UNITED STATES PATENT OFFICE.

E. PESIER, OF VALENCIENNES, FRANCE.

IMPROVEMENT IN THE MANUFACTURE OF SUGAR.

Specification forming part of Letters Patent No. **22,578**, dated January 11, 1859.

To all whom it may concern:

Be it known that I, EDMOND PESIER, professor of chemistry at the college of Valenciennes, in the Empire of France, have invented new and useful Improvements in the Manufacture of Sugar; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known, and of the usual manner of making, modifying, and using the same.

The invention consists in the application to the manufacture of sugar of alcohol and agents capable of effecting, when mixed with this liquid, the elimination of mineral or organic matters incorporated with the sugar in the juice of saccharifierous plants.

I will now describe the application of my process to the manufacture of sugar from beet-root.

Alcohol cannot be employed economically if the juice obtained, either from pressure or by maceration of green beet-root, is of feeble density. The juice must be concentrated from 18° to 30° Baumé's areometer, either after deflection in the ordinary manner, or directly, taking care to neutralize the acidity of the sirup as soon as it is formed by lime or any other base. Dried beet-root treated by washing with boiling water and neutralizing the acidity by the addition of a small quantity of lime produces directly sirups of the desired concentration. Crude and impure sirups, of whatever nature, are neutralized by carbonic or sulphuric acid, if they are too alkaline, and are then conducted into a closed sheet-iron vessel furnished with an agitator. Alcohol at 93° is then added from a vessel placed on an upper level and provided with a stop-cock, in the proportion of three times the quantity of sirup, so that the mixture will indicate 60° to 70° by Gay-Lussac's alcohol-meter. After being agitated during a short time it is allowed to settle. The deposit formed is thick or grumous, and is easily separated from the clear liquid by decantation when any excess of alkali or acid has not produced a too great transformation of the pectine. With the impurities which the deposit contains is combined a little sugar, more or less in quantity according to the degree of concentration of the sirup required for commercial purposes. The deposit may be washed many times with alcohol at 93°, (which will serve for another precipitation,) or after having been separated from the alcohol it may be used in distilleries instead of molasses. The liquid, quickly obtained, clear, and nearly colorless, is conducted, by difference of level, pumping, pressure of steam or air, or by other means, into a similar vessel to the first, provided with a funnel and stop cock for introducing the purifying chemical agents. An acid or an acid salt—such as sulphuric, oxalic, or tartaric acid—and sulphate of alumina, capable of forming a compound with potash or soda insoluble in alcohol, will separate the alkalies. The alkaline salts precipitated are nearly white, and collect with more or less rapidity, and have a variable value, according as the acid employed is a mineral or organic acid, the preference being determined by circumstances. Sulphuric acid diluted in alcohol, however, is preferred, the quantity being indicated by the cessation of the precipitate. I operate on the liquid when it is in a cold state and agitate it carefully. As soon as the acid has been added I neutralize the excess of acid and the acids which it has displaced by a base, such as lime, barytes, strontian, oxide of lead, or one of their basic salts. I then introduce into the separated liquid one of these bases in excess previously diluted in weak alcohol. An abundant precipitate is then formed. The bases serve to expel the ammonia and prevent acidity in boiling. The vessel in which I operate is furnished with a worm which allows of heating by steam. The ammonia, being heated and expelled, is drawn with the alcoholic vapors, and passes through a recipient containing alcohol acidulated by sulphuric acid or solution of sulphate of alumina. The ammonia condenses there and forms a useful product, and the alcoholic vapors pass into a refrigerator to be condensed to a liquid state. This operation being finished, I remove the base in excess. At the same time I decompose by carbonic or other suitable acid the small quantity of saccharate produced. I separate the deposit, and the clear liquid is placed in a separate boiler heated by steam, which boiler forms at the same time an evaporating-vessel and an alembic, so that the alcohol is condensed by a subsequent evaporation and the saccharine liquid concentrated to a sirup, which may then either be boiled or submitted to the ordinary processes of clarification and filtra-

tion, when it is freed from alcohol, at about 30° Baumé, in cases where its nature does not admit of suppressing this manipulation. All the operations are performed in closed vessels. The precipitates are separated by decantation. If the precipitates are light and voluminous, I accelerate their precipitation by adding, a short time after their formation, a body coagulable by alcohol, like albumen or gelatine, which are capable of precipitating all impurities in suspension in a perfect coherent deposit. When the latter are sufficiently accumulated in the vessel I wash them with strong alcohol for separating the sugar with which they are impregnated. I can then expel the alcohol by heat before it egresses through an opening for that purpose. When I introduce the carbonic acid, to avoid the loss of a certain quantity of alcohol the acid is absorbed by a base as soon as it escapes from the liquid. The animal-black may be applied new or in a state of fine powder to the sirups, allowing it to operate before the alcohol, which is precipitated with its impurities.

The means adopted for condensing the alcohol should be sufficient to allow an active evaporation of the liquids and prevent a large quantity of alcohol being used. By means of alcohol combined with lime a white sugar may be obtained from beet-root. For this purpose it is necessary to introduce the lime in excess in the liquid separated from the deposit that the alcohol produces, then to boil it. Condense the ammonia and alcoholic vapors, as before described, neutralize the excess of base, separate the deposit, evaporate, and boil.

Instead of adding the lime to the alcoholic solution, it may be added to the sirup, at 27° to 30° Baumé, after the evaporation of the alcohol; then clarify, filter, and boil.

Having thus described the nature of my invention, so as to enable others skilled in the art to carry out the same, I observe, in conclusion, that I do not claim the use of alcohol in the purification of crude sugar; but

What I do claim, and wish to be protected by Letters Patent of the United States, is—

The treatment of the saccharine juices of plants in the manner described by the use of alcohol in combination with other special agents.

EDMOND PESIER.

Witnesses:

W. H. BAIR,

Z. I. FONTAINEMEREAU.