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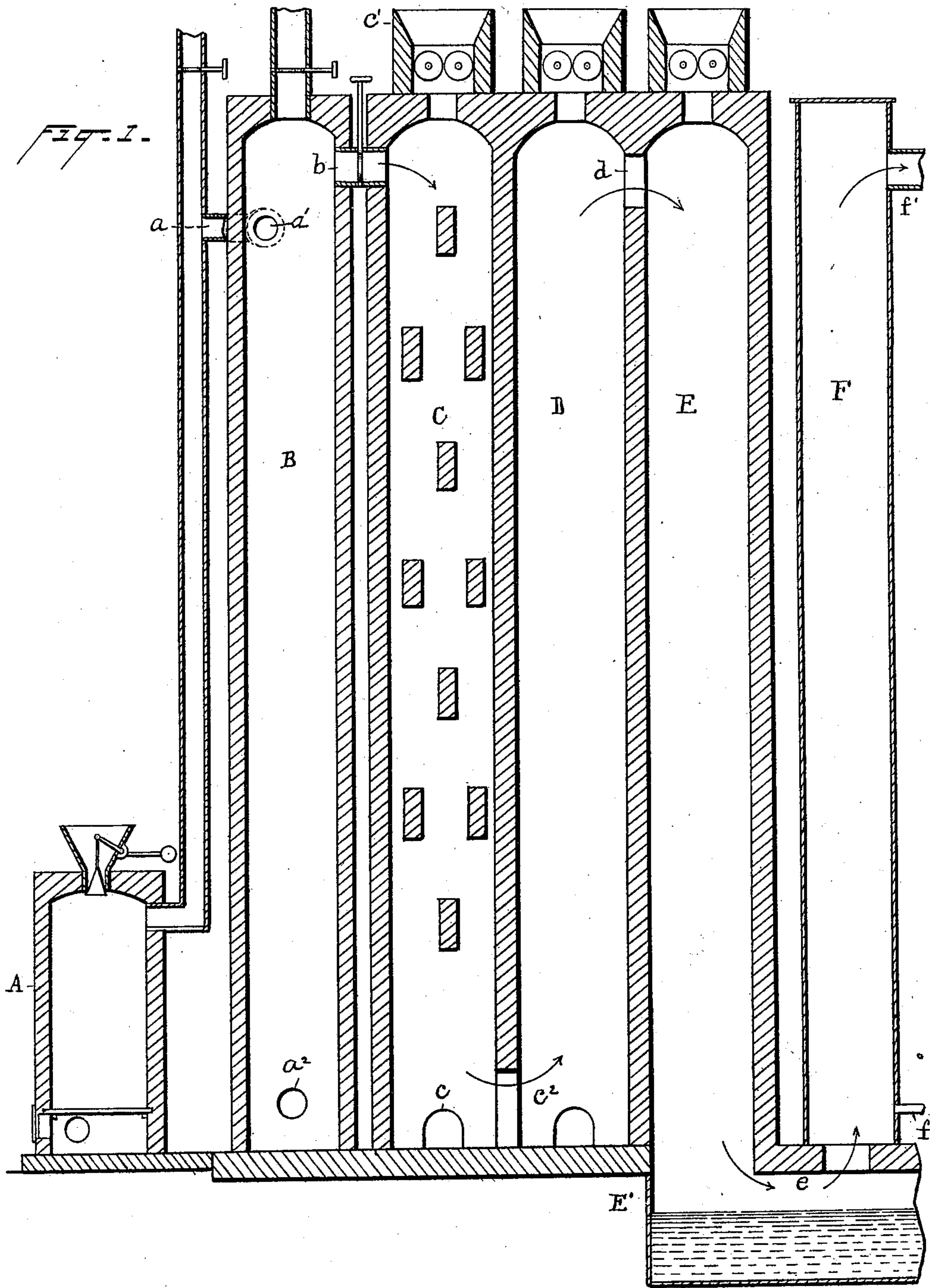
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T. B. FOGARTY.

PROCESS OF AND APPARATUS FOR MAKING CYANIDS AND AMMONIA.

No. 598,918.

Patented Feb. 15, 1898.



Witnesses
 Lewis A. Clark.
 Geo. R. Taylor.

