Dec. 14, 1926. 1,610,897

O. STÅLHANE

PROCESS FOR PRODUCING CYANIC COMBINATIONS

Filed March 31, 1926

Fig. 1.

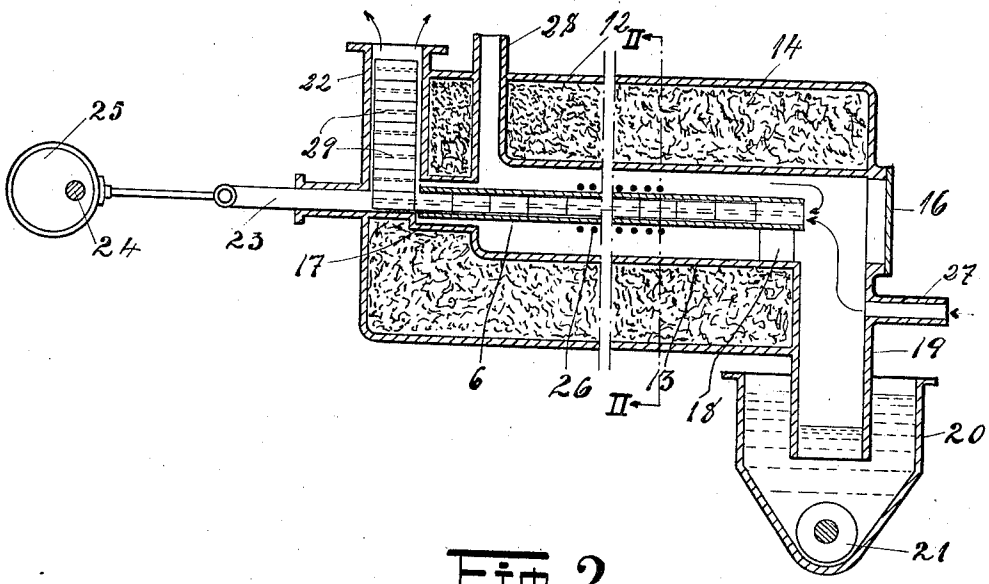
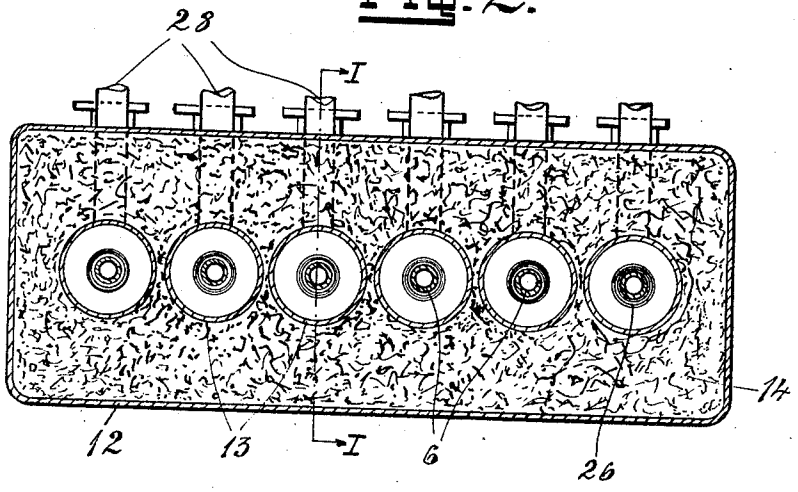


Fig. 2.



Inventor:
O. Stålhane

Patented Dec. 14, 1926. 1,610,897

UNITED STATES PATENT OFFICE.

OTTO STÅLHANE, OF STOCKHOLM, SWEDEN.

PROCESS FOR PRODUCING CYANIC COMBINATIONS.

Application filed March 31, 1926, Serial No. 98,793, and in Sweden November 18, 1924.

This invention relates to improvements in such processes for producing cyanic combinations, wherein carbide or a mixture consisting of carbon, and combinations of the alkali metals or the alkaline earth metals, and possibly some catalyzer, is brought into contact with nitrogen at high temperatures.

