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C. B. JACOBS.

PROCESS OF MAKING CYANIDS AND ACETONE.

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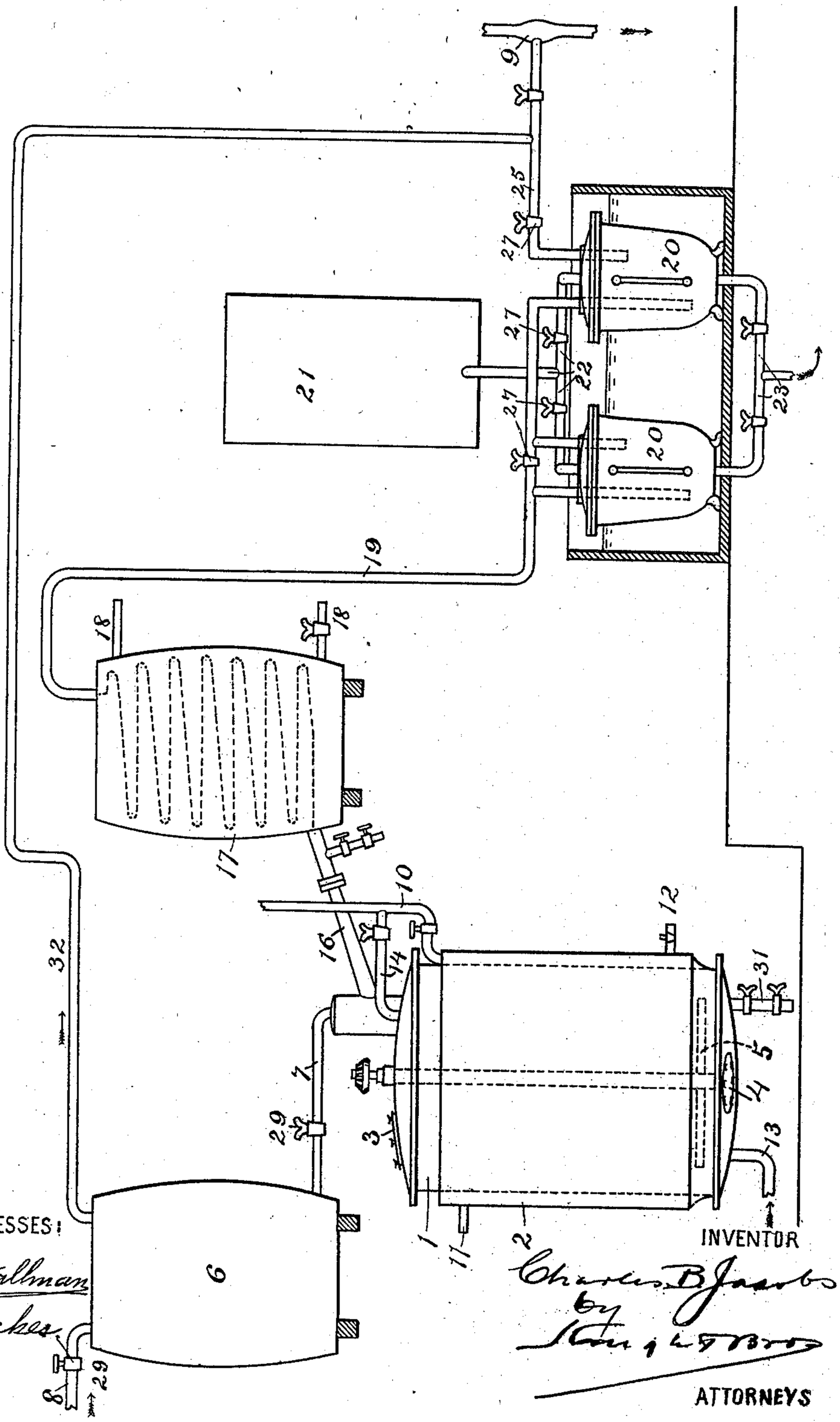
NO MODEL.



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CHARLES B. JACOBS, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO THE AMPERE ELECTRO-CHEMICAL COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING CYANIDS AND ACETONE.

SPECIFICATION forming part of Letters Patent No. 719,223, dated January 27, 1903.

Application filed March 5, 1901. Serial No. 49,836. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES B. JACOBS, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Cyanids and Acetone, of which the following is a specification.

Alkaline-earth-metal cyanids, particularly barium cyanid, may be made with great facility and efficiency in the electric furnace from the corresponding carbonates; but for commercial purposes they are not as desirable in many cases as the alkali-metal cyanids.

My invention consists in treating the alkaline-earth-metal cyanid with acetic acid, absorbing the hydrocyanic acid evolved in caustic alkali, and heating the alkaline-earth-metal acetate to produce a distillate of acetone and a residue of alkaline-earth-metal carbonate to be used as a basis for the production of a renewed supply of cyanid.

In forming the alkaline-earth-metal cyanid I proceed according to the method set forth in my Patents Nos. 657,937 and 657,938, dated September 18, 1900.

The accompanying drawing is a representation, somewhat diagrammatic, of an apparatus adapted to be used in carrying out my invention.

The first part of the process—namely, the formation of barium cyanid or other alkaline-earth-metal cyanid by heating barium carbonate or other alkaline-earth-metal carbonate with carbon in the electric furnace and subjecting the resulting mass of carbid to the action of nitrogen—is fully set forth in my patents above referred to and need not be further described herein. In fact, as far as the present invention is concerned any other process that has been or may be devised for the conversion of alkaline-earth-metal carbonate into cyanid may be employed.

