M. M. HAFF.

METHOD OF MANUFACTURING PHOSPHORIC ACID.

APPLICATION FILED SEPT. 27, 1913.

1,084,856. Patented Jan. 20, 1914.

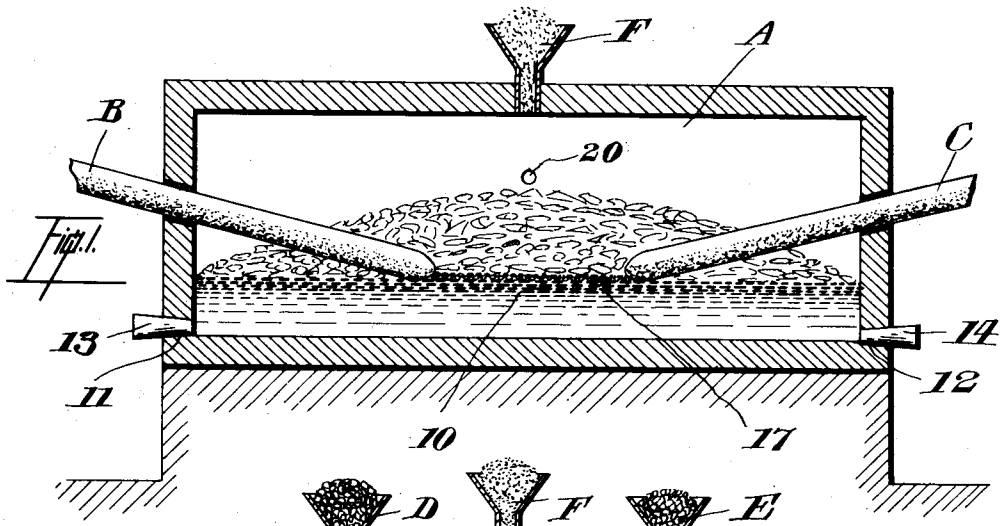


Fig. 1.

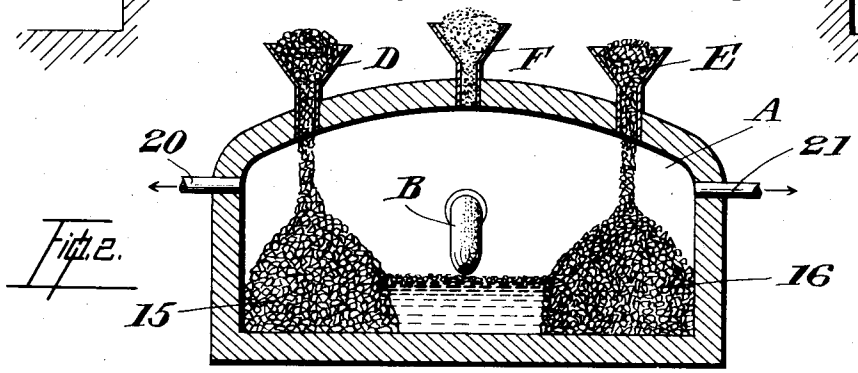


Fig. 2.

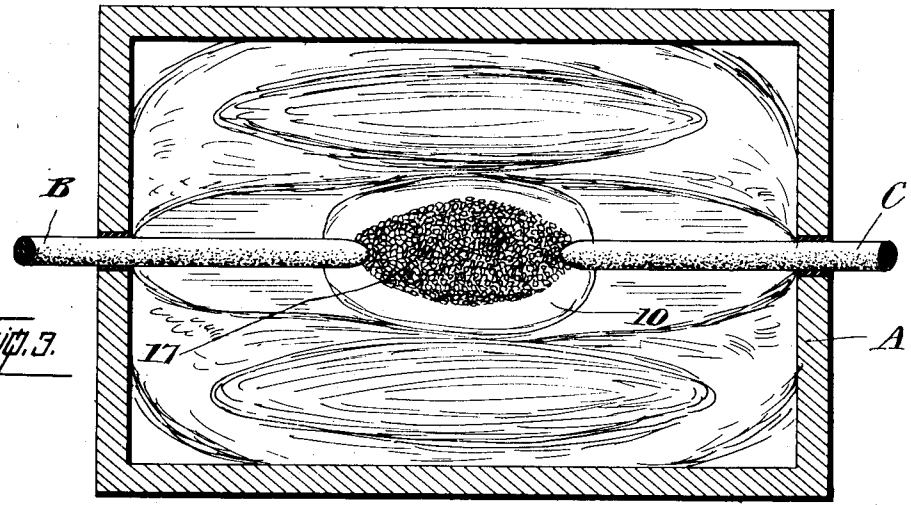


Fig. 3.