It has been tried to produce cyanic combinations in such a way that raw material of the above mentioned kind was heated together with nitrogen in electric shaft furnaces, the charge itself serving as resistance to the heating current. As, however, the charge is a second class conductor, it has in practice proved impossible to give to the whole of the charge an evenly distributed temperature suitable for the chemical reactions. Therefore, the yield of cyanic combinations in such processes has been very low. It has also been tried to carry out the process by heating the charge together with nitrogen in retorts by means of combustion gases. On account of the low heat conductivity of the charge, in the hitherto known processes of this kind using retorts with a large cross-section the retorts must be heated to a very high temperature, on account of the comparatively long way the heat must pass through the charge in the retort to reach its interior, and because the temperature of reaction is as high as about 1000° C. This entailed the disadvantage that the retort walls quickly were destroyed and that the charge was very unevenly heated, the parts close to the retort walls being heated too high giving the charge a tendency to melt, whereas in the interior of the charge the temperature as a rule was too low, which resulted in a low yield.

According to this invention the described disadvantages are avoided by carrying out the process in pipes with a very small cross-section compared with the hitherto used retorts. The walls of the pipes are to be heated by electric current conducted through the walls of the pipes or through special heating elements surrounding the pipes. The pipes should be of such dimensions that the heat had to pass a distance from the heated walls to the interior of the charge of only 0,8″ to 1,2″ and at any rate not more than 3″. The advantage is then gained that the charge passing through the pipes will be heated as evenly as possible, resulting in that the yield of cyanic combinations will become the highest possible. At the same time a temperature injurious to the pipe walls is avoided.

In order to lessen the heat consumption the nitrogen is led through the pipes in the opposite direction to the charge, so that the end product leaves the pipes at a comparatively low temperature, while the gas mixture leaving the pipes is cooled down leaving heat to the newly introduced charge material.

By way of example an arrangement to carry out the process with electric heating is shown in the accompanying drawing.

Fig. 1 shows a vertical section upon the line I—I in Fig. 2 of the furnace arrangement. Fig. 2 shows a vertical section upon the line II—II in Fig. 1.

12 denotes the furnace walls within which a number of pipes 13 of metal or fireproof material is arranged. They are surrounded by a heat-insulating material 14. Inside of the pipes 13 other pipes 6 of metal or fireproof material are so arranged that they easily may be taken out through holes 16 in the furnace walls. For this purpose they rest in one end upon an extension 17 of the inner end of the pipes 13 and are supported in the other end by the supports 18. Each pipe 13 has an extension 19 directed downwards that reaches into a water container 20 provided with a transport screw 21. The charge to be treated is fed into the pipes in the form of briquettes or lumps through the feeding pipe 22. In alignment with the pipes 6 a plunger 23 is arranged that by means of an excentric disc 25 or the like arranged upon the shaft 24 is given a reciprocating motion. During this motion the plunger pushes forward briquettes 29 from pipe 22 into the pipe 6. The briquettes are thus gradually fed through the pipe 6 by the plunger to finally fall down into the water container 20. The pipes 6 are in their middle part provided with electric heating elements 26 by means of which the pipes and the charge in them can be heated to the temperature suitable for the process. The necessary nitrogen is introduced, partly through the pipe 27, partly through the pipe 28. The gas from the pipe 28 passes around and along the pipes 6 and is intended to protect the heating elements 26 from oxidation. The nitrogen from the pipe 28 is mixed with the nitrogen coming from the pipe 27, enters the pipes 6 and leaves through the feed opening 22 as indicated by

arrows. The soluble cyanic combinations formed at the high temperature in the pipes 6 are dissolved in the water in the container 20 and the insoluble substances are brought away by the transport screw 21.

In the case the pipes 6 are made of metal the pipes may be heated by conducting an electric current through the walls of the pipes.

The section of the pipes may preferably be circular, but may also be elliptic or rectangular or of other shape.

The pipes may be arranged vertically, horizontally or inclined.

The pipes may also be heated by hot combustion gases or other hot gases sweeping around them.

To bring about a more intimate contact between the nitrogen and the different parts of the charge the briquettes may be perforated. They may for instance be provided with a central channel in the feed direction, or they may be provided with several channels in the feed direction, or at the circumference be provided with grooves.

The pipes 6 may also be composed of two concentric pipes, the charge and the nitrogen being fed through the space between the pipes. The briquettes should then have a form that corresponds to the cross-section of the said space.

Pulverized charging material may also be used and may then be formed into briquettes or one or more strings and forced into the pipes by some suitable feeding device.

I claim:

The continual process for producing cyanic compounds by reaction under heating between nitrogen and briquettes containing carbon and alkali metal compound in which the charge is continually fed in countercurrent to the nitrogen gas through electrically heated pipes arranged in a furnace and of such dimensions that the way of the heat from the heated pipe walls to the interior of the charge is comparatively short and not exceeding 3″.

In witness whereof I have hereunto set my hand.

OTTO STÅLHANE.