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R. W. POINDEXTER, JR., ET AL

APPARATUS FOR THE PRODUCTION OF ALKALI METAL CYANIDES

Original Filed April 17, 1926

Fig. 1.

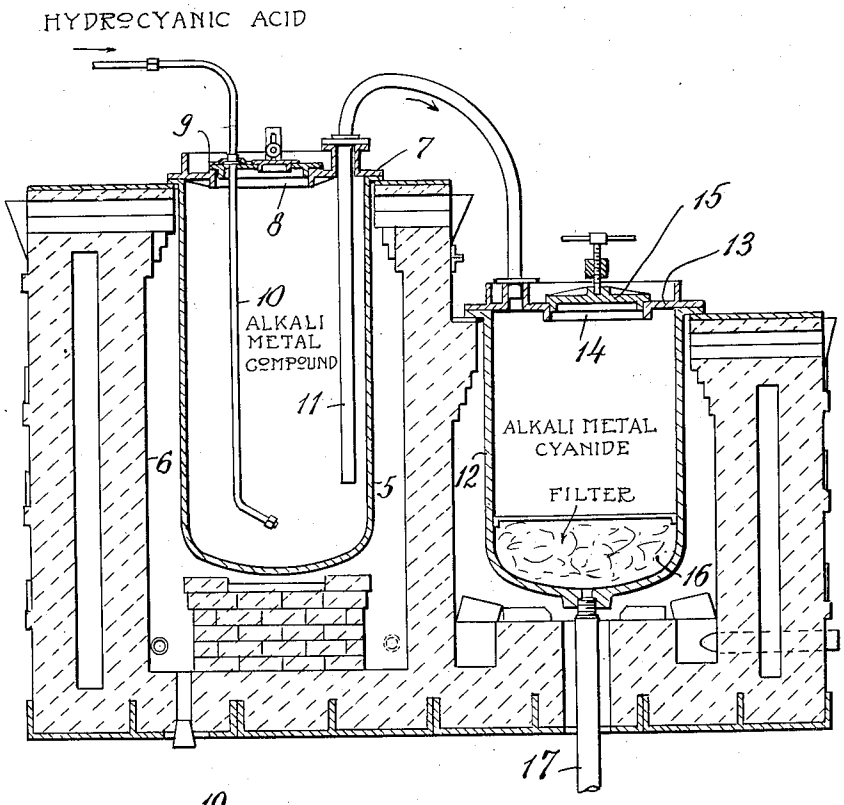
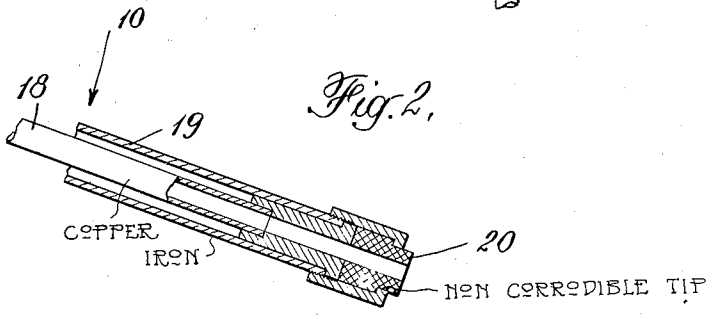


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE PRODUCTION OF ALKALI-METAL CYANIDES.

Original application filed April 17, 1926, Serial No. 102,612. Divided and this application filed February 9, 1927. Serial No. 166,936.

This invention relates to the production of high grade alkali metal cyanides by causing hydrocyanic acid to react with alkali metal carbonates and particularly to an apparatus adapted to facilitate the practice of the process described in U. S Patent No 1,624,147, issued on an application Serial No. 102,612, filed April 17, 1926, of which application this is a division.

In the patented process hydrocyanic acid is passed into and through a fused mixture of alkali metal salts in which carbonates predominate. The hydrocyanic acid is absorbed rapidly by the alkali metal carbonates and it is possible thereby to produce alkali metal cyanides of a high degree of purity.

It is the object of the present invention to provide a successful and commercially practicable apparatus for the production of alkali metal cyanides in solid form.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and accompanying drawing, in which:

Fig. 1 is a vertical section through an apparatus adapted for use in the practice of the invention; and

Fig. 2 is an enlarged sectional view of the inlet through which hydrocyanic acid is introduced into the converter.

The preferred apparatus for the practice of the process is illustrated in the accompanying drawing, in which 5 indicates a converter which may be constructed of iron or steel but is made preferably of a heat-resistant alloy consisting essentially of iron, nickel and chromium. The latter material is preferred because it resists oxidation by the heating gases which contact with the exterior surface. The converter 5 is mounted in a suitable furnace 6 of brickwork and may be heated by suitable burners adapted to the combustion of gaseous, liquid or solid fuel. The converter is provided with a top 7 having a charging opening 8 and a cover 9. Means are provided for permitting the escape of gases, formed during the reaction, in order to prevent the accumulation of pressure within the converter, while preferably avoiding the entrance of any considerable amount of air into the converter. The hydrocyanic acid is introduced thru a pipe 10 which extends down nearly to the bottom of the converter.

