

UNITED STATES PATENT OFFICE.

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TREATING CEREALS TO SEPARATE THE OILY GERMS, FLOUR, AND STARCH, FOR THE USE OF DISTILLERIES, &c.

SPECIFICATION forming part of Letters Patent No. 241,476, dated May 17, 1881.

Application filed October 6, 1880. (No specimens.) Patented in France February 23, 1880, in Great Britain February 28, 1880, in Belgium February 28, 1880, in Italy March 10, 1880, in Germany March 11, 1880, in Austria March 18, 1880, and in Spain March 19, 1880.

To all whom it may concern:

Be it known that I, FERDINAND CAMUS, of Paris, in the Republic of France, have invented a new and useful Improvement in Treating Maize and other Cereals to Separate the Oily Germs, Flour, and Starch, for Use in Distilleries and for other purposes, of which improvement the following specification is a full description.

This invention has reference to the bleaching and disintegration of maize (Indian corn) or other grain or seeds by means of a chemical process in which nascent sulphurous acid is generated in the body of the grain, and also to the separation of the product (flour or meal) thus obtained into pure starch, flour, or meal, with a large quantity of gluten and pure gluten.

The second portion of the invention is applicable also to flour or meal obtained in any ordinary or suitable way.

In order to bleach and disintegrate the grain it is, after previous cleaning, subjected to the action of a solution of sulphite or bisulphite of lime or soda, and then the grains, swelled by absorption of the solution, are treated with a suitable quantity of acid—such as sulphuric or hydrochloric acid, for example—and the production of sulphurous acid in the nascent state is caused to take place in the interior of the grain or seed. The bleaching and disintegration of the molecules is thus effected, which renders easy the separation of the oily germs and of the epidermic pellicle (bran) and farinaceous matter.

Mechanical treatment by crushing-rolls or grinders of the grain thus bleached and disintegrated, and the passage of the same through a suitable sieve or bolting-cloth, furnish the primary material for use in distilleries and starch-factories.

In order to obtain pure starch and flour or meal enriched by much gluten, flour or meal deprived of oil, as obtained by the method just described, or other flour or meal obtained by ordinary grinding, or otherwise, is treated by adding to it, while held in suspension in water, caustic alkali, soda, or potash, which determines the separation of the farinaceous matter into three distinct layers. The starch which forms the bottom layer is separated by de-

cantation of the flour and colored water, which are treated with a small quantity of sulphuric or hydrochloric acid, so as to neutralize the alkali and precipitate the gluten from solution. This gluten enriches the flour or meal, which can now be employed for making bread. By treating separately in the same manner the colored water separated from the flour, pure gluten will be obtained.

The following description will enable those skilled in the art to which this invention relates to practice the same.

The grain, which has previously undergone in a dry state mechanical cleaning as energetic as possible, is treated with a solution of a sulphite, or, better, of a bisulphite, and more particularly with bisulphite of lime or soda. This treatment may be carried on at ordinary or at moderately high temperatures. In the former case a long time is required, being about four or five days, while at an elevated temperature—that is to say, about 50° centigrade—the operation can be terminated in twenty-four hours. At the end of these periods the colored grain has been made extremely white. The mass is placed in vats constructed so far as possible of wood, and the bisulphite is added in a proportion which varies with the base of the salt employed, and also with the rapidity with which the operation is to be performed. For example, with crystallized bisulphite of soda in operating at 50° centigrade, in order that the operation may be completed in twenty-four hours, two kilos are added for each one hundred kilos of the mass. Then tepid water (50° centigrade) is introduced on the grain in sufficient quantity to just cover it. The mass is stirred from time to time, either by hand or with a mechanical mixer. When the grains are swelled and have absorbed the bisulphite solution, a quantity of sulphuric or hydrochloric acid corresponding with the weight of bisulphite employed, and diluted with considerable water, is gradually added. For example, if one hundred kilos of maize have been treated with two kilos of bisulphite of soda, two kilos of hydrochloric acid, if this be chosen, would be added. The acid penetrates by endosmose to the middle of the grain, and there reacts upon the bisulphite, producing sulphurous gas



under eminently favorable conditions. This gas, being in the nascent state, has a bleaching action incomparably superior to that which it would have if employed in a previously-prepared solution. Moreover, the gas comes into direct contact with all the molecules of the grain, and it also acts mechanically, disintegrating the particles of grain, separating them one from another, dividing and splitting them in its efforts to escape. This mechanical action constitutes a very important and advantageous element in the process.

