Specification of Dugald Campbell : treating sewage, &c.;

A.D. 1872, 30th MARCH. N° 944.

SPECIFICATION

OF

DUGALD CAMPBELL.

TREATING SEWAGE, &c.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY:
PUBLISHED AT THE GREAT SEAL PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS, HOLBORN.
1872.

Price 4d.

A.D. 1872, 30*th* MARCH. N° 944.

Treating Sewage, &c.

LETTERS PATENT to Dugald Campbell, Consulting and Analytical Chemist, 7, Quality Court, Chancery Lane, London, Middlesex, for the Invention of "AN IMPROVED PROCESS FOR THE TREATMENT OF SEWAGE AND THE PRODUCTION OF MANURES THEREFROM."

Sealed the 7th June 1872, and dated the 30th March 1872.

PROVISIONAL SPECIFICATION left by the said Dugald Campbell at the Office of the Commissioners of Patents, with his Petition, on the 30th March 1872.

I, DUGALD CAMPBELL, Consulting and Analytical Chemist, 7, Quality Court, Chancery Lane, London, Middlesex, do hereby declare the nature of the said Invention for "AN IMPROVED PROCESS FOR THE TREATMENT OF SEWAGE AND THE PRODUCTION OF MANURES THEREFROM," to be as follows :—

My Invention of "An Improved Process for the Treatment of Sewage and the Production of Manures therefrom," consists, in obtaining a precipitate from sewage as free or as nearly free as is possible from either the phosphate of alumina or the phosphate of iron, and for this purpose I use artificial or manufactured phosphates of lime, which are of themselves practically free from alumina or oxide of iron. I dissolve the said artificial or manufactured phosphates of lime in some mineral

acid, and in preference to others in either sulphuric or hydrochloric acid, as being more economical, and I apply the solution so obtained to the sewage, adding before or after, but preferably after, either a milk or cream of lime, or preferably a milk or cream of magnesia and lime prepared from magnesian limestone, in quantity sufficient to neutralize the acid which was in the acid phosphate of lime added to the sewage.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Dugald Campbell in the Great Seal Patent Office on the 27th September 1872.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, DUGALD CAMPBELL, Consulting and Analytical Chemist, 7, Quality Court, Chancery Lane, London, Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Thirtieth day of March, in the year of our Lord One thousand eight hundred and seventy-two, in the thirty-fifth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Dugald Campbell, Her special licence that I, the said Dugald Campbell, my executors, administrators, and assigns, or such others as I, the said Dugald Campbell, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "AN IMPROVED PROCESS FOR THE TREATMENT OF SEWAGE AND THE PRODUCTION OF MANURES THEREFROM," upon the condition (amongst others) that I, the said Dugald Campbell, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Dugald Campbell, do hereby declare the nature of my said Invention, and in what manner the same is to be

performed, to be particularly described and ascertained in and by the following statement:—

Hitherto acid solutions of the natural phosphates of alumina or of the natural phosphates containing either phosphate of iron or phosphate of lime, or mixtures of the same, or of the natural phosphates containing mixtures of phosphates of alumina and phosphate of iron, or of the natural phosphates, containing mixtures of phosphate of lime or of phosphate of iron or of phosphate of lime, either with or without the addition of lime or of chalk, have been proposed to be employed in the treatment of sewage so as to obtain a precipitate of the same, which precipitate is to be employed as a manure, but in most cases of such treatment the result has been the production of a precipitate containing more or less of phosphate of alumina or of phosphate of iron, these phosphates of alumina or of iron being great or little in the precipitate, according to the natural phosphate used in preparing the acid phosphate so employed in such treatment of the sewage, containing little or much of the oxides of alumina or of iron. Now experience has shewn that either of these precipitated phosphates, namely, the phosphate of alumina or the phosphate of iron, although valuable to some extent for agricultural purposes, are very inferior in this respect to precipitated phosphate of lime, the phosphate of alumina and phosphate of iron being both not easily decomposible by plants, owing no doubt to the bases of these phosphates, namely, alumina or oxide of iron forming practically little or no part of the food of plants.

