C. R. MABEE.

APPARATUS FOR TREATING MATERIALS.

APPLICATION FILED OCT. 23, 1915.

1,329,786.

Patented Feb. 3, 1920.

2 SHEETS—SHEET 1.

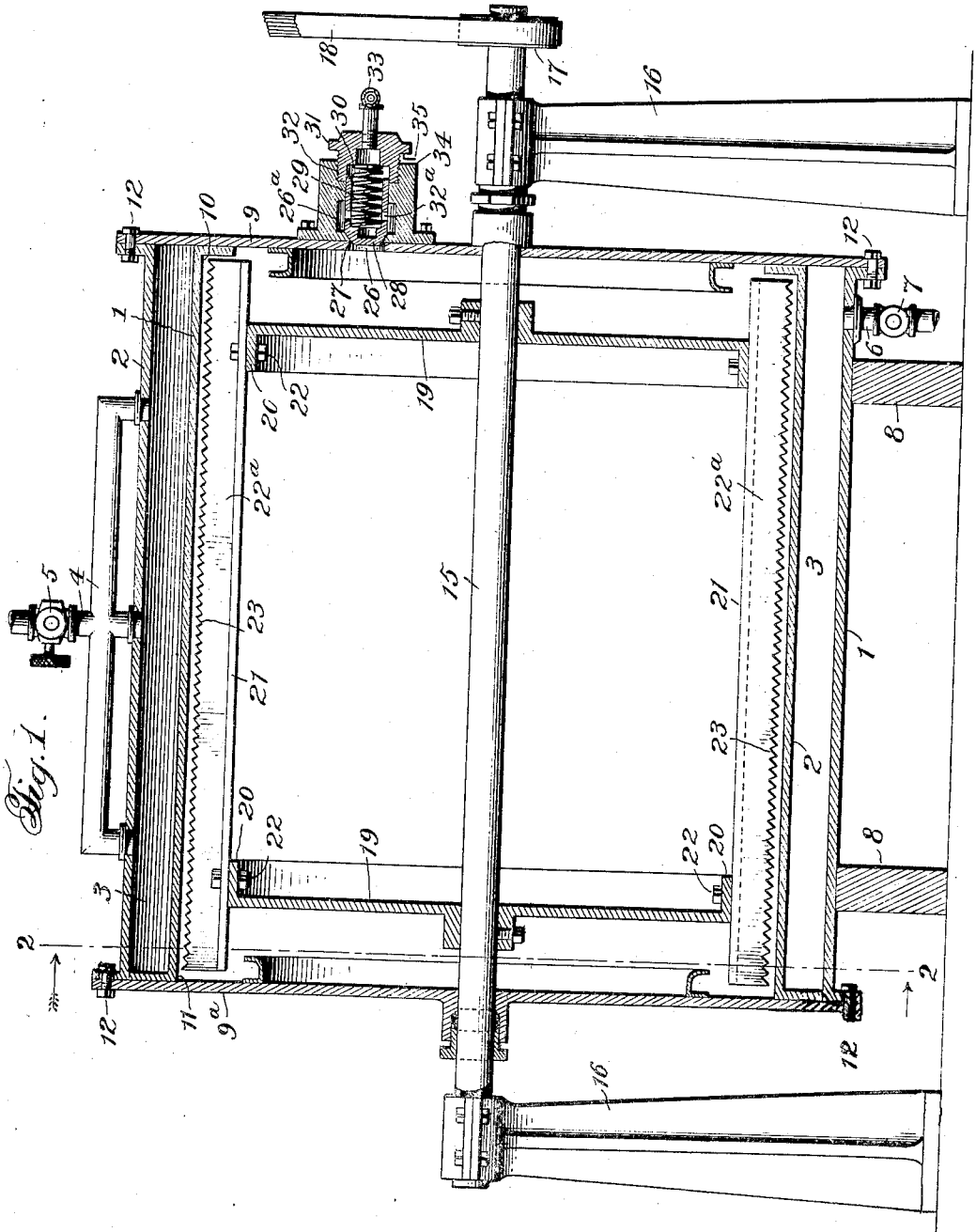


Fig. 1.