The combined actions are so energetic that the grain is completely bleached and disintegrated, so that it is very easy to separate the oily germ and the epidermic pellicle or coarse bran from the rest of the farinaceous matter. To accomplish this the grain is passed either between two crushing-cylinders separated by about one-half millimeter, or between two millstones separated a suitable distance, or through any grinding apparatus of ordinary or suitable construction, and then through a sieve or bolting-cloth, being carried thereto by a sufficient quantity of water. That portion which passes through the sieve constitutes the primary material prepared for use in distilleries and starch-factories.

As the result of this treatment, taking maize as an example, from one hundred kilos of grain are obtained sixty-five kilos of starch (corn-starch) or watered flour, which has passed through a silk sieve, No. 240, and twenty kilos of coarse and fine bran, gluten, and oily germs. The sixty-five kilos of watered farina, although called "starch" commercially, are not chemically-pure starch, but contain gluten, which brings their composition near to that of flour or meal; but while for brewing and distilling this flour is excellent, for bread-making it is lacking in desirable qualities, on account of the small quantities of gluten which it contains, and for the manufacture of glucose and starch for stiffening fabrics it is defective, on account of the gluten, which for these purposes is in excess.

In this invention, therefore, the flour or meal obtained as just described is divided into two parts—the one containing chemically-pure starch, suitable for making glucose and laundry-starch, the other containing all of the gluten, and in consequence constituting a very nutritious flour, which can be used advantageously in bread-making, and is also adapted for use in distilling and brewing, where gluten favors the formation of ferment. To attain this result the primitive flour or corn-starch which has passed through the bolting-cloth held in suspension in water is treated with caustic soda or potash, in proportion depending upon the proportion of the reagents employed in obtaining this flour, and also upon the temperature used in its production.

I may here say that if the flour has been obtained by treating in the cold way, one hundred kilos of maize, with two kilos bisulphite of soda and two kilos hydrochloric acid, one

per cent. of caustic potash or soda is added. The proportion varies also, it should be understood, with the temperature of the liquid and of the surrounding atmosphere. Scarcely has the addition of the caustic alkali been made than the decomposition takes place and chemically-pure starch falls to the bottom of the vat, where, in a short time, it acquires considerable consistence. Above the starch is the flour, and, finally, at the top of the vessel, the alkaline-water, holding in solution coloring-matters and gluten. Thus, by the addition of caustic lye, the separation of the farinaceous paste into three distinct layers is effected—viz., the starch at the bottom, the flour in the middle, and the colored water on top. The flour and water are now decanted and treated with sulphuric acid, so as to neutralize the alkali and precipitate all the gluten held in solution. This gluten mixes with the flour and enriches it. The flour is then allowed to settle, is dried, and bolted to render it suitable for bread-making. For brewing and distilling it is allowed to remain in the green or untreated state. The starch is perfectly pure and needs only simple washing.

To obtain pure gluten the alkaline solution is decanted from the flour, as well as from the pure starch, and precipitated by acid.

Having thus fully explained the said invention and the manner of carrying the same into effect, what I claim is—

1. The method of bleaching maize and other cereal grains and seeds for use in distilleries and for other purposes, by subjecting the same to the action of nascent sulphurous acid, substantially as described.

2. The method of bleaching and disintegrating grain by causing it to absorb a sulphite or bisulphite in solution and then treating the swelled grain with an acid, substantially as described.

3. The method of obtaining pure starch from flour or meal by treating the same, held in suspension in water, with caustic alkali, or in the manner explained, so as to cause the separation of the farinaceous paste into three layers, and decanting the flour and liquor from the precipitated starch, substantially as described.

4. The method of obtaining from flour or meal pure starch and flour or meal enriched with gluten, as described, said method comprising the treatment of the flour or meal, in suspension in water, with alkali, the decantation of the other constituents from the pure starch, and the precipitation of the gluten into the flour or meal decanted with it.

5. The process of treating maize or other grain so as to bleach and disintegrate the same and obtain therefrom starch adapted for making glucose or laundry-starch, and flour or meal for use in bread-making, distilling, or brewing, by causing the cleaned grain to absorb a solution of a sulphite or bisulphite and then acting on the swelled grain with an acid, so as to generate sulphurous-acid gas within the body of the grain, separating the oily germs and bran

by grinding or crushing and bolting, treating
the flour or meal obtained while held in sus-
pension in water with alkali, decanting the
other material from the pure starch and pre-
cipitating with acid the gluten into the por-
5 tion of the flour or meal decanted with it, sub-
stantially as described.

In testimony whereof I have signed my name
to this specification before two subscribing wit-
nesses.

F. CAMUS.

Witnesses:

EMILE BARRAULT,
AUG. VINCK.