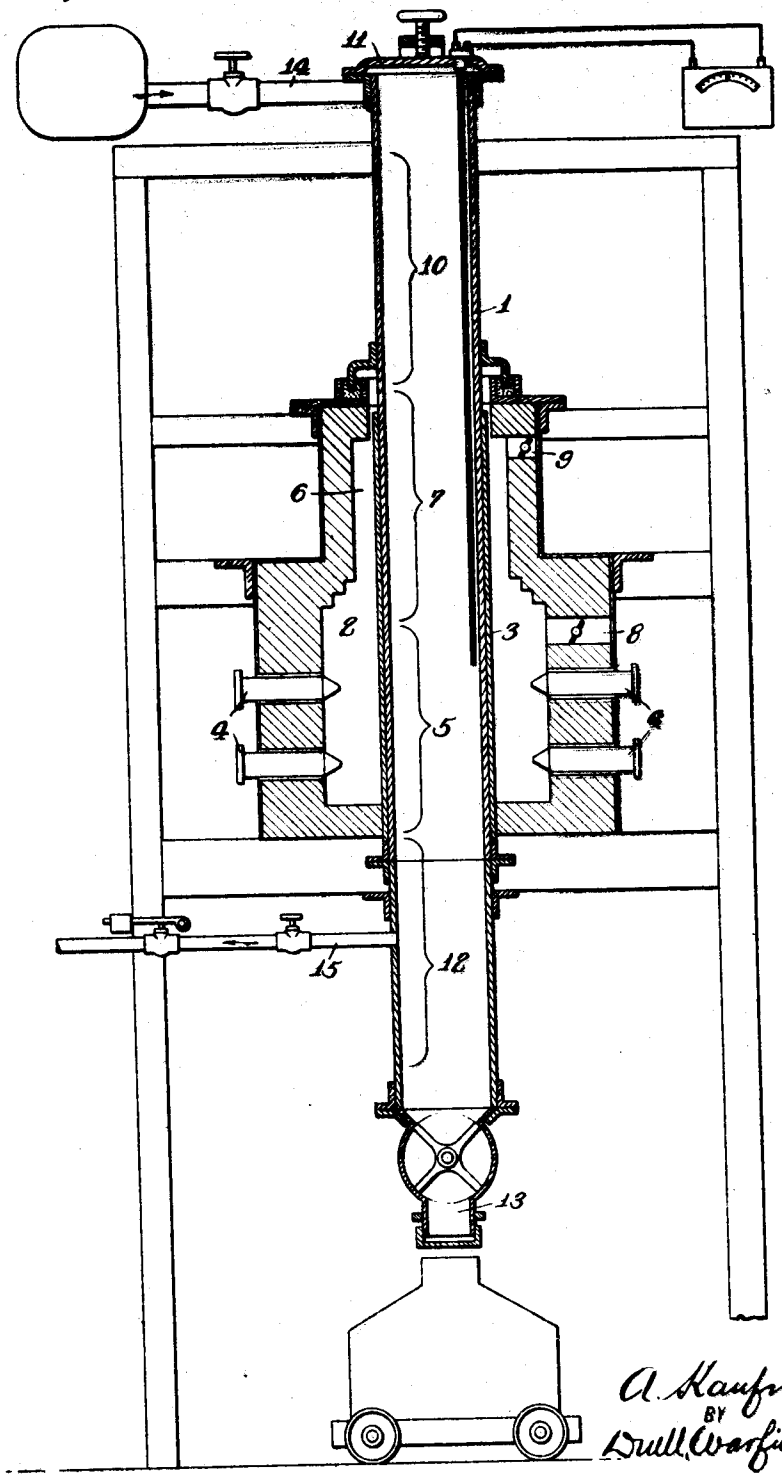
A. KAUFMAN.

APPARATUS FOR FORMING NITROGEN COMPOUNDS.

APPLICATION FILED MAY 2, 1917.

1,379,187. Patented May 24, 1921.



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APPARATUS FOR FORMING NITROGEN COMPOUNDS.

1,379,187. Specification of Letters Patent. Patented May 24, 1921.

Application filed May 2, 1917. Serial No. 165,860.

To all whom it may concern:

Be it known that I, ALFONSE KAUFMAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus for Forming Nitrogen Compounds, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus for and process of effecting chemical reactions and is directed more particularly to improvements in apparatus wherewith the economical and efficient commercial production of an alkali metal cyanid may be carried on. In the typical use of the invention to be described herein, sodium carbonate is employed with carbon and free or elementary nitrogen under pressure, to react at high temperatures to produce sodium cyanid. The character of the process and reaction as stated is in general that disclosed in the copending application of Charles B. Jacobs and Alphonse Kaufmann, filed December 21, 1916, Serial No. 138,140.

One of the objects of the invention is to provide improved and efficient apparatus wherewith an efficient and continuous production of sodium cyanid may be expeditiously effected by an economical and advantageous process.

Other objects and advantages will be in part noted hereinafter in connection with the accompanying description of a typical apparatus of the invention, as shown in the drawing, and the manner of use thereof.

The figure of the drawing represents a vertical central section of the improved apparatus.