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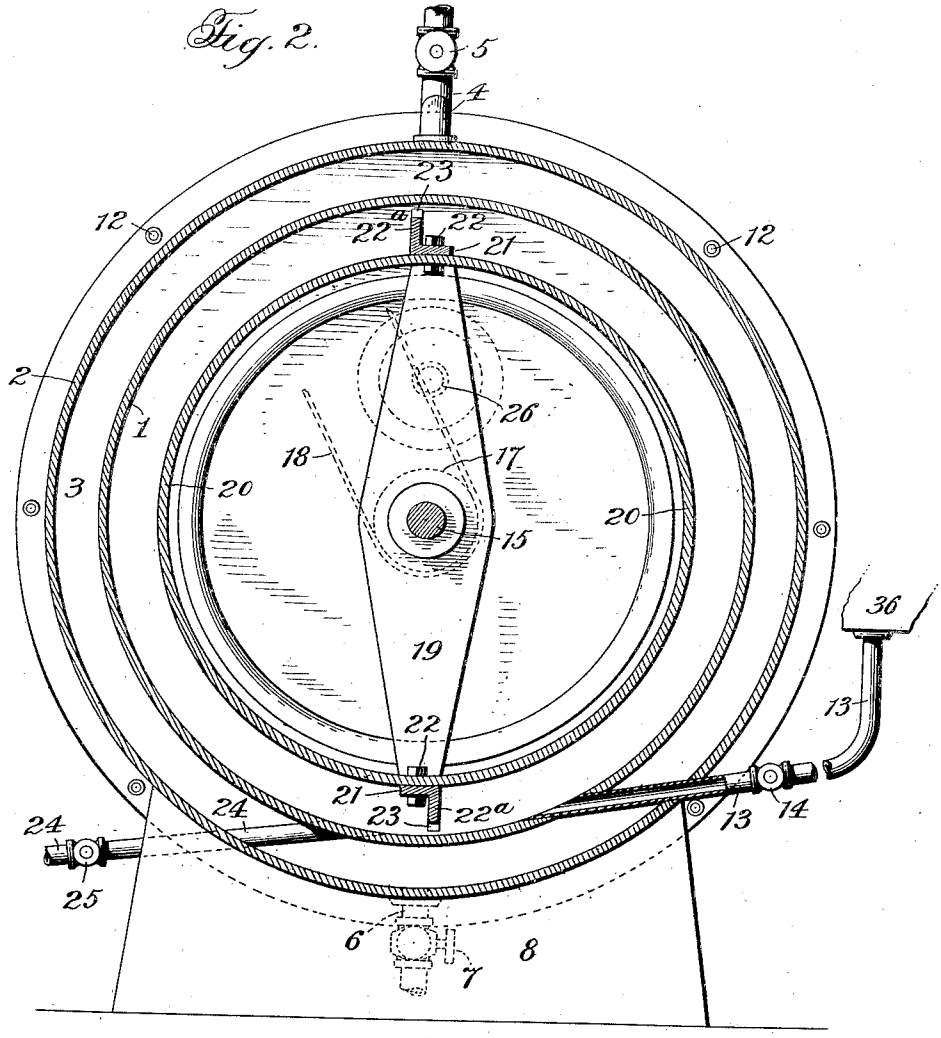
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TREATING MATERIALS.

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To all whom it may concern:

Be it known that I, CHARLES R. MABEE, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Apparatus for Treating Materials, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an apparatus for treating liquid substance or substances containing liquid to cook, or otherwise change the condition or consistency thereof by evaporation of the liquid, and while useful in many arts for the treatment of various materials, is more especially adapted for the treatment of tomatoes, and tomato products, such as catchup.

