

O. SERPEK.
PROCESS FOR THE MANUFACTURE OF ALUMINUM NITRID.
APPLICATION FILED AUG. 1, 1916.

1,233,926.

Patented July 17, 1917.

Fig. 1

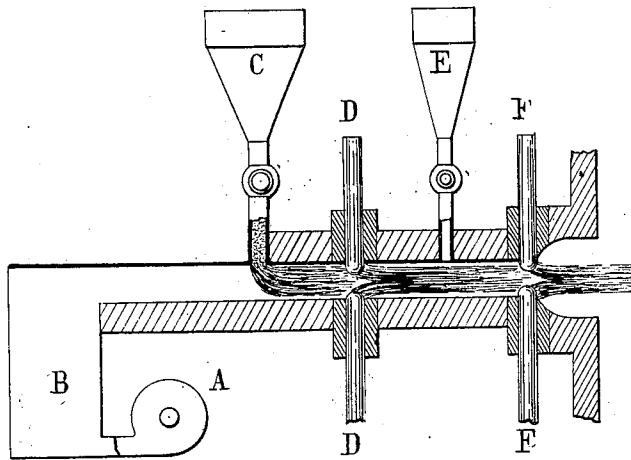
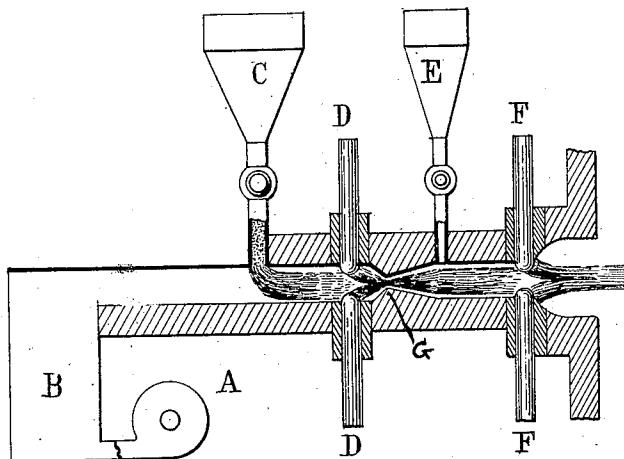


Fig. 2



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UNITED STATES PATENT OFFICE.

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PROCESS FOR THE MANUFACTURE OF ALUMINUM NITRID.

1,233,926

Specification of Letters Patent.

Patented July 17, 1917.

Application filed August 1, 1916. Serial No. 112,595.

To all whom it may concern:

Be it known that I, OTTOKAR SERPEK, a subject of the Emperor of Austria, of Tzech nationality, and a resident of 12 Rue Roquépine, Paris, France, have invented a new and useful Process for the Manufacture of Aluminium Nitrids, of which the following is a specification.

The present invention relates to a process for the manufacture of aluminium nitrid, in which the reactionary mixture formed by bauxite, alumina or other aluminous compound and carbon, is subjected to the action of a flame produced by the combustion of an excess of carbon in air, in such a manner that this combustion yields almost exclusively oxid of carbon, after this flame has been heated by its passage through or across one or more electric arcs, the reaction of formation of the nitrid being able to be completed, if necessary, by the passage of the reactionary mixture across one or more electric arcs.

The present invention is a modification of the process of obtaining aluminum nitrid, forming the subject of my Pat. 1,212,119, dated January 9, 1917, wherein aluminous material and carbon in a powdered state are allowed to fall freely or are otherwise projected freely and at a relatively high velocity through an atmosphere containing nitrogen and heated to the temperature of the reaction.

The invention is hereafter described in detail, with reference to the annexed drawing which shows, by way of example in Figure 1, in longitudinal vertical section, an apparatus capable of serving for the carrying out of the process. Fig. 2 is a similar view of a modification.

