



This invention relates to a Process for producing Water Gas from Natural Gas. The object of the invention is the production of useful gas mixtures for chemical Syntheses by the improved process herein described.

5 It is well known that natural gas can be decomposed by steam and that natural gas and carbon dioxide will react to give water gas or carbon monoxide and hydrogen.

10 It is also known that unsaturated hydrocarbons, such as ethylene and acetylene are obtained by rapidly passing saturated hydrocarbons, such as methane, under pressure over a suitable catalysts, at a temperature of 700-1000° C. or higher and that on the gases being quickly removed from the hot reaction zone, acetylene will form the main product at higher temperatures and ethylene at 15 lower temperatures.

I have discovered that by regulating the quantity of the oxygen or air used to mix with the natural gas in the proportion of one gram atom of oxygen to each gram atom of carbon in the natural gas and passing the mixture, at 20 a pressure of one or two atmospheres and at a temperature exceeding 975° C., over suitable catalysts, that a maximum yield, from a commercial standpoint, of water gas is obtained, and that in carrying out the process subsidiary reactions leading to the formation of carbon, water or oil are 25 avoided.

When oxygen is used, the amount is equal to, or greater in volume than, one half the amount of the natural gas. In the resulting gas, the ratio of hydrogen to carbon monoxide is substantially two to one, 30 and the quantity of nitrogen, if any is present, varies

in accordance with the quantity of nitrogen in the natural gas, and in the oxygen, air or oxygen-air mixtures.

It is possible to vary the amount of oxygen from that specified above, but it is not advisable to have too little oxygen, because of carbon formation, while a slight excess of oxygen may be of advantage in preventing the deposition of carbon on the catalyst and consequent loss of its activity.

The contact masses may be prepared in any suitable way, and the proportion of the components may be varied widely, and may include among other things, metallic nickel, cobalt, iron chromium, copper or platinum, alone or mixed.

The elements may be taken originally in the form of a suitable salt, such as the nitrate and mixed with the supporting material either mechanically or first by solution of the salt followed by impregnation of the supporting material with the solution. Upon ignition to decompose the salt to the metallic oxide with subsequent reduction of the oxide to the metal, the catalyst is found to be of sufficient activity and long life.

As supporting material, asbestos fibre, alumina, porcelain or any other inert substance of sufficiently high melting point and resistance to mechanical or thermal disintegration may be used. Both the catalytic metal and the supporting material must be as free as possible from the alkali and alkaline earth metals and oxides. Thereby the formation of carbon and oily products is diminished.

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WHAT I CLAIM AS MY INVENTION IS:

1. The process of producing water gas from natural gas by mixing natural gas with oxygen, or air, or air and oxygen mixtures, in the proportion of one gram atom of oxygen to every gram atom of carbon in the natural gas, and passing the mixture over suitable catalysts, at ordinary pressure and at a temperature exceeding  $975^{\circ}$  C.
2. The process of producing water gas from natural gas having nitrogen therein by mixing the natural gas with oxygen in the proportion of one gram atom of oxygen to each gram atom of carbon in the natural gas and passing the mixture over suitable contact masses at a temperature exceeding  $975^{\circ}$  ., whereby water gas containing nitrogen in amounts corresponding substantially to the amount of nitrogen in the natural gas is produced.
3. The process for the production of water gas from natural gas which consists in passing the natural gas with oxygen in the proportion of approximately one gram atom of oxygen to every gram atom of carbon in the mixture over suitable catalysts at a predetermined temperature.
4. The within described process for the production of water gas from natural gas which consists in the oxidization of the natural gas by elementary oxygen in the proportion of one gram atom of oxygen to every gram atom of carbon in the natural gas.