

UNITED STATES PATENT OFFICE.

JOHN SCOFFERN, OF UPPER HOLLOWAY, ENGLAND.

IMPROVEMENT IN PROCESSES FOR THE MANUFACTURE OF SUGAR.

Specification forming part of Letters Patent No. 6,900, dated November 27, 1849.

To all whom it may concern:

Be it known that I, JOHN SCOFFERN, of Upper Holloway, M. B., a subject of the Queen of Great Britain, have invented or discovered new and useful Improvements in the Manufacture and Refining of Sugar; and I, the said JOHN SCOFFERN, do hereby declare that the nature of my said invention and the manner in which the same is to be performed are fully described and ascertained in and by the following statement thereof—that is to say—

My invention consists of the employment of sulphurous acid as a means of separating lead used for purifying or removing coloring and other foreign matters from solutions containing sugar; and in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me. I would, however, first state that it has before been proposed to apply salts of lead as a means of purifying sugar in the course of manufacturing and refining the same; but heretofore no practically useful means of separating the lead therefrom has been employed.

For convenience of arrangement I will treat my invention under two heads: first, as applied to the process of sugar-refining; second, as applied to the process of extracting sugar from the original juice, whether of the cane, beet-root, or other material from which the kind of sugar termed by chemists "cane-sugar" may be procured.

The object which the sugar-refiner has in view is the separation from his raw material of every impurity, so far as may be practicable, and although the various stages of sugar-refining are modified to suit the judgment and to accord with the convictions of different manufacturers, yet the following general principles I believe are embraced by all: first, the process of blowing up; second, the process of filtration, (first through fibrous textures; secondly, through deep beds of animal charcoal in the granular state;) third, the process of boiling, generally *in vacuo*; fourth, the process of "claying," (technically so called, although clay is now no longer used;) fifth, the process of liquoring; sixth, the processes of drying and stoving.

Adaptation of my invention to refineries: Having put the quantity of sugar to be operated upon into the blow-up pan, and having dissolved it in the ordinary way, omitting, however, the usual addition of lime-water and spice, (blood,) I add the lead material, prepared as hereinafter indicated and in the quantity hereinafter indicated, such lead agent having been first rubbed up with enough hot water or sirup to make a thin magma or paste. It is desirable in all cases to add enough, and not too much, of the lead agent; and I find that a certain amount of experience is necessary to enable the manufacturer to determine how much of the lead agent any particular sample of sugar may require. I can, for that reason, only give general directions. Supposing the sugar intended to be operated upon be an average refining sample of Jamaica produce. The manufacturer should commence his operations by using the proportions of forty grains of the lead material, obtained by the process to be hereinafter mentioned, to every pound of sugar, less pure sugar requiring more material. By proceeding thus he should obtain a good result, and the information he acquires by this operation will be a sort of standard for the future. A portion of the sugar thus operated on should be set apart for future reference until the manufacturer shall have trained his eye sufficiently to appreciate the relation between the character of certain sugars and the corresponding amount of material necessary to separate their impurities.

I would observe that any quantity of lead material which the manufacturer might choose to add may be effectually separated by my process. Having added the determined quantity of lead material, I heat the liquid to the temperature of about 180° Fahrenheit. After the sugar has been perfectly dissolved and the lead material well incorporated the application of heat to the degree last mentioned during the space of five minutes is all that I have found necessary to produce the desired effect. After this I allow the contents of the vessel to repose for the space of about fifteen minutes, when on examining the surface a curdy brown precipitate may be seen gradually sinking to the bottom, leaving the liquor above in a greater

or less degree of transparency. I then resort to the process of bag-filtration. The liquor which comes through the filter apparatus is to be received into a copper vessel, and it will be found to contain a considerable portion of lead, which is to be separated by the operation which I call "gasing," and which consists in passing through it streams of sulphurous-acid gas until a portion of the liquor properly tested shall yield no trace of lead. To accomplish this end I observe the following plan: Supposing the liquor to be operated on to result from the solution of two parts of sugar and one of water, it will be viscous or like a sirup. The liquor in this state is to be agitated during the application of the gas. After the gas has been transmitted for about ten minutes the liquid should be tested to see whether it contains lead in solution.

