

UNITED STATES PATENT OFFICE.

JACOB BLUMER, OF BROOKLYN, AND CHARLES SCHLAGENHAUFER, OF
NEW YORK, N. Y.

MANUFACTURE OF YEAST.

SPECIFICATION forming part of Letters Patent No. 474,942, dated May 17, 1892.

Application filed August 25, 1891. Serial No. 403,706. (No specimens.)

To all whom it may concern:

Be it known that we, JACOB BLUMER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, and CHARLES SCHLAGENHAUFER, a subject of the Emperor of Austria-Hungary, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in the Manufacture of Yeast, of which the following is a specification.

The object of our invention is to manufacture yeast, and more especially compressed yeast, from certain waste products resulting from the manufacture of starch or its derivatives—such as starch-sugar, dextrine, alcohol, &c.—from raw—that is, unmalted—starch-bearing materials, such as cereals, potatoes, &c. These waste products are, first, wash and soaking waters—acid, alkaline, or neutralized—which are obtained by washing or soaking the original starch-bearing material in suitable liquids; second, the more or less solid residues which are left after the starch-bearing material has served the purpose of starch-manufacture.

The following is a full description of the preferred method by means of which we utilize the wastes, and for the sake of clearness we will first describe how we obtain the wastes in a systematical way and then how to use them.

The starch-bearing material is first reduced to small fragments, either dry or wet, by crushing-rollers or other suitable appliances. It is then mixed with water, or water and slop, resulting in our process, as hereinafter mentioned, or with diluted solutions of acids or alkali, and treated for a certain time and at a temperature which is low enough to leave the starch intact, never more than 50° centigrade. After a sufficient part of the soluble matter has been extracted from the starch-bearing material the liquid extract is separated from the remaining solid material. This may be done by filtering-presses, centrifugal machines, or any other apparatus suitable for the purpose. The main point is to obtain a clear solution in order to save all the parts not soluble or in suspension for the manufacture of starch. This clear extract which we

use for yeast-making is a solution of sugar, dextrine, soluble albuminous substances, and mineral salts, and the proportions of these substances depend on the kind of material which is used. In case the extract should be too diluted it may be put on new material again in place of water or other solutions, and this may be repeated as many times as necessary to obtain a final extract of desired concentration. In this way it is an easy matter to obtain extracts of five to eight degrees on Balling's saccharometer. Heretofore it has not been separated in a systematical way, but was wasted in the form of wash or soaking waters. The solid parts of the starch-bearing material remaining in the filtering-press, centrifugal machine, or other apparatus still contain the whole amount of starch intact and enter into the manufacture of starch or its derivatives in any of the usual methods. After the material has served this purpose there will be left a more or less solid residue, which is composed of fiber, certain albuminous substances, fat, mineral salts, and a certain small quantity of starch, as there are no means, either mechanical or chemical, to eliminate from the starch-bearing material the whole amount of starch in its original form. This residue is another waste product which we sometimes utilize for our purpose. We use it preferably in combination with the wash or soaking waters.

We will first describe the process of making yeast when using the above-mentioned liquid extract by itself, although we do not claim specifically herein the manufacture of yeast from an extract containing soluble substances obtained directly from cereals, but not containing the waste from the solid residues and without the addition of malted grain, since that is claimed in our application, Serial No. 407,490, filed October 2, 1891. The clear extract is preferably placed in a suitable digester or heater and its temperature raised above mashing temperature, preferably to from 80° to 130° centigrade, 100° centigrade being the temperature generally employed. If a temperature below 80° is used, the time consumed is so long that it renders the process commercially impracticable. In doing this the extract is sterilized and a part of the albumi-

nous substances will coagulate. The coagulum has to be separated from the clear extract or wort by some filtering or other suitable process—such as by the use of centrifugal machines or by decanting—and forms a nutritious feed for animals. In some cases, especially when the extract is heated above 100° centigrade for too long a time, the dextrine is changed into a modification which is difficult to ferment, and it will then be advantageous to add a very small amount of finely-ground malted grain. This is to be done before the filtering takes place and at a temperature of about 50° centigrade. The malted grain is only added for the purpose of assisting the fermentation of the above-mentioned modification of dextrine, and an amount equal to one per cent. of the solids contained in the extract will be sufficient to accomplish it. The filtered clear wort, which is separated from the coagulum, or in some cases from the coagulum and the malted grain, is then cooled to about 25° to 35° centigrade and is mixed with a suitable quantity of mother-yeast in order to start fermentation. The temperature during the process of fermentation should be maintained constant at about 25° to 35° centigrade, and during said process the wort or fermenting liquid should be continuously agitated. After the lapse of a certain time the extract is fermented and the yeast formed, when the liquid is cooled down to about 15° centigrade and the yeast allowed to settle to the bottom of the containing-vessel. As soon as the liquid appears clear it is carefully drawn off, and the remaining yeast is then washed with fresh cold water one or more times, and finally pressed, in order to obtain the yeast in compact form. The clear liquid drawn off, as above mentioned, contains a small amount of alcohol in solution, and this is separated from it by distillation. The extract formed from the soluble substances of one bushel of starch-bearing material will yield from one-fifth to one-third gallon of proof-alcohol. The liquid remaining after distillation is slop or swill. We propose in some cases to use part of this slop in the place of water for soaking or extracting the original starch-bearing material, as hereinbefore mentioned.