Referring more particularly to the drawing, there is shown an elongated tubular retort or fixation chamber 1 vertically arranged and extending through a suitable furnace 2. The retort may conveniently be of cast iron which is of good conductivity and possesses the requisite tensile strength, while being relatively cheap. About that portion of the retort positioned within the furnace there is provided a protective casing 3 of a refractory alloy, such as nickel chromium, resistant to oxidation by combustion within the furnace, but also of good heat conductivity. The requisite furnace temperature, about 1000° C. or higher, for the process described, may be obtained in any suitable manner; for example, by gas combustion regulated through burners 4. The furnace walls, of material such as firebrick, are constructed to provide a zone 5 of high heat about the retort and within which zone the reactions take place. In addition the furnace has preferably an upper compartment 6 about a zone 7 of the retort, and through which the waste heat of the furnace may circulate for the purpose of preheating the charge within the retort prior to bringing the latter within the higher heat reaction zone. The combustion gases of the furnace may be controlled, for example, by dampers 8 and 9. Above the furnace the retort is extended a distance substantially equal to the length of the preheating zone to provide a charging zone 10 into which fresh charges of material may be supplied through the upper end 11 of the retort. Below the furnace the retort is also extended a similar distance to provide a zone 12 for the material treated and from which the same may be discharged through the lower end 13 of the retort. As described, the charging zone 10, the preheating zone 7, the reaction zone 5, and the discharging zone 12 are of equal length, so that in operation, as the treated material is removed, the material thereabove will fall and progressively pass through the retort.

A conduit 14 leads to the upper end of the retort from a suitable gas reservoir and serves as a means for injecting nitrogen under pressure to the charge. There is also provided an outlet conduit 15 at the discharging end of the retort which serves as an exhaust for the waste gas product of the reaction, such as carbon monoxid.

In operation, the retort is charged with sodium carbonate intimately mixed with carbonized material such as coke and charcoal, both in powdered form, and reaction thereof with free or elementary nitrogen is effected in the high heating reaction zone 5. During this operation the material in zone 7 is preheated or raised to a temperature approaching the reaction temperature in order to prevent objectionable cooling of the retort and to expedite the reaction, and the treated material in zone 12 is cooled prior to its withdrawal through the lower end. The nitrogen forced downwardly through the charge

combines in the reaction and the waste product of the reaction in the form of gas, as carbon monoxid, may be emitted through pipe 15. The flow of the nitrogen downwardly as described is of material advantage in that it is heated in the preheating zone 7 and its oxygen content, commonly present in small quantity, burns with the charge prior to the reaction, and therefore the nitrogen enters the reaction zone as substantially pure. The elongation of the retort above the furnace is also of advantage since it allows the newly charged material to drop on a bed of the still cool material. The association of the new charge with that immediately therebelow accordingly occurs homogeneously and without the creation of dust due to a difference in temperatures.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In apparatus for the production of alkali metal cyanid, in combination, an elongated retort constructed and arranged to receive material to be treated at one end and to discharge the treated material at the other end, a heating chamber about an intermediate portion of said retort constructed and arranged to insure a reaction temperature about a zone of said retort adjacent but distinct from the zone thereof from which the treated material is discharged and to insure a lower preheating temperature about a zone of said retort adjacent but distinct from the zone thereof to which new material to be treated is admitted, the latter zone being unheated, and means for regulating the passage of heating gases about the preheating zone.

2. In apparatus for the production of alkali metal cyanid, in combination, an elongated retort constructed and arranged to receive material to be treated at one end and to discharge the treated material at the other end, a heating chamber about an intermediate portion of said retort constructed and arranged to insure a reaction temperature about a zone of said retort adjacent but distinct from the zone thereof from which the treated material is discharged and to insure a lower preheating temperature about a zone of said retort adjacent but distinct from the zone thereof to which new material to be treated is admitted, means for regulating the passage of heating gases about the preheating zone, an intake gas conduit communicating with said retort on the receiving side of the reaction zone, and an outlet gas conduit communicating with said retort on the discharging side of the reaction zone.

3. In apparatus for the production of alkali metal cyanid, in combination, an elongated retort constructed and arranged to receive material to be treated at one end and to discharge the treated material at the other end, a heating chamber about an intermediate portion of said retort constructed and arranged to insure a reaction temperature about a zone of said retort adjacent but distinct from the zone thereof from which the treated material is discharged and to insure a lower preheating temperature about a zone of said retort adjacent but distinct from the zone thereof to which new material to be treated is admitted, the latter zone being unheated, means for regulating the passage of heating gases about the preheating zone, means for admitting nitrogen to the receiving zone of said retort, and means for withdrawing the reaction gas products from the discharging zone of said retort.

4. In apparatus for the treatment of an alkali metal to obtain its cyanid, in combination, an elongated retort, a heating chamber disposed about a portion thereof and adapted to create a reaction zone of high temperature in the retort and a preheating zone thereabove, means for regulating the passage of heating gases about the preheating zone, and means for admitting nitrogen to said retort and to insure its flow to the reaction zone after preheating in said preheating zone.

5. In apparatus for the production of sodium cyanid by chemical reaction of sodium carbonate with nitrogen under pressure and with carbonaceous material, at high temperature, in combination, a retort having a zone for cooling and discharging the reaction products, a zone thereabove provided with an external heating chamber for heating the charge to reaction temperature, a zone thereabove for preheating the charge prior to reaction, means for regulating the passage of heating gases about the preheating zone, and an unheated zone thereabove for receiving fresh charges, means for admitting nitrogen to the charge through said last-mentioned zone, and means for permitting emission of reaction gases from said first-mentioned zone.

6. In an apparatus for the production of alkali metal cyanid, the combination of an elongated upright retort, a furnace surrounding the preheating and reaction zones thereof and having a combustion chamber and a secondary heating chamber, the latter being of restricted cross-sectional area and located above said combustion chamber and means for regulating the passage of heating gases about the preheating zone, said retort extending above and below said furnace to provide unheated charging and cooling zones.

In testimony whereof I affix my signature in the presence of two witnesses.

ALFONSE KAUFMAN.

Witnesses:
J. L. RENVE,
FRED D. REID.