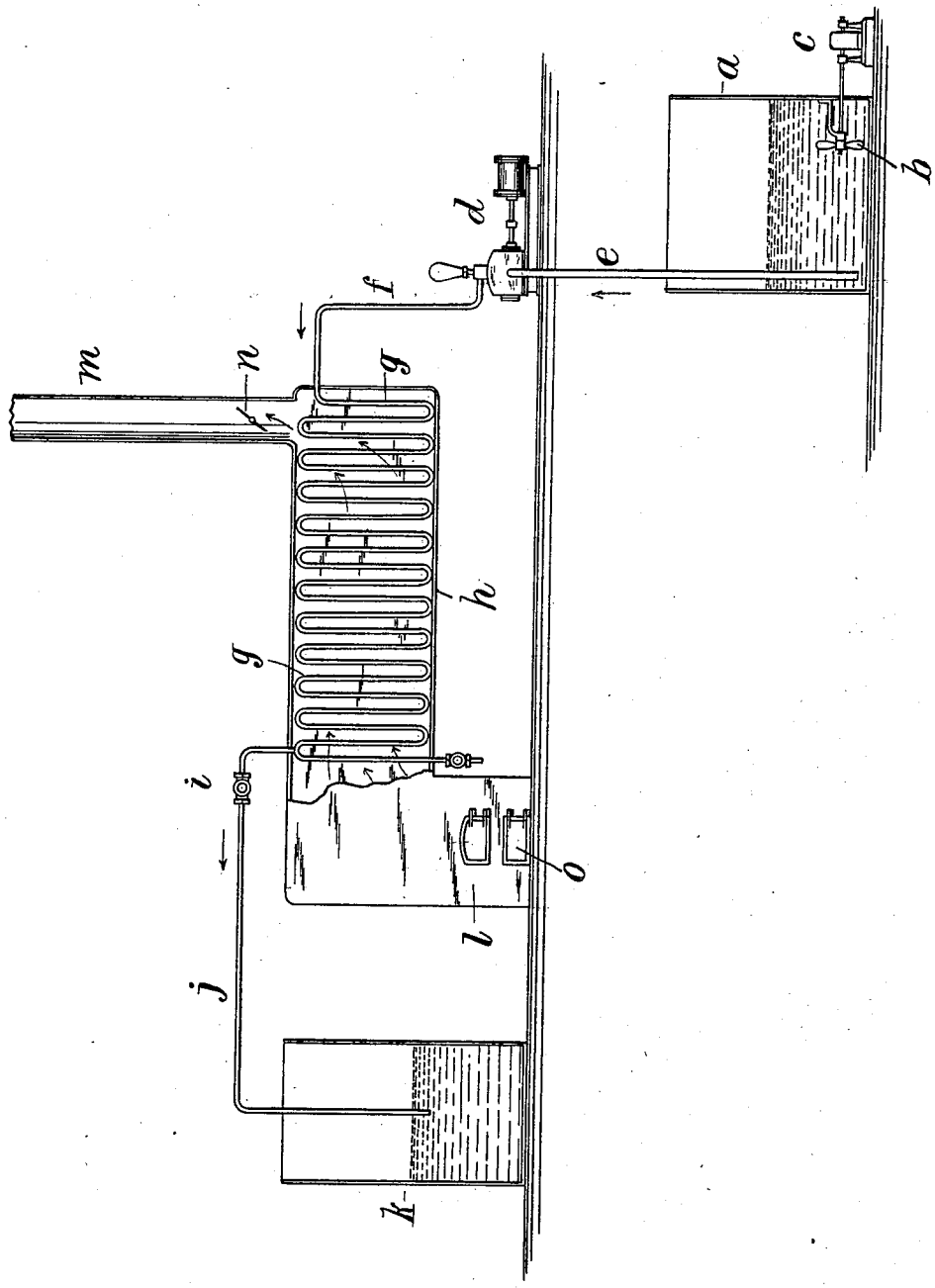
No. 666,636. Patented Jan. 29, 1901.

J. W. AYLSWORTH.

PROCESS OF DECOMPOSING GLYCERIDS.

(Application filed May 11, 1900.)

No Model.)



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UNITED STATES PATENT OFFICE.

JONAS WALTER AYLSWORTH, OF EAST ORANGE, NEW JERSEY.

PROCESS OF DECOMPOSING GLYCERIDS.

SPECIFICATION forming part of Letters Patent No. 666,636, dated January 29, 1901.

Application filed May 11, 1900. Serial No. 16,296. (No specimens.)

To all whom it may concern:

Be it known that I, JONAS WALTER AYLSWORTH, a citizen of the United States, whose residence and post-office address is No. 223 Midland avenue, East Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Processes of Decomposing Glycerids, fully described and represented in the following specification and the accompanying drawing, forming a part of the same.

The object of the present invention is to furnish an improved method of treating glycerids to separate the glycerin from the fatty acids and to obtain the products of such separation more expeditiously and economically and with greater safety than is effected by the methods commonly practiced.

