Oct. 19, 1943. W. J. ROWE ET AL 2,332,345

DEXTRINE COOKER

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Fig. 1.

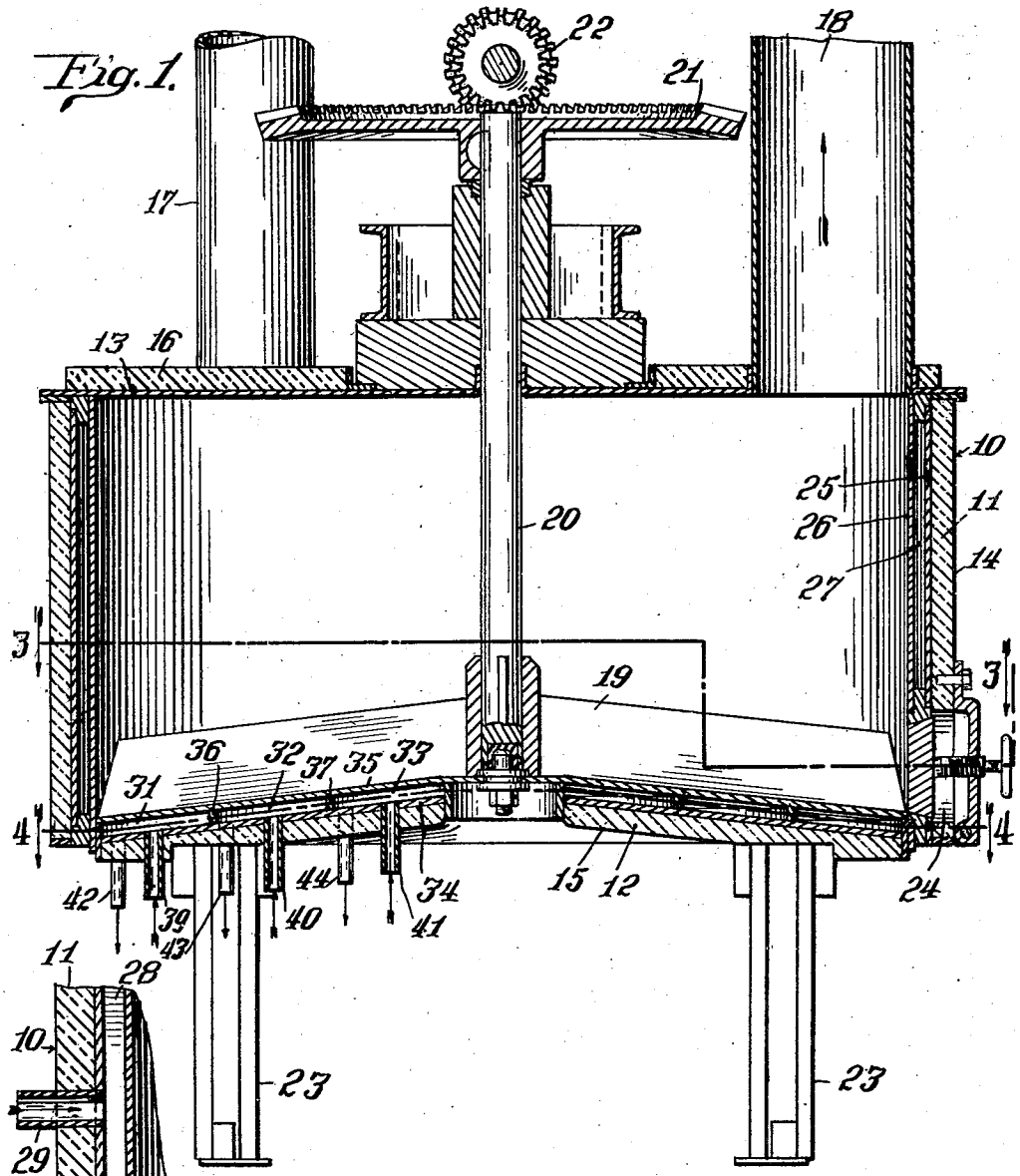


Fig. 2.