At the conclusion of the operation, the molten cyanide is withdrawn through a pipe 11. The molten cyanide may be forced through the pipe 11 by closing the converter tightly and applying gaseous pressure from any suitable source. The molten cyanide is delivered by the pipe 11 into a filter 12 which may be constructed of iron, steel or the alloy of iron, nickel and chronium, and is mounted in another section of the furnace 6 which is also adapted to be heated by means of suitable burners. The filter is closed by a top 13 which is provided with a manhole 14 and a cover 15 to permit access for cleaning. The lower part of the filter is filled with a bed 16 of suitable filtering material such as iron turnings or borings. The molten cyanide passes through this bed to an outlet pipe 17, the solid impurities, principally carbon, being retained by the filter so that the molten cyanide can be withdrawn in a substantially pure condition. The cyanide is delivered by the pipe 17 to a casting apparatus or pellet machine in which the product is solidified in suitable form for commercial transportation and use.

Hydrocyanic acid very readily decomposes when exposed to heated iron. A large amount of carbon results from the decomposition and in the event that a tube composed simply of iron is used to introduce the hydrocyanic acid it would be quickly stopped up with a deposit of carbon. There would be in addition a loss of hydrocyanic acid resulting from the decomposition. Copper does not have this effect on hydrocyanic acid even when hot. Copper is, however, rapidly attacked by fused alkali metal cyanides. A plain copper tube is not adapted, therefore, for the introduction of the hydrocyanic acid into the charge.

We have found it desirable to use a composite tube for the purpose of introducing the hydrocyanic acid into the converter. The tube 10 is composed of an inner tube 18 of copper and an outer sheath 19 of iron. The inner tube of copper should not be exposed, however, to the melted cyanide

and we employ, therefore, a tip 20 which is made of a material which neither decomposes hydrocyanic acid, nor is attacked by fused alkali metal cyanides, for example, carbon. This tip is secured to the end of the copper tube and fits tightly against the iron sheath so that the fused cyanide cannot leak into the space between the iron and copper tubes and come in contact thereby with the copper. The outer sheath is not affected by the cyanide and the hydrocyanic acid is delivered through the copper tube and the carbon tip into the molten mass of alkali metal cyanide and carbonate without decomposition. We can, therefore, substantially avoid destruction of the hydrocyanic acid within the tube and we avoid destruction of the tube whereby it is introduced to the molten bath. The apparatus is adapted, consequently, for successful and continued practice of the process.

Various changes can be made in the details of the operation and in the structure of the apparatus employed therein without departing from the invention.

We claim:

1. In an apparatus for preparing alkali metal cyanides, a converter and means for introducing hydrocyanic acid into the converter, including a tube which does not cause decomposition of the hydrocyanic acid, a protecting sheath which is not substantially attacked by fused alkali metal cyanides and a tip at the end of the tube and sheath, adapted to prevent contact of fused material in the converter with the tube, the tip being composed of a material that neither decomposes hydrocyanic acid nor is attacked substantially by fused alkali metal cyanides.

2. In an apparatus for preparing alkali metal cyanides, a converter and means for introducing hydrocyanic acid into the converter including a copper tube and a surrounding sheath and a tip at the end of the sheath adapted to protect the copper from the attack of alkali metal cyanide.

3. In an apparatus for preparing alkali metal cyanides, a converter and means for introducing hydrocyanic acid into the converter, including a copper tube, a surrounding sheath adapted to protect the copper from the attack of alkali metal cyanide and a tip at the end of the tube and sheath, adapted to prevent contact of fused material in the converter with the tube, the tip being composed of a material which neither decomposes hydrocyanic acid nor is attacked by fused alkali metal cyanides.

4. In an apparatus for preparing alkali metal cyanides, a converter and means for introducing hydrocyanic acid into the converter including a copper tube, a surrounding sheath adapted to protect the copper from the attack of alkali metal cyanide and a tip of carbon at the end of the tube and sheath adapted to prevent contact of fused material in the converter with the tube.

5. In an apparatus for preparing alkali metal cyanides, a converter, a tube of material which does not cause decomposition of hydrocyanic acid adapted for the introduction of hydrocyanic acid into the converter, and means which is not substantially attacked by fused alkali metal cyanides surrounding the tube and adapted to prevent contact of fused material in the converter with the tube.

6. In an apparatus for preparing alkali metal cyanides, a converter, a copper tube for introducing hydrocyanic acid into the converter and means surrounding the copper tube and adapted to prevent contact of fused material in the converter with the tube.

In testimony whereof we affix our signatures.

ROBERT W. POINDEXTER, JR.
PAUL T. DOLLEY.