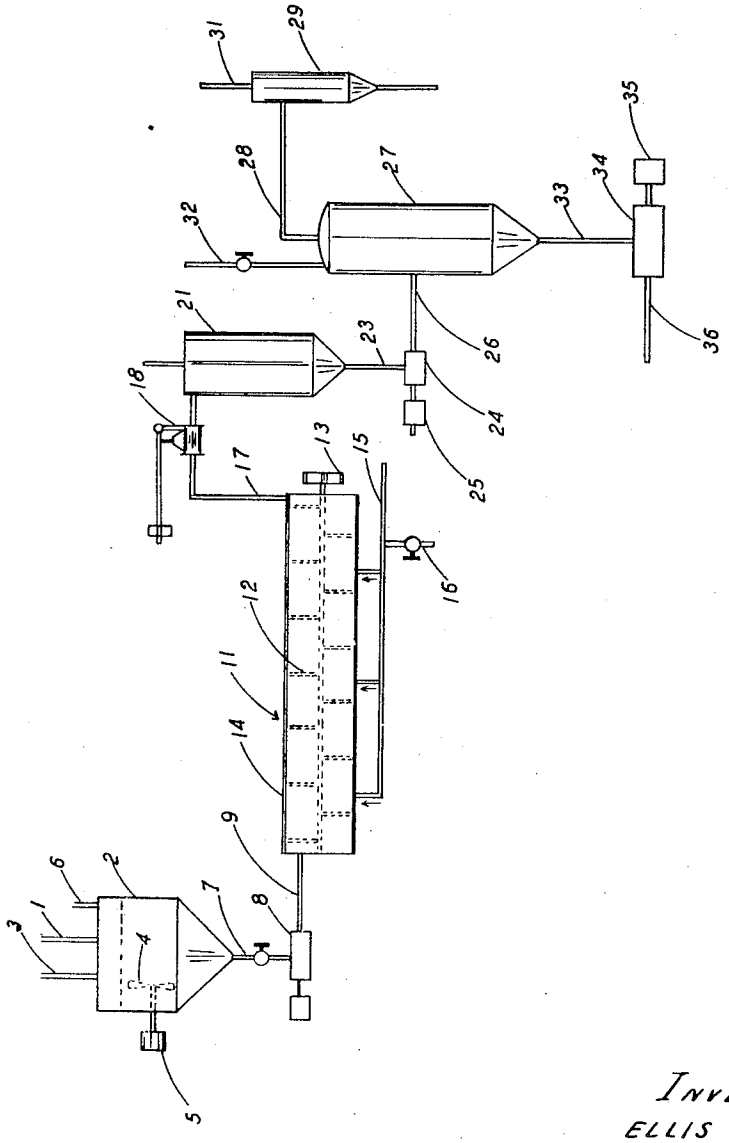
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PROCESS FOR MASHING CEREALS

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PROCESS FOR MASHING CEREALS

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1 Claim. (Cl. 195—21)

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This invention is a new and useful process for mashing cereals. This application is a continuation in part of my prior application, Serial No. 414,041, filed October 8, 1941, now abandoned.

The invention will be fully understood from the following description read in conjunction with the drawing which is a diagrammatic side elevation with parts in section of apparatus in which the invention may be carried into effect.

One object of the invention is the rapid and efficient mashing of cereals to obtain the maximum possible efficiency of conversion of starches into fermentable sugars and to generate a mash adapted to yield a distillate of the highest quality.

Another object of the invention is the provision of a process that is complete in relatively few steps and therefore requires a minimum of equipment.

Another object of the invention is the provision of a rapid continuous process that is, nevertheless, capable of successful operation within relatively wide limits and in which there is little or no danger of setting up reactions destructive or harmful to the organic materials involved.