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Fig. 3

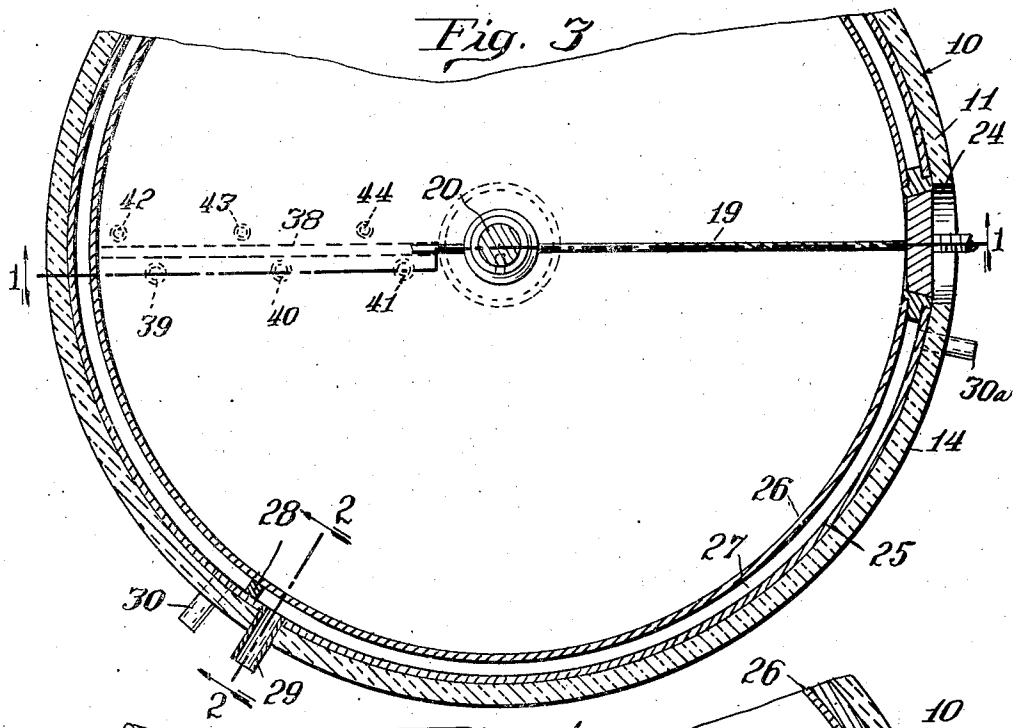
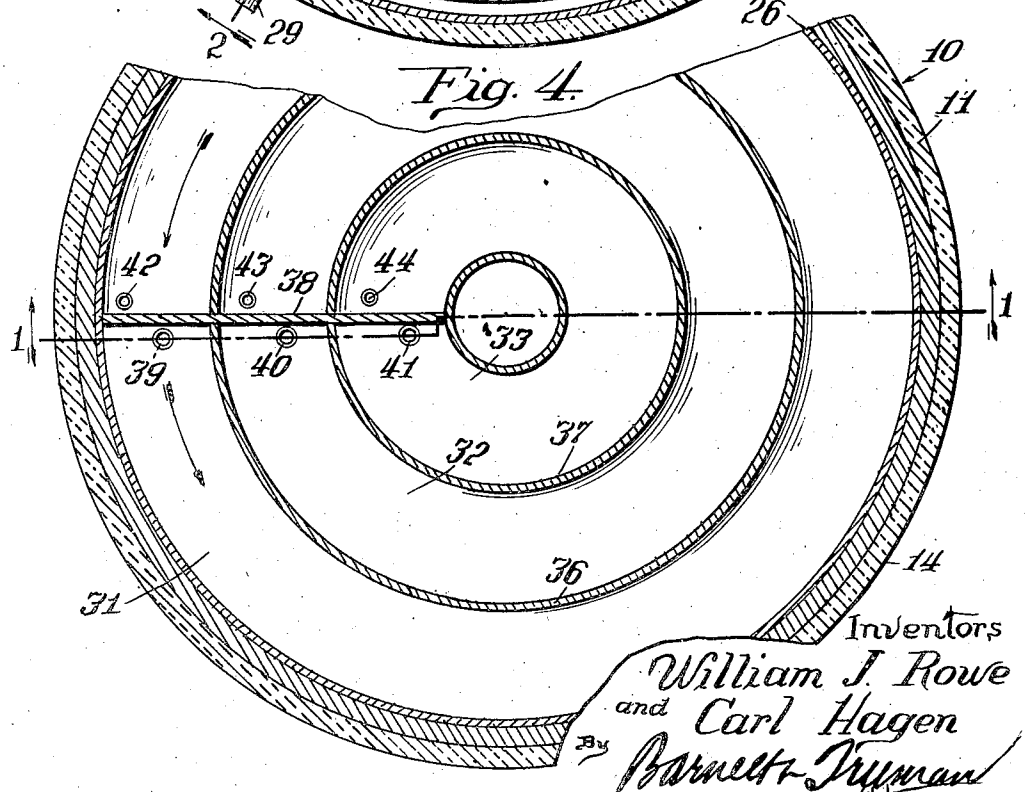


