

74

UNITED STATES PATENT OFFICE.

FRANCIS J. PHILLIPS AND EDWARD J. ROSE, OF LONDON, ENGLAND.

MANUFACTURE OF READILY-SOLUBLE SILICATES.

Paper thin

1,357,183.

Specification of Letters Patent.

Patented Oct. 26, 1920.

No Drawing.

Application filed June 22, 1920. Serial No. 290,902.

To all whom it may concern:

Be it known that we, FRANCIS JOHN PHILLIPS and EDWARD JOHN ROSE, subjects of the King of Great Britain and Ireland, residing at 10 Old Burlington Street, London, England, have invented certain new and useful Improvements in the Manufacture of Readily-Soluble Silicates, of which the following is a specification.

10 This invention relates to the preparation of soluble silicates or hydrated silicates of sodium or potassium, in which the silica content in relation to the alkali is relatively high.

15 The difficulty of obtaining a solution, or a soluble hydrate of, such silicates of high silica content is well known, and various attempts have been made to obviate this difficulty by means of special solvents, heat treatments and grinding processes.

20 In the manufacture of such silicates the materials from which they are derived are first mixed together and fused; the vitreous mass thus obtained is then ground or agitated with water to obtain a solution.

25 The invention consists in subjecting the mixture obtained by agitating the comminuted vitreous mass with water to the action of an acid or to an acid forming atmosphere or atmosphere containing acid-forming gases; this acid may be gelatinous silicic acid, or one which precipitates gelatinous silicic acid, which by continued agitation becomes redissolved into the main solution. The invention also consists in the improved process of manufacture of alkali silicates set out in the following description and claims.

40 The preferred method of carrying our invention into effect is as follows:—

To increase the fusibility of the mixture, which contains approximately three parts by weight of sand (SiO_2) to one part of alkali (Na_2CO_3 or K_2CO_3) borax may be mixed with the silica and all ~~at~~ by hand or mechanically and its weight may be within the limits 0.5% to 10% of the total weight, the lower limit being preferred. The mixture is next fused in a furnace, a convenient temperature being 1200°C .

50 When the vitreous mass is in a viscous state it is reduced to sheets, cakes or filaments by passing through two rollers which may be of metal, porcelain or other material.

The rollers revolving perform the function of squeezing the mass into very thin sheets, cakes, or the like. As the opening between the rollers may be varied at will the sheets or the like may be produced of any desired thickness, from that of a thin paper upward. Alternatively, the vitreous mass may be passed through an extrusion machine to produce filaments of any desired cross section, or by means of a blast the material may be blown into wool, in a similar manner to that employed in the production of slag wool.

It has been found that the mass reduced in the manner described is rendered more readily soluble, and is much easier to handle than in the crude mass usually employed, which generally requires crushing and grinding although it has been proposed to drop it into water in order to break it into fragments.

75 We have found that if the rolled, squeezed, or extruded material from the furnace be dropped directly into water it will break into minute particles.

80 The silicate produced in the manner before described is subsequently placed in a vessel containing a quantity of water which may be from 5.0% to 30% of the total weight; we usually employ 20% by weight of water in this operation.

85 The whole mass is then continuously ground together by any form of grinder, such as an edge runner mill or other mechanical means. It is possible to make a solution by continuous agitation whereby the particles grind themselves into solution by contact, but we do not prefer this method as it is less economical. The addition of independent abrasive material, such as separate masses of flint etc. is unnecessary in the grinding process.

100 The vessel in which the mass is being ground or agitated may be heated as has been previously proposed with the object of lessening the time required to obtain solution. Any means of heating may be employed such as live steam, a steam pipe passing through the vessel, an electric heater etc. So soon as the mass has become practically dissolved, the solution is passed into a further vessel and further water may be added.

105 Gelatinous silicic acid is then added to the solution; continued grinding or agita-

tion causes the gelatinous silicic acid to be redissolved into the silicate thus giving a soluble silicate with a smaller percentage of alkali and greater percentage of silica than before.

Instead of adding gelatinous silicic acid we may add an acid preferably in the form of a fine spray which precipitates gelatinous silicic acid. We prefer for this purpose sulfuric acid, and usually employ a 50% solution but the strength of the acid is not a vital factor in the operation.

If the sulfuric acid is employed, the equivalent quantity of sodium sulfate will be formed which remains in solution and which we do not in general find necessary to separate out.

While almost any acid other than sulfuric acid may be used, we do not propose to employ carbonic acid.

The final solution can be evaporated and reduced to powder or blocks or slabs.

Ordinary commercial silicates have been employed in combination with other materials such as sawdust, chalk, sand, lime, etc., and in some of these cases it has been proposed to add acid in order to precipitate silicic acid for various purposes such as waterproofing, but this addition of acid has not been accompanied by the continued agitation which is necessary to produce the soluble silicate of high silica content in accordance with our invention.

We claim:—

1. A process of manufacturing alkali metal silicates or hydrated silicates, consisting in grinding up fused alkali and silica with water and agitating silicic acid into solution with the alkali metal silicate.

2. A process of manufacturing alkali metal silicates or hydrated silicates consisting in the addition of an acid other than carbonic acid to the silicate solution obtained by grinding up fused alkali and silica with water, and agitating the silicic acid thus precipitated into solution with the alkali metal silicate.

3. A process of manufacturing alkali metal silicates or hydrated silicates consisting in subjecting the silicate solution obtained by grinding up fused alkali and silica with water, to further agitation in an acid atmosphere the agitation being continued

until the silicic acid deposited passes into solution with the alkali metal silicate.

4. A process of manufacturing alkali metal silicates or hydrated silicates consisting in subjecting the silicate solution obtained by grinding up fused alkali and silica with water, to further agitation in an atmosphere of acid-forming gases the agitation being continued until the silicic acid deposited passes into solution with the alkali metal silicate.

5. A process of manufacturing alkali metal silicates or hydrated silicates consisting in the addition of an acid other than carbonic acid in the form of a fine spray to the silicate solution obtained by grinding up fused alkali and silica with water, and agitating the silicic acid thus precipitated into solution with the alkali metal silicate.

6. A process of manufacturing silicates or hydrated silicates of sodium or potassium consisting in adding borax to the dry mixture of silica and alkali, fusing, breaking up, grinding with water into solution, adding an acid, and then grinding or agitating further in the presence of water.

7. A process of manufacturing silicates or hydrated silicates of sodium or potassium consisting in adding borax to the dry mixture of silica and alkali, fusing, breaking up, grinding with water into solution, adding silicic acid, and then grinding or agitating further in the presence of water.

8. A process of manufacturing silicates or hydrated silicates of sodium or potassium consisting in adding borax to the dry mixture of silica and alkali, fusing, breaking up, grinding with water into solution, adding an acid, then grinding or agitating further in the presence of water and evaporating to dryness.

9. A process of manufacturing silicates or hydrated silicates of sodium or potassium consisting in adding borax to the dry mixture of silica and alkali, fusing, breaking up, grinding with water into solution, adding an acid, then grinding or agitating further in the presence of water, and evaporating to dryness.

In testimony whereof we affix our signatures.

FRANCIS J. PHILLIPS.
EDWARD J. ROSE.