WITNESSES

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METHOD OF MANUFACTURING PHOSPHORIC ACID.

1,084,856. Specification of Letters Patent. Patented Jan. 20, 1914.

Application filed September 27, 1913. Serial No. 792,121.

To all whom it may concern:

Be it known that I, MAXIMILIAN MATTHEUS HAFF, a subject of the King of Great Britain, residing at 188 Metcalfe street, city of Ottawa, county of Carleton, Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Methods of Manufacturing Phosphoric Acid, of which the following is a specification.

This invention relates to an improvement in the method of manufacturing phosphoric acid by heating silicious material with phosphatic material and the object of the invention is to overcome the difficulty presented by the formation of a high resistance glass slag in the furnace.

To expel phosphoric acid by electrically heating a mixture of phosphatic material such as calcium phosphate with silicious material such as silica, it is necessary that a higher temperature than that of mere fusion be produced, and it is extremely difficult to pass sufficient current through the bath to produce this temperature, owing to the high resistance of the calcium silicate slag. I have found that if a path of increased current density be formed in the furnace, as by introducing broken carbon to the surface of the bath, between the electrodes, this difficulty is overcome. It is not intended that this carbon should act as a reducing agent, but inasmuch as a certain amount of the phosphoric acid liberated from the calcium silicate may be reduced by the carbon, it is desirable to introduce or mix air with the furnace gases as they are withdrawn to thereby reoxidize any reduced oxids.

My invention may be practised in connection with any suitable or well known form of electric resistance furnace with either double or single arcs, and for the sake of illustration I have shown in the accompanying drawing an electric resistance furnace having two electrodes, the current passing from one electrode to the fused bath and thence to the other electrode. The process could be equally well practised, however, with a furnace in which the crucible was one terminal and a single electrode the other.

Referring to the drawing, Figure 1 represents a longitudinal vertical section through a furnace in which the method may be carried out. Fig. 2 is a cross section, and Fig. 3 is a sectional plan view.

Referring to the drawing, A represents the furnace chamber built with suitable walls of fire brick or other refractory material in accordance with the usual practice.

B and C represent the electrodes of carbon or graphite extending in an inclined direction through the end walls and adapted to produce arcs against the surface of the molten bath 10 which will be formed in the furnace soon after starting thereof, the molten material being in normal operation tapped out from time to time through tap holes 11 and 12 which are normally closed by plugs 13 and 14.

The mixture to be furnaced, which may consist of natural phosphate rock and silica, is fed into the furnace at the sides of the electrodes through suitable hoppers D and E, the material forming piles 15 and 16 on the bottom of the furnace and at the sides of the electrodes, the material in the center being melted to form a molten bath by the action of the electric current. The path of the current is thus longitudinally from one end to the other of the bath, and as stated previously the high resistance of the calcium silicate slag will make it difficult to maintain the continuity and uniformity of the current flow. In accordance with the present invention this difficulty is overcome by introducing broken carbon from time to time through a suitable hopper F between the electrodes, this carbon forming a conducting path 17 of relatively higher current density on the surface of the molten bath and between the electrodes. The amount of carbon introduced will be regulated to correspond with the current required and thus provides a means of regulating the current density of the furnace. The carbon is most conveniently in the form of broken coke.

It will be seen that the broken carbon on the bath of the high resistance slag provides a zone of high current density and temperature and enables the operation in the furnace to be satisfactorily carried out.

The volatile phosphoric acid may be withdrawn by suction through suitable outlets 20 and 21. The air which it is desired to introduce for the purpose of reoxidizing any reduced phosphorous oxids will be

drawn in through the feed openings. If desired, separate inlets may be provided for the air.

What I claim as my invention is:

1. The steps in the process of manufacturing phosphoric acid by heating phosphatic material with silicious material in the electric furnace which comprises fusing the charge placing broken carbon on the bath to form a conducting path of increased current density and mixing air with the furnace gases to reoxidize any reduced phosphorous oxids.

2. The step in the process of manufacturing phosphoric acid by heating phosphatic material with silicious material in the electric furnace, which comprises producing and maintaining a conducting path of increased current density in the furnace by adding to the bath a material having a higher conductivity than the bath.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

MAXIMILIAN MATTHEUS HAFF.

Witnesses:
RUSSEL S. SWART,
PEARL M. GARRAW.