Fig. 4



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2,332,345

DEXTRINE COOKER

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Application September 20, 1940, Serial No. 357,582

5 Claims. (Cl. 127—1)

This invention relates to the production of dextrines from starch by roasting processes, that is, by processes in which starch in batches, and in a dry state, is heated to convert the same into dextrine; and the object of the invention is to provide a new and improved dextrine cooker, so-called which, in comparison with dextrine cookers used heretofore is more economical to operate; and by the use of which the cooking operation is shortened, and the quality of the pastes made from the dextrine products improved in respect to tack, body smoothness and permanence of paste fluidity and shortened time of drying when spread to a film. The terms "dextrines" and "dextrine products" are intended to include British gums, in the production of which no acid is used, as well as the acid roasted products known specifically as dextrines.

The cooker of the present invention may be used for the production of dextrines from any of the starches, corn starch, tapioca starch, potato starch, etc., commonly used for this purpose.

There are four general types of dextrine cookers: those having steam coils located in their side and bottom walls, this type being disclosed, for example, in United States Patent to J. J. Merrill No. 1,425,497, August 8, 1922; cookers jacketed for circulation of oil at high temperature; cookers jacketed for the circulation of products of gas combustion; and steam jacketed cookers in which a body of steam is maintained in the jacket during the dextrinizing operation at a given pressure, say 90 pounds per square inch, without any movement of the steam taking place except that incident to the maintenance of such pressure in all parts of the jacket.

The dextrine cookers most commonly used at the present time are probably of the steam coil type. The steam jacketed type of dextrine cooker has been found, generally speaking, inefficient and unsatisfactory and its use has been largely discontinued.

The object of the present invention is to improve upon the steam jacketed type of cooker; and the attainment of such object has resulted in the advantages above noted.

The improvement constituting the present invention consists in the construction of the steam jacket for the side wall and bottom of the cooker, so that the steam divided into separate, preferably, circular streams will sweep in a continuous movement across the outer face of the inner wall element of the jacket—the heat transfer element—carrying with it water of condensation to the condensate discharge pipes. This effect is obtained, preferably by dividing the jacket into separate steam ducts each provided with a partition and locating the steam inlet and water outlet for each duct on opposite sides of this partition so that the steam under its supply pipe pressure and under the vacuum resulting from its condensation is compelled to flow in one direction across the heat transfer element of the jacket. By such arrangement the amount of heat transferred is much increased in comparison, both with the old steam jacketed type of cooker and also in comparison with the steam coil type.

The invention is illustrated in a preferred embodiment of the accompanying drawings in which:

Fig. 1 is a vertical sectional view on line 1—1 of Fig. 3, and 1—1 of Fig. 4, illustrating the application of the invention to a dextrine cooker otherwise of ordinary construction.

Fig. 2 is a fragmentary sectional view on line 2—2 of Fig. 3.

Fig. 3 is a fragmentary plan sketch on line 3—3 of Fig. 1; and

Fig. 4 is a fragmentary plan section on line 4—4 of Fig. 1, to illustrate particularly the arrangements of the bottom wall jackets.

Referring to the drawings, 10 designates the cooker as a whole which consists of a cylindrical vessel having a side wall 11, a bottom wall 12 and a top wall 13, all of which are preferably insulated, the insulation being indicated at 14, 15 and 16. 17 designates a feed pipe through the top of the cooker, which is closed during the dextrinizing operations, and 18 an outlet opening for vapors generated during the dextrinizing operation which pipe is connected with a vacuum apparatus not shown. The cooker is provided with an agitator 19 on a shaft 20 driven by gearing 21, 22. The cooker is supported by legs 23. The side wall 11 of the vessel is provided with a discharge gate 24. So far the apparatus is of ordinary construction.

In accordance with the present invention the side wall 11 is provided with a steam jacket element consisting of an outer shell 25 and an inner shell 26, providing between them jacket space 27. Across this space is arranged a vertical partition 28 (Figs. 2 and 3) on one side of which is the steam supply pipe 29, and on the other side the outlet pipe 30 for condensation. In order to prevent trapping of condensate on the steam supply side of the discharge gate 24, the jacket element 27 is provided with an outlet pipe 30a near the gate 24.

The bottom wall 12 of the cooker is preferably

provided with a jacket element consisting of a plurality of concentric steam spaces or ducts, three being shown and designated 31, 32 and 33. This bottom jacket element is formed by a lower dished plate 34, an upper dished plate 35, the heat transfer element for the bottom jacket element, and concentric rings 36, 37. A radial partition 38 extends across the spaces 31, 32, 33 and the steam inlet pipes 39, 40 and 41 are arranged on one side of the radial partition while the condensate outlet pipes 42, 43, 44 are arranged on the opposite side of the radial partition 38.