Referring to the drawing, the cereal to be mashed may be any starch-containing material such as, for example, rye, wheat, rice, barley, corn, etc. This material is introduced through pipe 1 into tank 2. Water is introduced through pipe 3 to the extent of from 300 to 700% by weight of the cereal introduced and the whole is made into a uniform mixture by means of the mixing paddle diagrammatically indicated by 4 driven by any suitable means diagrammatically indicated by 5. Preferably malt is also introduced at this stage through pipe 6 and uniformly mixed into the cereal and water. The primary purpose of introducing the malt is to reduce the viscosity of the mixture in the next, i. e., the gelatinization stage.

The mix so made is then passed out of the tank 2 through valve pipe 7 and pumped at a uniform continuous rate by means of the pump 8 through the pipe 9 into the convertor 11. The convertor 11 is preferably an elongated pressure-retaining vessel provided with a suitable stationary baffle, or a stirrer diagrammatically indicated by 12 driven by any suitable means diagrammatically indicated by 13. This receptacle is provided with a steam jacket 14 into which steam under pressure is introduced through the branched pipe 15, condensate being bled out of the system to the valved pipe 16, and the receptacle is also provided with jets for introduction of live steam into the mix. In the convertor 11 the mixture is heated

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to a temperature from 100° C. to 160° C. The rate of progression is so related to the volume of the convertor that the mixture is in this zone for a period of from 3 to 20 minutes, both limits inclusive. The mixture will develop a vapor pressure which may range from about 14 to about 90 lbs. absolute and for this reason, the convertor 11 is constructed to hold pressures of this order.

I find that in these conditions and within this period the gelatinization of the starches present is complete; that the operating conditions are easily susceptible to control and that there is little or no danger of side reactions that would impair the reaction efficiency or diminish the yield or quality of the eventual distillate.

From this zone the material is continuously discharged through pipe 17 and through pressure reduction valve 18 into the atmospheric flash tank 21; from the outlet 23 of the tank 21 the material is moved continuously by pump 24 driven by any suitable means diagrammatically indicated by 25 through pipe 26 into tank 27. Tank 27 is provided with a vapor outlet 28 connected to a barometric condenser 29 which is supplied with water through the pipe 31. The barometric condenser is operated to maintain an absolute pressure of 150 to 200 mm. of mercury within the tank 27 with the result that the mixture which comes into the tank as a continuous stream is practically immediately cooled to a temperature in equilibrium with the body of material in the tank, i. e., to a temperature of from 60 to 65° C.

It will, of course, be understood that the intermediate atmospheric flash tank may, if desired, be omitted and the material from the pressure-reduction valve 18 conducted directly into the tank 27 but in this case a relatively greater load will be thrown onto the barometric condenser 29. Preferably malt is continuously introduced through pipe 32 into the tank 27 and in this case it is preferable that the rate of introduction of material into tank 27 be so related to the volume of the tank that the material is held in this tank for an average time of from 3 to 30 minutes. In this case, the saccharification will be complete within this stage with substantially the maximum possible yield of fermentable sugars.

The material is continuously removed from tank 27 through pipe 33 by means of pump 34 operated by any suitable means diagrammatically indicated by 35 and is discharged by pump 34 through pipe 36 directly into the final mash coolers. The mashing is therefore complete in what is essentially a two-stage operation, occupying only a few minutes.

The foregoing description is for purposes of illustration and not limitation and it is therefore my intention that the invention be limited only by the following claim wherein I have endeavored to claim broadly all inherent novelty.

I claim:

In the process of mashing cereals, the steps of first gelatinizing the same by conducting the same, in admixture with water to the extent of from 300 to 700% by weight of the cereals, progressively forward as a continuous stream through a first zone maintained at from 100 to 160° C., the rate of progression being so related to the volume of said zone that the cereal is held at said temperature for a period of from 3 to 20 minutes, thereafter passing the material in admixture with malt as a continuous stream through not exceeding two stages of pressure reduction, the final stage being maintained under an absolute pressure of substantially 150–200 mm. of mercury, whereby the temperature is instantaneously reduced to from 60 to 65° C., the rate of discharge being so related to the volume of said final stage that the material is saccharified in said final stage for a period of from 3 to 30 minutes, and continuously withdrawing the saccharified material from said final stage.

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