Now my Invention consists in applying for the purpose of obtaining a precipitate from sewage as free or as nearly free as it is possible from either the phosphate of alumina or the phosphate of iron, artificial or manufactured phosphates of lime which are of themselves practically free from alumina or oxide of iron instead of applying solutions of these natural phosphates, to which I have herein-before referred, as and to obtain a precipitate to be employed as a manure, and I treat the said artificial phosphates of lime in the following manner:—I act upon the said artificial or manufactured phosphates of lime with some mineral acid so as to render the phosphate of lime soluble, and in preference to others by either sulphuric or hydrochloric acid as being more economical than most other such acids, and I apply the compound so obtained, or a solution of the same, adding before or after, but preferably after, either a milk or cream of lime, or preferably when it is

procurable, a milk or cream of magnesia and lime prepared from magnesian limestone in quantity sufficient to neutralize the acid which was in the acid phosphate of lime added to the sewage.

In carrying out my Invention of "An Improved Process for the Treatment of Sewage and the Production of Manures therefrom," by the use of artificial or manufactured phosphates of lime rendered soluble by acid or acids, I prefer to use the material obtained from the calcination of bones, known in the market as bone ash, as it is at present the cheapest and best source with which I am acquainted from which I can now derive by the treatment of an ordinary mineral acid a soluble phosphate of lime as free or as nearly free as it is possible commercially to obtain it from the phosphate of alumina or the phosphate of iron, and to this bone ash I add about three-quarters of its weight of sulphuric acid, by preference of brown sulphuric acid, made from pyrites of 80 per cent. as the most economical, mixing or stirring up the whole well together, and allowing the mixture, preferably, to remain undisturbed for a few hours, when the mixture described can be most advantageously used either in its then existing state or preferably dissolved in water or in sewage or any analogous liquid; this solution of soluble phosphate of lime is then to be mixed with the sewage to be treated, contained in a cistern or reservoir, by means of agitators of any ordinary kind in the said cistern or reservoir, after which the milk or cream of lime, or of magnesia and lime prepared from magnesian limestone, sufficient to neutralize the acid which was in the acid phosphate of lime added to the sewage, is added and the whole compound mixture is to be well agitated and then allowed to rest until the precipitate having subsided (which it will shortly do), the supernatant liquid is run off from it, and where practicable such supernatant liquid is applied to the irrigation of land, to which purpose it will be found highly beneficial.

Instead of adding the solution of acid phosphate of lime to the sewage in a cistern or reservoir, and agitating the mixture and afterwards adding the milk or cream of lime or of magnesia and lime, and again agitating the solution of acid, phosphate of lime may be run into the upper part of an inclined trough containing the sewage, so as to produce a running stream of the sewage and solution of acid phosphate of lime mixed together. The milk or cream of lime or of magnesia and lime is then to be delivered at a lower part of the trough into the stream

of sewage and solution of acid phosphate of lime, and the whole will then be well mingled by running together until the mixture reaches the reservoir, and then no use of agitators will be required in the reservoirs. After the liquid is run off from the precipitate, the precipitate is collected and may be used in its then existing state as a manure, or it may be collected and a small quantity of acid, preferably sulphuric acid, may be added to it, and it may be dried by any of the well-known methods employed for drying precipitates from sewage or such like substances, and in this state it may be used or sold as a manure.

As sewage differs very much in quality, so will the quantities of solution of acid phosphate of lime required to be added to the sewage differ; a strong sewage, that is a sewage containing a large quantity of fecal matter either in solution or suspension, or both, requiring more than a weak sewage; generally I have found that from about one and a half parts to two and a half parts by weight of the acid phosphate of lime to every one thousand parts by weight of raw sewage of an average kind to answer well; a very strong sewage would require a little more of the acid phosphate and a very weak sewage would require a little less. The quantity of hydrate of lime or hydrate of magnesia and lime to be added to the sewage (preferably in the form of a milk or cream) is as near as may be about half the weight of the acid phosphate of lime that is added to the sewage.

Having thus described my Invention, and the means which I adopt in carrying out the same into effect, I would have it understood that what I claim is, the employment of artificial or manufactured phosphates of lime in the treatment of sewage and in the production of manures therefrom, substantially as described.

In witness whereof, I, the said Dugald Campbell, have hereunto set my hand and seal, this Twenty-sixth day of September, in the year of our Lord One thousand eight hundred and seventy-two.

DUGALD CAMPBELL. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1872.