Inventor
 Thomas B. Fogarty
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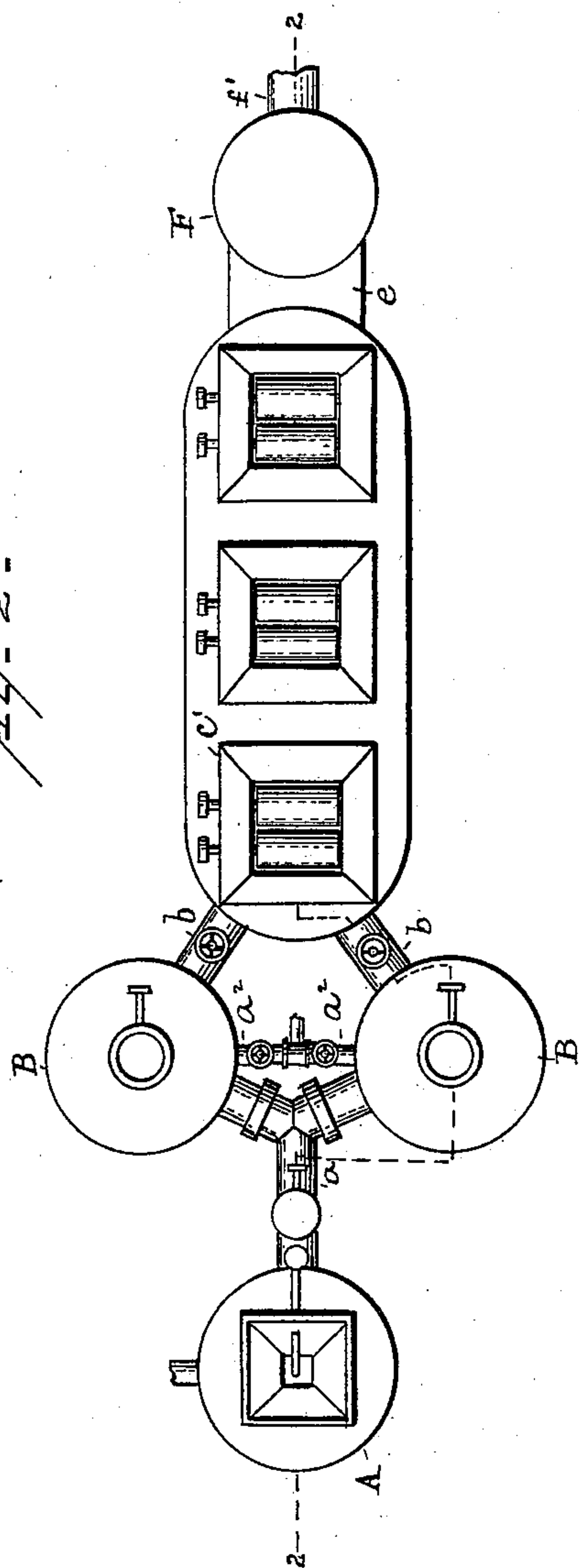
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UNITED STATES PATENT OFFICE.

THOMAS B. FOGARTY, OF NEWARK, NEW JERSEY.

PROCESS OF AND APPARATUS FOR MAKING CYANIDS AND AMMONIA.

SPECIFICATION forming part of Letters Patent No. 598,918, dated February 15, 1898.

Application filed October 6, 1896. Serial No. 607,984. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. FOGARTY, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes of and Apparatus for Making Cyanids and Ammonia, of which the following is a specification.

My invention relates to an improvement in the processes for making cyanids and ammonia heretofore described by me in Patents Nos. 500,650 and 500,651, issued to me July 4, 1893, and in the application filed by me June 13, 1896, and bearing the Serial No. 595,419. The objects I have in view and the difficulties in attaining them are fully set forth in those specifications.