The air, forced by any suitable pump A, passes first into a heating chamber B where it is heated to a high temperature. The gaseous current afterward traverses a narrower passage into which falls, from a hopper C, powdered carbon. The carbon is ignited and a strong combustion takes place. The flame is afterward again heated by its passage across one or more electric arcs D. The charge of carbon falling from the hopper C, is regulated in such a way that there is not merely sufficient carbon for the combustion of the heated air but enough of an excess of carbon to reduce the resulting carbonic acid (CO_2) to carbonic oxid (CO).

If desired, however, there may be supplied from the hopper C only the quantity of carbon exactly necessary for the total combustion of the air and carbon be added which is intended to effect the reduction of CO_2 into CO , by means of a hopper (not shown on the drawing) immediately before the passage of the flame across one or more arcs D. This reduction is effected instantaneously so that the gaseous current before traversing the one or more arcs D, contains only oxid of carbon and nitrogen. This gaseous current which is brought to a high temperature, being able to exceed 2000°C , receives from a hopper E the reaction mixture (bauxite, alumina or other aluminous compound and carbon or other reducing agent). The quantity of carbon necessary to the reaction for formation of the nitrid might have been already added in the hopper C, before the passage of the flame across the one or more arcs D or between this hopper C and one or more arcs D; in this case only the aluminous compound is supplied from the hopper E. The reaction of formation of the nitrid of aluminum takes place, by reason of the high temperature attained, between the aluminous compound, the carbon and the nitrogen; this reaction can be completed, if necessary, by the passage of the reaction mixture through one or more arcs F wherein the mixture is drawn or carried along by the speed of the gases; these arcs F may be dispensed with if it is found, by experiment or otherwise, that the formation of the nitrid is already finished beforehand.

The one or more arcs D for heating the flame may be blown into a contracted throat portion arranged immediately after these one or more arcs as indicated at G in the modification Fig. 2.

The electric arcs may obviously be replaced by any other arrangement of electrical heating device; the process according to the present invention can be, moreover, carried out in a horizontal furnace or a vertical furnace of any suitable construction.

I claim as my invention,

1. A process for the manufacture of aluminum nitrid, consisting in projecting powdered aluminous material and carbon in a powdered state freely and at a relatively high velocity through a flame produced by the combustion of an excess of carbon in air, with the production of almost exclusively

carbon monoxid and heating said flame to a very high temperature by its passage through an electric heating zone before it is brought into the presence of the mixture of
5 aluminous material and carbon.

2. A process for the manufacture of aluminum nitrid, consisting in projecting powdered aluminous material and carbon in a powdered state freely and at a relatively
10 high velocity through a flame produced by the combustion of an excess of carbon in air, with the production of almost exclusively carbon monoxid and heating said flame to a very high temperature by its
15 passage through an electric heating zone before it is brought into the presence of the mixture of aluminous material and carbon and completing the reaction of the formation of the nitrid by the passage of the re-
20 acting mixture through an electric heating zone.

3. A process for the manufacture of aluminum nitrid, consisting in producing a flame by the combustion of an excess of carbon in air, projecting this flame through an
25 electric arc, and introducing into the traveling flame thus highly heated a powdered mixture of aluminous material and carbon.

4. A process for the manufacture of aluminum nitrid, consisting in producing a flame by the combustion of an excess of
30 carbon in air, projecting this flame through

an electric arc, introducing into the traveling flame thus highly heated a powdered mixture of aluminous material and carbon
35 and completing the reaction of the formation of the nitrid by the passage of the reacting mixture through an electric arc.

5. An apparatus for the manufacture of aluminum nitrid, comprising a forced air
40 supply, a passage therefrom, arc-producing electrodes in said passage, means for supplying powdered carbon to the passage in advance of the electrodes and means for
45 supplying powdered aluminous material and carbon to the heated flame, coming from said electrodes.

6. An apparatus for the manufacture of aluminum nitrid, comprising a forced air
50 supply, a passage therefrom, arc-producing electrodes in the passage, means for supplying powdered carbon to the passage in advance of the electrodes, means for supplying
55 powdered aluminous material and carbon to the heated flame, and a second set of arc-producing electrodes to complete the reaction.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

OTTOKAR SERPEK.

Witnesses:

CHARLES WREN,
M. DEFERZIMONT.