It is one of the primary objects of the invention to provide means whereby the material to be cooked or otherwise treated is subjected to continuous movement in layer formation over a cylindrical treating surface and while under substantially uniform pressure, it being understood in this connection, of course, that the treating surface has applied thereto a temperature different from that of the material to be treated.

A further object of the invention is to provide means for simultaneously imparting rotatable movement to a circular layer of the material over the treating surface, and for cutting up or disintegrating into relatively fine particles, the material, thereby resulting in more uniform treatment of the various parts of the layer formation and higher temperature transmission, and incidentally materially shortening the time of operation.

In the treatment of materials, such as tomatoes or catchup, it is desirable to subject the same to a high temperature, say approximately 235 degrees, whereby to thoroughly cook and sterilize the products, that the same may keep the required length of time, and it has been ascertained that by the provision of a closed cylindrical retainer, with means exterior of the container for applying a high degree of temperature to the treating surface, and means within the container, rapidly moving adjacent said surface to apply a continuously moving layer of the material across and over the surface while under a given pressure, the operation is more expeditiously carried on, with less expense, and more satisfactory results.

It has been found highly important in the treatment of catchup and similar products, to provide a container substantially closed throughout, whereby in the operation of the various parts of the apparatus an internal pressure will be built up to say, approximately twenty-four pounds absolute, and one of the features of the present invention resides in the provision of means, whereby the required or desired internal pressure may be maintained, in a substantially uniform manner throughout the treatment, and whereby the vapors and gases are allowed to escape from the container only when this pressure is exceeded.

It is also contemplated by the invention, to provide means whereby the escape of vapors or gases from the normally closed container may be accurately regulated at will, it being obvious that according to certain treatments, the desirable pressure to be maintained will differ.

Another object of the invention is to provide in a single machine, a combined cooker, disintegrator, and evaporator, for the treatment of material such as tomatoes, catchup, garbage, etc.

Still further, the invention embraces a novel construction and arrangement of conveyer mechanism within the container for the material, said conveyer mechanism having associated directly therewith disintegrating devices, and in the preferred embodiment of the invention, these devices constitute in effect, a part of the conveyer mechanism proper.

Other and further improvements, and novel details in the construction and arrangement of the various parts of the invention will be understood by those skilled in the art from the description to follow when considered in connection with the accompanying drawings which form a part hereof and wherein is disclosed for the purpose of illustration, a convenient and satisfactory embodiment of the invention.

In the drawings:—

Figure 1 is a longitudinal section of the apparatus with parts in elevation.

Fig. 2 is a transverse section substantially on the line 2—2 of Fig. 1.

With more particular reference to the drawings, wherein like reference numerals

refer to corresponding parts throughout the several views, 1 is an elongated cylindrical container, the same preferably extending substantially horizontally, though of course, it is within the contemplation of the invention to otherwise dispose the cylinder, for instance at a slight inclination toward the outlet end thereof. Surrounding the wall of the container and extending substantially from end to end thereof is a casing or jacket 2 of greater diameter than that of the wall of the container, whereby to provide between said wall and the jacket, a space 3 for the reception of a heat transmitting medium which in the preferred embodiment of the invention takes the form of steam at a high heat.

A suitable inlet conduit 4 for the steam is provided, the conduit 4 communicating with the space 3 and connecting at its opposite end with any suitable source of supply, and said conduit is preferably valve controlled as indicated at 5. A suitable outlet 6 for the condensed steam or water of condensation is provided, preferably adjacent the outlet end of the container, the same also being preferably valve-controlled, as indicated at 7. The container is supported in any desired manner as by suitable standards 8. The end walls of the container are preferably closed as illustrated, though it is desirable to provide removable closures such as plates 9 and 9a, overlying end openings 10 and 11 respectively. These plates 9 and 9a are removably supported in any desired manner as by bolts 12 to the end that the plates may be removed as desired for purposes of cleansing the interior parts of the mechanism, or in the event it is desired to leave one or both of the ends open for the free discharge of vapors and gases.