The improvements in the process which I am about to describe are directed toward remedying the chief defect in my previous processes, which, though practicable, are somewhat difficult to carry out owing to the difficulty in keeping up the temperature in the apparatus sufficiently to make the proper reactions take place. This difficulty has been due to the fact that reactions absorbing heat have been allowed to take place in conjunction with the cyanid-forming reactions, and thus at the most important point in the process the temperature has been suddenly reduced. If this reduction is sufficient, the cyanids will not be formed, other reactions taking place, and as it is difficult to reach the requisite temperature in the retort for the formation of cyanids it is essential that secondary reactions involving the absorption of heat should be prevented, if possible. The principal cause of the drop of temperature is the reduction in the retort of the carbonic acid to carbon monoxid. This is a necessary step in the process, since the cyanid-forming reactions cannot take place in the presence of carbonic-acid gas. By the herein-described process I intend that before the producer-gas enters the retort proper all carbon dioxid shall be reduced. I accomplish this by reducing it under treatment of pulverized carbon in a separate chamber, which takes the gas immediately on issuing from the air-heater instead of accomplishing this reduction in the retort together with other reactions, by utilizing the solid carbon mixed

with the hydrocarbons set free in their distillation. This reduction-chamber may be independently heated, if necessary, to keep up the temperature. In this process I feed into the reducing-chamber material which has the especial function of reducing the carbon dioxid of the producer-gas. Thus the producer-gas, practically free from oxygen and carbon dioxid, may enter the retort with the principal cause of its tendency to drop in temperature eliminated.

In the accompanying drawings, where similar letters indicate similar parts of the apparatus, Figure 1 shows in section on the line 2 2, Fig. 2, apparatus in which my process can be carried out. Fig. 2 shows a plan of such apparatus.

An ordinary producer-gas is formed by burning fuel in a limited supply of air in the furnace A. The products of combustion are carried through the flue *a* to air-heaters B B. It will doubtless be found necessary to have several of these heaters in order to operate the process continuously, since the heaters must be heated to an almost incandescent heat inside in order to heat the air passing through them sufficiently. The drawings show two of these heaters, which are designed to be used alternately, one heater being heated, while the other is employed to heat the air. These heaters B B are connected by the flues or pipes *b b* with the main retort, which is built in suitable manner and of materials which will withstand and contain the great heat which is necessary in the process. The flues *b b*, having proper controlling-dampers, lead directly to a chamber C, filled with checker-work and having an aperture *c* at the bottom, the door to which can be removed and the debris in the bottom of the chamber be taken out. At the top of this chamber C is another aperture through which adjusted quantities of pulverized material may be dropped from a hopper *c'* or by other means. At a point opposite to the entrance of the flue *b* to the chamber C is a flue *c²*, leading therefrom to a chamber D, which may or may not have checker-work therein to impede the fall of pulverized material, which is admitted through an aperture in the top of the chamber by means similar to the hopper upon C. The drawings show a pipe or flue *d* opposite

to the flue c^2 , which leads from D to another chamber E. This chamber is arranged with a hopper and an aperture for dropping through material. There may be more chambers like D and E, as may be found necessary to entirely complete the process. The drawings show E as setting into a tank E' , the water or other liquid therein serving to receive and hold in solution the various soluble products of reaction. E is connected by a flue e with a chamber F, which has a steam-pipe f opening therein. This chamber is to be used in case the products desired are to be ammonia and fuel-gas, when the cyanids and other products being led into the chamber F are treated with steam and the ammonia and fuel-gas taken off and separated by appropriate means through a pipe f' .

It is understood that the drawings merely show the apparatus in a more or less diagrammatic form, in practice the necessary dampers, &c., means for feeding in pulverized material, and means for retaining the heat within the retort being added.

The carrying out of the process is as follows: The fuel is burned in a limited supply of air in the furnace A, forming a producer-gas, consisting largely of carbon monoxid. This is led through a pipe or flue to the air-heater B where sufficient air is admitted to effect complete combustion in the chamber. Until the air-heater is raised to the requisite temperature the products of combustion are simply led through it and then allowed to escape through a^2 . When the heater is sufficiently heated, however, the producer-gas is brought into the heater through the flue a opening into B at a' , while air is drawn or forced through the opening a^2 in the bottom of the heater. The air passing up through the heater is raised to a very high temperature, usually about 2,000° Fahrenheit, and it meets the producer-gas. Intense combustion takes place, the oxygen of the air being extracted and the carbon monoxid of the gas being oxidized to carbon dioxid. The nitrogen of the air is thus practically freed from its accompanying oxygen and is carried along with the producer-gas to play its part in future reactions. It is now necessary to reduce the carbon dioxid again to carbon monoxid, and in order to effect this before admitting the producer-gas into the cyanizing-chambers D and E the gases are led through the flue b into the chamber C. Pulverized material, like anthracite coal or coke, consisting largely of free carbon, is allowed to drop down through the chamber, and the highly-heated carbon dioxid coming in contact with such material through the great heat and the presence of an excess of carbon is reduced to carbon monoxid. It is intended that the air admitted through B should be of sufficient temperature to withstand any drop in temperature which may occur through this reduction process subsequent to the oxidation of the carbon monoxid. However, if the