The steps of the process involved in the production from the alkaline-earth-metal cyanid of the alkali-metal cyanid with simultaneous production of alkaline-earth-metal acetate are carried out in the apparatus shown in the accompanying drawing.

The retort or vessel 1 for receiving the charge of barium cyanid is adapted to be tightly closed and is preferably surrounded by a water-jacket 2 to keep the temperature down during the reaction. Charging and discharging holes, respectively, in the top and bottom of the retort are closed during the operation by cover-plates 3 4. An agitator 5 may be provided to stir the material during the reaction.

6 represents an acetic-acid receiver or tank, also closed and connected by pipe 7 to retort 1. A pipe 8 leads from tank 6 to the open air, and another pipe 32 leads from said tank to an exhaust device, such as jet-pump 9.

The water-jacket of retort 1 is supplied with water through a pipe 10, pipe connections 11 12 also being provided for overflow and drainage. A steam-pipe 13 leads into retort 1, and a water-supply pipe 14 is also provided, these pipes being respectively for admitting steam to force out the gas from the retort before discharging and for admitting water to wash the retort. A pipe connection 16 from retort 1 leads up through the return-condenser 17, cooled by liquid passing through pipes 18, a pipe connection 19 leading from the top of the coil of the return-condenser to the absorption chambers or vessels 20, containing alkali—for example, solution of caustic potash or soda.

21 is a supply-tank for the caustic alkali solution, pipe connections 22 leading therefrom to the vessels 20 and pipe connections 23 leading from the bottom of said vessels to draw off the alkali metal cyanid. The terminals of pipe connections 19 dip into the solution in the vessels 20 to nearly the bottom of the vessels. Extending from the upper part of said vessels 20 are pipe connections 25, leading to the exhaust device 9, whereby a continuous condition of partial vacuum is maintained throughout the system during operation. The gas admission and exhaust pipes of the two absorption-chambers 20 are so connected and provided with cocks 27 that the gas may be forced to pass through a plurality of the chambers either simultaneously or successively. Various shut-off valves 29 may also be provided to stop com-

munication through the pipe connections—for example, when the retort 1 is being discharged and recharged.

The retort 1 having been charged with barium cyanid (or with the product from the electric-furnace process above described) and having been tightly closed, the acetic acid is admitted from tank 6 and reacts upon the barium cyanid, forming barium acetate and liberating hydrocyanic acid, which passes off in the form of gas through the pipe connection 16 and is cooled in condenser 17, the moisture and acetic acid that may pass along with the gas being thereby condensed and returned to the retort. During this reaction it is desirable to stir the mass of barium cyanid by the agitator 5 and to keep the retort cool by water supplied in the jacket 2. It will be understood that the barium cyanid charged into the retort, if it is the electric-furnace product above referred to, will not be pure, but will be mixed with oxid and carbon. The quantity of acetic acid necessary for the operation is theoretically in the proportion of one hundred and twenty pounds thereof to one hundred and seventy-five pounds of barium compound in the furnace product. After completion of this reaction, as determined by drawing off samples through pet-cock 31, the gas remaining in the retort is blown out by steam, and the retort being closed off by valves 29 at each side it is opened by removing bottom cover-plate 4 and the material therein discharged. This material contains barium acetate, which is removed to a suitable drying apparatus, evaporated to dryness, and destructively distilled, whereby acetone is distilled off and a residue containing barium carbonate obtained. This barium carbonate may then be returned to the electric furnace for reconversion into cyanid. The acetone distilled from the barium acetate is condensed, collected, and utilized in the usual manner. As any suitable form of still may be used for the operation, it is not deemed necessary to show it herein. The hydrocyanic-acid gas passes from the condenser 17 to the absorption chambers or vessels 20 and is there absorbed by the caustic alkali, forming alkali metal cyanid, which is drawn off through connections 23.

The reactions involved in the above-described operations are as follows:

Conversion of barium carbonate into barium carbid:

$$BaCO_3+4C=BaC_2+3CO.$$

Conversion of the carbid to cyanid:

$$BaC_2+2N=Ba(CN)_2.$$

Decomposition of the cyanid by acetic acid:

$$Ba(CN)_2+(CH_3COOH)=2HC.N+Ba(CH_3COO)_2.$$

Absorption of the hydrocyanic acid by alkali:

$$HCN+KOH=KCN+H_2O.$$

Decomposition of the acetate into carbonate and acetone:

$$Ba(CH_3COO)_2=BaCO_3+(CH_3)_2CO.$$

It will be understood that in place of barium carbonate I may select any alkaline-earth-metal carbonate which is capable of conversion to cyanid, while the corresponding acetate is decomposible by heat to form acetone and carbonate. Furthermore, any alkali-metal hydrate may be used as the absorbent for the hydrocyanic-acid gas—for example, sodium hydrate may be used and on account of its lightness and cheapness would generally be used instead of potassium hydrate.

I claim—

1. The process which consists in treating an alkaline-earth-metal cyanid with acetic acid, forming hydrocyanic acid which passes off, and an alkaline-earth-metal acetate; and heating the alkaline-earth-metal acetate to produce the corresponding carbonate and acetone.

2. The process which consists in heating an alkaline-earth-metal carbonate in the presence of carbon, subjecting the material to the action of nitrogen, thereby forming alkaline-earth-metal cyanid, treating the cyanid with acetic acid, forming hydrocyanic acid which passes off, and alkaline-earth-metal acetate, heating the said acetate to produce acetone and alkaline-earth-metal carbonate, and utilizing such carbonate in the repetition of the process.

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Witnesses:
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