UNITED STATES PATENT OFFICE.

HEINRICH PRECHT, OF NEU-STASSFURT, GERMANY.

PROCESS OF OBTAINING META OR PYRO PHOSPHORIC-ACID COMBINATIONS.

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To all whom it may concern:

Be it known that I, HEINRICH PRECHT, a subject of the King of Prussia, residing at Neu-Stassfurt, Prussia, Germany, have invented certain new and useful Improvements in and Relating to the Production of Phosphate of Potassium and of Alumina; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the production of phosphate of potassium and of aluminum.

It is well known that the meta phosphate of potassium heretofore produced is insoluble in water or substantially so, and my invention has for its object a process whereby phosphates of potassium and of aluminum readily, in fact, completely soluble in water may be readily obtained by conversion of the insoluble into soluble salts, in which all of the contained phosphoric acid is in a form readily soluble in water. This I attain as hereinafter more specifically described by subjecting the potassium meta phosphate to a melting process, and if this process is carried out in such manner that the meta phosphate is rapidly cooled, that is to say in such a manner as to prevent crystallization, an amorphous potassium salt of the concentrated metaphosphate that is readily soluble is obtained. The potassium meta-phosphate may be obtained in any well-known manner, as for instance by heating potassium mono-phosphate (KH_2PO_4), or by melting, preferably by means of steam, potassium carbonate or potassium chlorid together with metaphosphoric acid in such proportions that the compound will contain one atom of P for each atom of K.

In carrying out my invention I proceed as follows: The insoluble potassium metaphosphate is melted and then allowed to flow into a shallow flat iron vessel or into shallow channels for the purpose of rapidly congealing the same so that it will not crystallize but remain in an amorphous condition. A potassium salt of the concentrated metaphosphate is thus formed which by slow cooling would revert into a crystalline and insoluble compound.

The melting of the insoluble potassium metaphosphate can be effected with the best advantage in a reverberatory furnace in which the phosphate is heated to such a degree as to render it fluid so that it may be allowed to flow out of a tap-hole. If the melting is effected in a reverberatory furnace provided with an inclined sole or hearth the operation can be made a continuous one by feeding the phosphate into the furnace at the highest and coolest point of the hearth, which should incline toward the source of heat, and allowing the molten material to flow from a tap-hole at the lowest and hottest point of such hearth, and if necessary the material may be raked down the incline so that the salt will be gradually reduced to a fluid state. The melting of the phosphate is advantageously effected by subjecting it to the action of an oxidizing flame as a reducing flame might result in a reduction of the phosphoric acid, which would be detrimental.

Practical experience has demonstrated that a potassium phosphate completely soluble in water is obtained when the molten mass contains one molecule of phosphoric acid (P_2O_5) to one molecule of potassium oxid (K_2O) or one hundred parts by weight of anhydrous phosphoric acid, (P_2O_5) or phosphoric acid free from water, to at least 66.2 parts by weight of potassium oxid (K_2O). In practice it will, however, be found of advantage to operate with a larger proportion of potassium oxid (K_2O) so that phosphoric acid in the form of pyrophosphate will in part be present in the molten salt. If the proportion of potassium oxid (K_2O) relatively to the phosphoric acid is such that one part of potassium pyrophosphate to four parts of potassium metaphosphate must be formed in the molten mass, potassium metaphosphate that is completely soluble in water is readily obtained, as above described. In order that these proportions may be obtained a basic body, such as potash or soda, the quantity of which will correspond to the desired combination or composition, is added to the potassium metaphosphate either before or during the melting of the same.

The soluble potassium phosphates obtained as above described can be employed in the production of soluble phosphate of alumina or of orthophosphate of potassium soluble in

water as follows: In the production of phosphate of alumina soluble in water, the phosphate of alumina is mixed with the soluble potassium metaphosphate or potassium pyrophosphate or both, obtained as hereinbefore set forth, in any desired proportion within the limit of forty per cent. of phosphate of alumina, the soluble potassium meta or pyro phosphate forming with the phosphate of alumina combinations that are soluble in water and whose solutions do not decompose. The phosphate of alumina, as such and in its insoluble form, is added to the potassium meta or pyrophosphate or to a mixture of them, either during the process of melting or to the potassium phosphates in the phosphoric acid solution employed as a starting material, in that a solution of phosphoric acid contaminated with or rendered impure by alumina is employed in the production of the insoluble phosphates. Should the phosphate of alumina contain a small proportion of iron the latter is also converted into a soluble form.

In the production of potassium orthophosphate from the soluble meta or pyrophosphates of potassium or of a mixture of them, the latter salts are dissolved in water until the solution is of a specific gravity of about 1.25, which solution is then heated under pressure in a closed vessel by means of steam, to a temperature a little above the boiling point. The higher the temperature within certain limits the more rapidly will the conversion take place, said conversion being completed in about two hours at a temperature of about 120° centigrade, the reaction being somewhat accelerated by addition of phosphoric acid to the solution.

The products obtained by my invention may be used for any purposes in the arts and manufactures, but are particularly applicable for use as fertilizers in that they contain potassium oxid and phosphoric acid and are therefore well adapted as substitutes for that class of fertilizers which contain chemical combinations of potassium together with phosphatic constituents, and have the advantage over the latter fertilizers in that said products do not contain undesirable chlorids.

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

1. The herein-described process of obtaining meta or pyro-phosphoric acid combinations from phosphate salts of the metals of the alkalies, which consists in melting the insoluble salt or salts and rapidly cooling the same to prevent crystallization for the purpose set forth.

2. The herein-described process of obtaining meta or pyro-phosphoric acid combinations, from phosphate salts of the metals of the alkalies, which consists in melting the insoluble salt together with a salt of the metals of the alkalies, and rapidly cooling the same to prevent crystallization for the purpose set forth.

HEINRICH PRECHT.

Witnesses:
W. EGGELING,
E. KOHLE.