By the side of the operator should be conveniently placed two or three filters of filtering-paper, each about four inches diameter in the round—that is to say, before being folded into a conical shape—a bottle containing hydrosulphate of ammonia, (the kind of hydrosulphate of ammonia I employ is made by transmitting a current of hydrosulphuric-acid gas through an aqueous solution of ammonia,) or an aqueous solution of hydrosulphuric acid, a few clean straws, a solution of sugar of lead, (twenty grains to the fluid ounce of distilled water,) some filter-supports, test-glasses, a mixture of one ounce of chalk with three ounces of water, and a Berlin-ware boiling-dish. To ascertain if any lead be left proceed as follows: Into a Berlin boiling-dish put about a fluid ounce of the liquor, give it a boil over a spirit-lamp, add a tea-spoonful of the chalk-mixture, boil again for a minute, then pour the boiled liquid on a filter previously made wet with water. The liquid will at first come through so turbid that to test it would be difficult; therefore it should be passed through the same filter at least twice. Still it will seldom be quite clear at this stage, on account of the density of the liquor. With weak liquors the case is different. This ultimate want of clearness, however, interferes in no way with the perfect action of the test to be applied, which is done as follows: Into the filtered liquor, or a portion of it, pour about ten drops to the ounce of hydrosulphate of ammonia, should that test be employed, or about about a fourth part of the filtered liquid's own volume of hydrosulphuric-acid solution, should that test be used, and observe the appearances that result. Should the addition of either test occasion the least tint of blackness, it is a sign that the liquor still contains lead, and that it must be further gased. Should the result, however, be that the addition of the test produces no visible effect or merely a whiteness, it may be concluded that the gasing has been continued long enough. It is desirable to proceed a step further in the process of testing, and for this purpose I use the solution of sugar of lead

as a counter-test, thus: Taking the portion of filtered liquid to which the test has been added with no visible effect, or with merely the production of a whiteness, I now drop in, by means of a straw, (note, straws should never be used a second time,) a small quantity of the sugar-of-lead solution, when, supposing all conditions to have been effective, a patch of blackness will be observed, and which may be permanent or may presently change to white or gray. The appearances here indicated, if observed on the addition of the counter-test, assure the operator most confidently that all lead had been previously removed. He therefore proceeds with the next part of his operation. By means of any convenient source of heat (steam in preference) the liquid which has been gased is heated with all convenient rapidity to a temperature of 180° Fahrenheit. Chalk or powdered marble, or other convenient form of carbonate of lime, is then to be added, in weight equal, by preference, to one-sixth of the lead material originally employed. To facilitate the admixture of the chalk or other carbonate with the fluid, either of them should be added in the condition of thin paste made by rubbing it up with water. Having added the chalk, it is advisable to retain the liquor at a temperature of 180° Fahrenheit, or thereabout, for about ten minutes or a quarter of an hour. (Note, in operating upon a liquor of the density of two of sugar and one of water, or thereabout, I assume that animal charcoal is to be employed as the last filtering agent, for otherwise it would be preferable to operate upon solutions of less density.) The liquor is now in a condition to be filtered previously to its being turned onto the charcoal-beds.

In applying my invention to cane-juice I find it desirable to render the juice neutral or slightly alkaline before treating it with the lead material. I therefore first test the juice by litmus paper, and if the color of the paper is changed by acid or acid salts, I proceed to neutralize the same by lime or chalk. If chalk be used, I first make it into a paste by grinding it with water. If lime be employed, what is called "cream of lime" is to be used; and having heated the juice to about 180° Fahrenheit, if I employ chalk I stir in small quantities till the juice no longer indicates the presence of acid, or only very slightly so. If I employ lime, then I carry on the process till slight but distinct alkaline reaction is indicated to the test. I now apply the lead material in the manner above described, but in the proportion of one hundred and fifty grains to each imperial gallon of the juice; but such proportion will be varied according to the purity or density of the juice. The liquor is next to be filtered, gased, as above explained, and subjected to the action of carbonate of lime, so as to neutralize all acid, as in the previous case.

If my invention be applied to beet-root or other juice, I operate on the same after it has

been treated with lime, as at present practiced, and then it is to be operated on by the lead material as described in respect to the cane-juice, but larger quantities of the lead material are required.

I will now explain how I prepare the lead material I prefer to use in carrying out my invention.

Take twelve gallons or any proportionate quantity of vinegar of five per cent. strength, heat it in a copper vessel to 160° Fahrenheit, then gradually pour in (stirring all the time) forty pounds avoirdupois of finely-powdered litharge. Now raise the temperature until the mass boils, frequently dislodging or breaking the crust which collects upon the bottom of the vessel. Ebullition may be continued until the mass becomes so thick that portions are blown out of the vessel by the process of boiling, at which period the heat should be gradually decreased and the last portions of moisture should be dissipated by a gentle heat. If vinegar of greater strength be used, a proportionably greater quantity of litharge is used. The result thus obtained I consider to be a mixture of two or more of the basic acetates of lead, of which chemists recognize several. The above is a cheap mode of preparing the lead material for my invention. I do not, however,

claim such preparation, nor do I confine myself thereto.

I would state that sulphurous acid combined with a base—such as magnesia or otherwise—may be employed for separating lead from sugar in solution, but, I believe, not with such advantage as results from the means above explained.

I deem it proper to call particular attention to the fact that inasmuch as the lead employed in the foregoing process has poisonous properties, it should only be used by experienced refiners, who will carefully comply with all the instructions herein contained to guard against any portion of it being left in the sugar.

Having thus described the nature of my invention and the manner in which the same is to be performed, I would remark that I do not confine myself to the precise details so long as the peculiar character of my invention be retained; but

What I claim is—

The combined use of sulphurous acid with lead in the manufacture and refining of sugar, substantially as herein set forth.

JNO. SCOFFERN.

Witnesses:

JOSEPH MARQUETTE,
WILLIAM EWING.