gases cannot be kept at a sufficiently-high temperature the chamber C may be heated by any method and kept up to such a temperature that the gases which issue from it will be hot enough to accomplish the formation of cyanids. Means for heating chamber C are not shown, as it may be done in any common way. Passing through the flues c^2 these gases, now consisting largely of nitrogen in a free state and of carbon monoxid, enter the chamber D, where they rise through a fall of pulverized material, consisting of a mixture of alkali or an alkaline earth and bituminous coal or other material rich in hydrocarbon compounds. Reactions take place, as described in the application and patents to which reference has been heretofore made, and alkaline cyanids are produced. The excess of carbon in the chamber C and the free carbon which is not utilized in the chamber D drop to the bottom of said chambers and may be removed through ports like d in the walls. The chamber E is similar to D, and is provided because it is found that it is preferable for the gases to travel some distance in order to promote economy in the process. If necessary, other chambers, like D and E, with means for introducing the pulverized mixture may be added. The alkalies are collected by any good method, here shown as a settling-tank, from which they may be extracted by well-known methods. The steaming-chamber F has one or more jets of steam entering into it, so that, if desired, the cyanids may be directly treated by jets of steam, which, as described in the above-named specification, will produce ammonia and fuel-gas. The ammonia may be led off to scrubbers and prepared for commercial use and the fuel-gas may be collected and carbureted to make illuminating-gas, all being done by well-known methods.

Having thus described my process, what I claim is—

1. The improved process of making cyanids, consisting in forming a producer-gas by burning fuel in a limited supply of air, then adding to such producer-gas an adjusted quantity of highly-heated air to effect further combustion; then allowing a quantity of solid pulverized material, having a high percentage of free carbon, to fall through the gases of combustion, whereby the gases are rid of the presence of all oxygen and carbonic-acid gas; then allowing a quantity of solid pulverized material, rich in hydrocarbons and containing an alkali, to fall through the gases, the various elements then combining to form an alkaline cyanid, substantially as set forth.

2. The improved process of making ammonia and fuel-gas, consisting in forming a producer-gas by burning fuel in a limited supply of air, then adding to such producer-gas an adjusted quantity of highly-heated air to effect further combustion; then allowing a quantity of solid pulverized material, having a high percentage of free carbon, to fall

through the gases of combustion, whereby the gases are rid of the presence of all oxygen and carbonic-acid gas; then allowing a quantity of solid pulverized material, rich in hydrocarbons and containing an alkali, to fall through the gases, the various elements then combining to form an alkaline cyanid, and finally treating such cyanids with steam to form ammonia and fuel-gas, substantially as set forth.

3. In apparatus for carrying out a process of making cyanids and ammonia, a furnace A for burning fuel in a limited supply of air, one or more heaters for heating air, a chamber C for taking from said air and producer-gas all oxygen and carbonic acid, means for introducing pulverized material, consisting largely of free carbon, retorts D and E for forming the cyanids, said retorts having means for introducing a pulverized mixture of alkali and material rich in hydrocarbons, apertures in chambers C, D and E for removing the products of the reactions, and flues

connecting the various chambers, substantially as set forth.

4. In apparatus for carrying out a process of making cyanids and ammonia, a furnace A for burning fuel in a limited supply of air, one or more heaters for heating air, a chamber C for taking from said air and producer-gas oxygen and carbonic acid, means for introducing pulverized material, consisting largely of free carbon, retorts D and E for forming the cyanids, said retorts having means for introducing a pulverized mixture of alkali and material rich in hydrocarbons, and a chamber F having steam-jets for decomposing the alkaline cyanids obtained, substantially as set forth.

This specification signed and witnessed this 2d day of October, 1896.

THOMAS B. FOGARTY.

Witnesses:

EUGENE CONRAN,
JNO. R. TAYLOR.