With the jacket thus formed the steam is compelled to sweep around and under the heat transfer element in a plurality of separate circular streams, as a result of which the amount of heat transferred to the material in the cooker for a given steam pressure in the supply pipe is much increased and its distribution made uniform.

The following comparison has been made between the operation of the steam jacketed cooker of the present invention and a common steam coil type of cooker, both employing a steam pressure at the supply pipe of 160 pounds per square inch, that is, steam having a temperature of 370° F. With the steam coil type of cooker the temperature of the starch after heating for an hour was 250° F. and at the end of four hours 275° F.; while with the steam jacketed cooker of the present invention, the temperature after one hour was 290° F. and after four hours 350° F. An oil jacketed cooker with the entering oil at 380° F. gave a starch temperature of 230° F. after one hour, and a starch temperature of 320° F. after four hours.

The gas jacketed cooker, in order to give starch temperatures comparable to the temperatures of the steam jacketed cooker of the present invention, actually 285° F. after one hour, and 390° F. after four hours, necessitated an initial temperature of 430° F.

It is obvious that the bottom jacket of the herein disclosed cooker might consist of a single steam space or of two spaces or of more than three. Similarly the side wall jacket might be divided into more than one steam space.

The intention is to cover all modifications within the scope of the appended claims.

We claim:

1. In apparatus for dextrinizing starch by the dry roasting method the combination of: an inner metal shell to contain the material treated; means forming with said inner shell a steam jacket divided to form a plurality of circular steam ducts; means providing a steam inlet and a condensate outlet for each of said ducts; a partition extending across each duct which forms a steam barrier between its inlet and outlet, said inlet and outlet being arranged in proximity to said partition whereby the steam entering the ducts is compelled to flow in continuous streams through said ducts for substantially their length; and means for agitating the material under treatment.

2. In apparatus for dextrinizing starch by the dry roasting method the combination of: an inner metal shell, to contain the material treated, having a cylindrical side wall and a bottom wall; means forming with said side and bottom walls a steam jacket divided to form a plurality of circular steam ducts; means providing a steam inlet and a condensate outlet for each duct; a partition extending across each duct forming a steam barrier between its inlet and outlet, said inlet and outlet being arranged in proximity to said partition whereby steam entering the ducts is compelled to flow in continuous streams through said ducts for substantially their length; and means for agitating the material under treatment.

3. In apparatus for dextrinizing starch by the dry roasting method the combination of: an inner cylindrical metal side wall element to contain the material treated; an outer cylindrical side wall element spaced from the inner element to form therewith a circular steam duct; means providing a steam inlet and condensate outlet for said duct; a vertical partition in said duct between said inlet and outlet which latter are arranged in proximity to said partition whereby steam entering the duct is compelled to flow in a continuous stream around and in contact with the outer surface of said inner side wall element for substantially its entire circumference; and means for agitating the material under treatment.

4. In apparatus for dextrinizing starch by the dry roasting method, the combination of: a dextrinizing vessel comprising an inner metal bottom member with which the material treated is in contact; an outer bottom member spaced from said inner member; partitions for dividing the space between said bottom members into a plurality of concentric steam ducts; means for providing a steam inlet and a condensate outlet for each duct; transverse partitions extending across said ducts, said inlets and outlets being arranged in proximity to said partitions whereby steam entering the ducts is forced to flow through said ducts continuously in concentric circular streams in contact with the underside of said inner metal bottom member; and means for agitating the material under treatment.

5. In apparatus for dextrinizing starch by the dry roasting method the combination of: an inner cylindrical metal structure, consisting of side and bottom walls, to contain the material treated; an outer cylindrical side wall element spaced from the inner element to form therewith a circular steam duct; means providing a steam inlet and a condensate outlet for said duct; a vertical partition in said duct between said inlet and outlet which latter are arranged in proximity to said partition, whereby steam entering the duct is compelled to flow in a continuous circular stream around and in contact with the outer surface in said inner side wall element for substantially its entire circumference; an outer bottom member spaced from said inner bottom member; circular partitions for dividing the space between said bottom members into a plurality of concentric steam ducts; means providing a steam inlet and outlet for condensate for each duct; radial partitions across said ducts, the inlets and outlets being arranged close to said partitions whereby steam entering the ducts is forced to flow therethrough in continuous concentric circular streams in contact with the underside of said inner bottom member; and means for agitating the material under treatment.

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