An inlet for the material to be treated is provided adjacent one end of the container as indicated at 13, said inlet preferably taking the form of a conduit or pipe adapted to receive its supply from any suitable source to deliver into the interior of the cylinder in a tangential direction. A suitable valve 14 may be provided to regulate the supply of material and by adjusting the valve, it will be observed that the thickness of the layer of material to be presently described is regulated at will.

A shaft 15 is arranged within the container substantially centrally thereof, the same projecting beyond opposite ends of the container and preferably supported from upright rests 16. The shaft projects at one end beyond the adjacent support 16 and is adapted to be rotated relative to the supports and wall of the container at a high speed, in any desired manner. A convenient form of drive is illustrated in the drawings, the same comprising a pulley 17 fixed upon the shaft and adapted to be driven as by a belt 18, which latter is cut-away in the illustration but is adapted to be driven from any suitable source not shown.

Mounted upon the shaft 15 for rotatable movement therewith is suitable conveyer mechanism, which said conveyer mechanism has operatively associated therewith means for disintegrating the material during the treatment thereof, and these parts in the embodiment of the invention illustrated are constructed substantially as follows:

Suitable webs or supports 19 are secured to the shaft within the container adjacent opposite ends thereof, it being understood in this connection however, that other intermediate supports may be provided if desired. Annular flanges 20 are provided at the periphery of the supports 19 and projecting between said supports 19 are suitable bars 21, the latter being secured to the annular flanges 20 in any desired manner as by removable bolts 22. Conveniently, two of such bars are employed, arranged opposite to one another, though the number of said bars may vary as desired. The bars 21 preferably have an outwardly extending flange 22a, which flanges constitute the conveyer members proper and are preferably of considerable depth, because of the fact that it is desirable at times in the treatment of material to form the same in an annular layer of considerable thicknesses, say inches.

While it is obvious that independent disintegrating devices may be employed in connection with the conveyer mechanism, it has been found convenient and quite satisfactory to utilize the blades or flanges 22a for this purpose, and with this in view, the outer edges of the blades 22a which assume a position in contact with or adjacent to the inner surface of the container are provided with a series of cut-out parts, slits or notches 23, which in the movement of the conveyer members are adapted to disintegrate the mass of material into minutely divided particles. An outlet for the treated material is arranged adjacent the rear end of the machine and conveniently takes the form of a conduit or piping 24 connecting with the interior of the container tangentially as illustrated. A suitable valve 25 of any desired construction, may be interposed in said conduit 24, whereby to regulate the discharge of the treated material. It will be understood that the conveyer members being driven at a high rate of speed through the medium of the shaft 15 and associated parts, the material as fed into the machine, will be contacted with by the conveyer mechanism and caused to assume a circular layer of considerable thickness, which layer is continuously moved over the inner surface while a central quiet zone for the escape of the vapors and gases is provided within the layer.

It is highly desirable to provide means whereby the vapors and gases within the central quiet zone can be maintained within the cylinder during the cooking operation and until it is desirable to commence evaporation, and means is provided whereby after the internal pressure has increased, say beyond approximately twenty four pounds absolute, the vapors and gases are permitted to escape.

With this in view, a suitable pressure or relief valve mechanism is provided, the same being preferably connected to one of the removable end plates, and conveniently made up as follows:

An opening 26 is provided in the end wall 9 the wall surrounding the opening being shaped to constitute a valve seat 27. Fitted within said opening is a suitable cup-shaped valve 28 normally held to the seat as by a spiral spring 29, fitted within the valve and adapted at its free end to contact with the suitable abutment 30 on an adjusting nut 31 having a threaded engagement 32 with the wall of the opening 26. The opening 26 is preferably enlarged as at 26^a and the side wall of the valve member 28 is conveniently provided with one or more openings 32^a adapted to communicate with the enlarged chamber 26^a whereby when the valve is unseated, the vapors and gases are permitted to flow from the central quiet zone of the container into the chamber 26^a and thence into the valve member to the ports 32^a. The cap or nut 31 has an opening therein leading to the outside, if desired, but in the illustration connecting with a suitable conduit 33 to be delivered wherever desired, and quite useful in the event it is desired to employ the discharged vapors in connection with a multiple effect apparatus.