When we employ the liquid waste or extract in connection with the above-described more or less solid residues, we proceed in the following manner: The two kinds of waste are placed in a digester and heated to from 80° to 130° centigrade, whereby they become sterilized and whereby simultaneously the starch still contained in the residue is gelatinized and dissolved. The "mash," as we will call this combination of wastes, is then cooled to about 60° or 70° centigrade and mixed with a suitable amount of finely-ground malted grain. The diastase contained therein will act on the dextrine of the extract and on the starch of the residue. In this case, also, we only add a small amount of malted grain,

not more than just sufficient to saccharify the starch. After saccharification is completed we filter the clear wort from the solid substances of the mash, and proceed with this clear wort in the same way as described when we use the liquid waste or extract above—*i. e.*, we add a suitable amount of mother-yeast, ferment the wort, separate the yeast from it, and distill the fermented wort, in order to obtain the small quantity of alcohol.

Heretofore the manufacture of yeast has been an integral part of the distilling and brewing business; but by our improvement we are able to employ waste products of an entirely different industry and to economically produce a yeast of exceptional strength and high quality. In all former methods of yeast-making the greatest part of the starch in the starch-bearing material had to be converted into sugar, while in our method the main body of the starch stays intact and can be separated in its original form.

While in all former methods one had to deal with large quantities of alcohol produced from converted starch, we only ferment the sugar which nature has stored away in cereals, and in some cases that small part of sugar which we obtain by utilizing the more or less solid residues. With our process yeast-making becomes a profitable branch of starch-manufacturing, which produces wastes that contain all the substances which are necessary to build up the yeast-plant, but which heretofore were lost for this valuable purpose. We are justified to say, therefore, that we place yeast-making by our method on a rational and economical basis.

We are aware that it has been proposed to make yeast from a liquid extract pressed from potatoes and mixed with a large proportion of green malt (which mixture, however, was not sterilized) and we do not claim that process.

What we claim is—

1. The method of making yeast, which consists in extracting the soluble parts of unmalted starch-bearing materials with a suitable liquid and at a temperature below 50° centigrade, thereby leaving the starch in said materials intact, separating such extract from the solid material, sterilizing the extract and coagulating albuminous substances by raising its temperature above mashing temperature, preferably to 100° centigrade, separating the coagulated albuminous substances before fermentation of the extract, fermenting such extract with the assistance of a small amount of malted grain at a temperature of about 30° centigrade, thereby forming yeast, and separating the yeast, substantially as described.

2. The method of making yeast, which consists in extracting the soluble parts of unmalted starch-bearing materials with a suitable liquid at a temperature below 50° centigrade, separating such extract from the solid material, combining the extract with the more or less solid residues which are left after the

starch-bearing material has served the purpose of starch-manufacturing, sterilizing the mixture, adding malted grain, fermenting it, thereby forming yeast, and separating the yeast, substantially as described.

3. The method of making yeast, which consists in extracting the soluble parts of unmalted starch-bearing materials with a suitable liquid at a temperature below 50° centigrade, separating such extract from the solid material, combining the extract with the more or less solid residues which are left after the starch-bearing material has served the purpose of starch-manufacturing, sterilizing the mixture, adding malted grain, separating the

clear wort, fermenting it, thereby forming yeast, and separating the yeast from the wort, substantially as described.

This specification signed and witnessed this 6th day of August, 1891.

JACOB BLUMER.

Witnesses:

CHARLES M. CATLIN,
J. A. YOUNG.

This specification signed and witnessed this 17th day of August, 1891.

CHARLES SCHLAGENHAUFER.

Witnesses:

CHARLES M. CATLIN,
J. A. YOUNG.