decomposition chamber their heating power is utilized to advantage. 5
 Moreover since this part of the decomposition gases forms a glowing gaseous shell surrounding the entire decomposition vessel, the latter is effectively protected against fluctuations of temperature. The uniformity of the heating is moreover ensured by the fact that the deposition of carbon takes place more slowly at the moderately heated parts of the chamber walls so that the free cross section of the openings, and the corresponding amount of gas passing there- 10
 through remains larger at those parts, so that the chamber is there heated to a higher degree than at the originally hotter parts. Thus the temperature of the walls is automatically equalized by the decomposition of the gaseous hydrocarbons, natural gas or the like and subsequent deposition of carbon. 20

Instead of providing the walls of the chamber or retort with artificial openings, they can be constructed of porous material or of porous carbon. The process is in this case carried out substantially in accordance with the example above-described. Inasmuch, however, as the distribution and the number of pores is more uniform and greater than those of the artificial openings, the heating of the retort by the diffusing gases will also be more uniform. Such retorts with porous walls are not only essentially cheaper than those of gas-tight material with artificial openings, but are also considerably more durable in practice. 30

Whilst I have hereinbefore described only the preferred way of carrying out the present process it should be well understood that many changes and modifications may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. 40

Having now particularly described and ascertained the nature of my said invention 45

and in what manner the same is to be performed, I declare that what I claim is:

1. In the manufacture of useful products by decomposition of gaseous hydrocarbons of the character described, by heat in decomposition chambers the walls of which separate said decomposition chambers from the heating chamber and are heated by the combustion of the decomposition gases conducted from said decomposition chamber to said heating chamber, the process which comprises passing at least one part of the decomposition gases directly through the walls of the decomposing chamber and burning said gases in said heating chamber. 50 55 60

2. In the manufacture of useful products by decomposition of gaseous hydrocarbons of the character described, by heat in decomposition chambers the walls of which separate said decomposition chambers from the heating chamber and are heated by the combustion of the decomposition gases conducted from said decomposition chamber to said heating chamber, the process which comprises passing from the decomposition chamber one part of the decomposition gases admixed with solid decomposition products, passing the other part of the decomposition gases free of solid admixtures, directly through the walls of the decomposing chamber, and burning said gases in immediate proximity to said walls. 65 70 75

3. In the manufacture of useful products by thermal decomposition of gaseous hydrocarbons of the character described, the process which comprises passing the gaseous hydrocarbons into a decomposing chamber maintained at a decomposing temperature and provided with pervious walls, and heating said chamber at least in part by means of combustible gases passing from said chamber through said walls and burning in immediate proximity thereto. 80 85

In testimony whereof I affix my signature.

IMRE SZARVASY.