It will be understood that the tension of the spring 29 is such that it will normally hold the valve 26 to its seat, whereby to prevent any escape of the vapors or gases until the desired internal pressure has been reached, and the degree of pressure necessary to open the valve may be adjusted, to adapt the apparatus to different treatments, by rotating the cap or nut 31, and in this connection, it is of advantage, to employ a suitable index 34 on the plate 9 adjacent the periphery of the nut and to form on the nut a suitable index finger or pointer 35. In this way, the operator may accurately determine the amount of movement in either direction of the nut 31, necessary for the given pressure at which it is desired that the valve should be open.

In operation, the material is fed into the cylindrical container through the conduit 13, when it will be immediately projected onto and over the interior treating surface of the container, assuming a layer formation. Steam under pressure entering into the jacket 3 will readily transmit its heat to the contained material, but it will be found that owing to the peculiar construction and action of the apparatus, the material will not tend to cling to the surface, or become scorched or otherwise injured. The shaft 15 rotating at a very high speed, the conveyer members maintain under centrifugal force, a continuous circular layer of the material adjacent to or in contact with the surface and under continuous rotatable movement over said surface. The valve remaining closed against its seat, the cooking operation of the material is continued, until the predetermined internal pressure is obtained, when the valve will become automatically unseated to discharge the vapors or gases, and in this way, the internal pressure is maintained uniform.

It is found that the temperature in the closed container bears a given relation with the pressure and is equal in all directions. The high temperature due to the nature of the heat transmitting medium employed herein, namely steam, tends to break down the cellular and fibrous substances, and the fact that the material is cooked under pressure while moved in a circular path at a high speed over the heated surface and while subjected to the disintegrating effect of the teeth at the outer edges of the conveyer members, the time of operation is considerably shortened.

After the cooking has been completed and it is desirable to commence evaporation, the valve may be so adjusted that it will readily open at a slight pressure, whereby to provide in effect, a continuous outlet for the discharge of the vapors and gases until evaporation has been completed.

If desired, a suitable pump diagrammatically illustrated at 36, may be employed, whereby to pump the products into the container through the conduit 13, and interposed in the outlet conduit 24 may be provided a suitable trap, it being understood however that the product when desired might be delivered from the machine and through the trap and of its own pressure.

What I claim is:—

1. In an apparatus for treating substances containing liquid to change the consistency thereof by evaporation, the combination of a cylindrical container, the inner wall of which constitutes a treating surface, means for maintaining under substantially continuous movement a circular layer of the material adjacent said surface and for maintaining a central zone for the vapors, said container having an inlet and outlet for the material, and an outlet opening for the discharge of the vapors, and means normally closing the vapor outlet opening, said means being adjustable to permit the escape of vapor from said zone.

2. In an apparatus for treating substances containing liquid to evaporate liquid constituents thereof, the combination of a substantially cylindrical container the inner wall of which constitutes a treating surface, means within the container for maintaining the material under substantial continuous movement in layer formation adjacent said surface, said container having end walls with an opening in one of said walls for the escape of vapors, and means mounted on said wall adjacent said opening automatically operable to regulate the escape of vapors from the containers.

3. In an evaporating apparatus, the combination of a substantially cylindrical heated container, material engaging means within the container, means for relatively rotating one of the parts comprising the container and said means whereby the material is applied in layer formation upon the interior surface of the container and whereby there is maintained a central zone within the layer of material for the reception of vapors, said container having an outlet opening for the vapors, and means for normally closing said opening, said means being constructed and arranged whereby it automatically opens to discharge the vapor upon an excess of pressure.

4. In an evaporator, the combination of a substantially cylindrical externally heated container, means extending longitudinally of the container adjacent the interior treating surface thereof, said container having an inlet for the material adjacent one end and a discharge outlet adjacent its opposite end, means for imparting relative rotation between said longitudinally extending means and the container at a high speed whereby the material is subjected to continuous circumferential movement in layer formation and whereby there is maintained within the layer a central zone for the escape of vapors, one of the end walls of the container having a vapor discharge outlet in communication with said central zone, and means for normally closing said vapor outlet, said means being adjustable whereby to permit the discharge of vapor through said outlet.

5. In an apparatus for cooking or evaporating substances containing liquid, the combination of a substantially cylindrical container having an inlet adjacent one end and an outlet adjacent the opposite end, means for applying to the wall of the container a temperature different from that of the material under treatment, means adjacent the surface of the container and rotatable at a high speed whereby to apply and maintain under continuous circumferential and simultaneous endwise movement and under pressure a circular layer of the material, and whereby to maintain a central zone for the escape of vapors, the end walls of the container being normally closed, and a valve controlled outlet in one of said end walls for the escape of vapor from said zone.

6. In an apparatus for treating liquid substances to change the condition thereof by evaporation, the combination of a horizontally disposed cylindrical container, means for heating the wall of the container, a shaft rotatable at a high speed centrally arranged within the container, elongated longitudinally extending conveyer members arranged adjacent the inner surface of the container and supported from said shaft for movement therewith, said members having serrated outer edges forming disintegrating means.

7. In an apparatus for treating liquid substances to change the condition thereof by evaporation, the combination of a cylindrical container, means for applying to the wall thereof a temperature different from that of the material being treated, and a combined conveyer and disintegrating device of integral construction arranged adjacent the interior surface of the container, means for rotating said device at a high speed whereby to simultaneously disintegrate the material and cause the same to assume a continuous movable circular layer formation in contact with the inner surface of the container.

8. In an apparatus for treating liquid substances to change the condition thereof by evaporation, the combination of a cylindrical container, means for applying to the wall thereof a temperature different from that of the material being treated, and a combined conveyer and disintegrating device arranged adjacent the interior surface of the container, means for rotating said device at a high speed whereby to simultaneously disintegrate the material and cause the same to assume a continuous movable circular layer formation in contact with the inner surface of the container, said container having closed ends and a controllable outlet in one end for the discharge of the vapors and gases.

9. In an apparatus for treating substances to evaporate the liquid therefrom, the combination of a cylindrical container, and means rotatable within the container for rapid rotation whereby to form the contained material into a cylindrical layer under continuous rotation, said means comprising an elongated strip of material extending longitudinally of the inner surface of the container and adjacent said surface, said strip having grooves in the outer edge thereof.

10. In an apparatus for treating substances to evaporate the liquid therefrom, the combination of a cylindrical container and means rotatable within the container

for rapid rotation whereby to form the contained material into a cylindrical layer under continuous rotation, said means comprising an elongated longitudinally extending strip of material having an integral cutting edge to disintegrate the substance being treated.

11. In an apparatus for treating substances containing liquid to change the consistency thereof by evaporation, the combination of a cylindrical container, the inner wall of which constitutes a treating surface, means for applying heat to said wall sufficient to evaporate liquid constituents of the material, said container having an inlet adjacent one end for the material, and an outlet adjacent its opposite end for the treated material, and means for maintaining under substantially continuous movement a circular layer of the material adjacent said surface, and for maintaining a central zone for the vapors, said means comprising a plurality of circumferentially spaced elongated metallic strips extending longitudinally of and arranged adjacent to the treating surface, said strips having grooves in the outer edge thereof, and a rapidly rotatable shaft upon which said strips are mounted, and said container having an outlet opening for the vapors from said central zone.

In testimony whereof I hereunto affix my signature.

CHARLES R. MABEE.