The invention is especially applicable to the decomposition of the neutral fats—as tallow, lard, palm-oil, cotton-seed oil, and similar greases and oils which are used in the manufacture of soap, stearic acid, and glycerin—into their component parts—namely, fatty acids and glycerin.

My improved process consists, essentially, in first emulsifying the fat or oil comprising the glycerid; second, forcing the emulsion into or through a continuous heated channel, and, third, applying pressure mechanically thereto, whereby the emulsion is simultaneously subjected to a specified temperature and pressure for a suitable period of time and may when sufficiently treated be displaced from one end of such channel by introducing a portion of the fresh emulsion at the opposite end.

This process avoids the cooling off of the receptacle in which the fat is treated and avoids the emptying of such receptacle to treat a fresh portion of the material, thus making the process continuous and greatly economizing the application of the heat. The process also enables me to subject the material to a higher pressure than is due to the temperature, and thus effect the desired results without discoloring the product, which is often caused by an excessive temperature and which greatly diminishes the market value of the product.

In practicing the invention a pipe is provided with a pump connected to one end and a discharge-cock applied to the other to regulate the discharge.

An apparatus adapted to practice the invention is shown in the drawing, but is not claimed herein, as I have claimed an apparatus in a separate copending application, Serial No. 16,297, filed May 11, 1900, with title "Apparatus for continuous treatment of liquids to facilitate chemical reaction."

In the drawing, *a* designates a tank provided with an agitator *b*, (represented by a propeller-screw,) driven by motor *c* to form an emulsion of the fat or oil. The contents of the tank may be agitated by ebullition, if preferred. A pump *d* is connected by pipe *e* with the tank to draw the emulsion therefrom and by pipe *f* with the heated channel *g*, which is represented in the drawing by a continuous pipe extended through a hot chamber *h* and provided with a discharge-cock *i*. The discharge-cock is connected by a pipe *j* with a separating tank or reservoir *k*. The chamber *h* is shown connected at one end with a furnace *l* and at the opposite end with a chimney *n*, whereby the products of combustion from the furnace are caused to pass over the convolutions of the pipe *g*, and thus maintain them at the desired temperature. A damper *m* in the pipe *n* and a draft-door *o* upon the furnace serve to regulate the temperature.

In practicing the process the oil, melted grease, or fat is mixed with water in the tank *a* in such proportions that the volumes of water and fat shall be about equal, the emulsion being made and maintained by agitation with the screw *b* or by ebullition, or both, which agitation is maintained until the emulsion has been wholly withdrawn for treatment in the succeeding operations. An emulsion of the oil or fat with water may be made by the admixture of a small per cent. of an alkali, like caustic soda, or soap. I have found that the addition of less than one per cent. of alkali will suffice in most cases to secure the desired emulsion with the water. Emulsion may be made with practical advantage by using a smaller percentage of alkali in connection with mechanical agitation. The pipe being heated to the specified temperature, the emulsion is forced into the same by the pump *d* and the cock *i* is closed when the

pipe is filled, and the pump operated to maintain a specified pressure therein. The cock is kept closed until the contents of the pipe have been treated for a suitable period of time to effect the desired reaction, when the cock is adjusted to discharge the contents of the pipe (under the specified pressure) at such a rate that the new material entering one end of the pipe will be properly treated before it escapes to the reservoir. The rate of movement through the pipe will obviously depend on the length of the pipe traversed as well as upon the degree of heat and pressure employed. After their exit from the pipe the products may be collected and the glycerin recovered from the water by any of the means well known to the art.

For treating the various oils and fats in soap-manufacture the pipe and pump should be constructed to sustain and produce any pressure between one hundred and fifty and five hundred pounds upon the square inch and means provided to heat the pipe to various temperatures between 350° and 750° Fahrenheit. The degree of heat and the pressure within the pipe are varied within the above-specified temperatures and pressures to suit the particular fat operated upon and also to suit the requirements for which the fatty acids are to be subsequently used. For example, palm-oil mixed with one-half to one per cent. of caustic soda and fifty to one hundred per cent. of water is decomposed and the fatty acids separated from the glycerin in less than one hour, when the mixture is subjected in the heated pipe to a temperature between 490° and 530° Fahrenheit under a pressure between three hundred and three hundred and fifty pounds per square inch. Tallow requires a longer time with the above-mentioned pressure and temperature, but the reaction may be expedited by increasing the temperature and the pressure in the pipe. The rapidity of the action may also be greatly increased by the admixture of a larger percentage of alkali or by the admixture of one-quarter to six per cent. of an alkaline earth, such as lime or a metallic oxid, as zinc oxid, or the use of such alkaline earth or oxid alone or together in conjunction with the alkali. With the admixture of six per cent. of zinc oxid with tallow the decomposition is effected in fifteen minutes.

The glycerin and fatty acids of glycerids have been heretofore separated by the following methods: first, by saponification with the chemical equivalent of alkali or alkaline earth and subsequent decomposition of the products by an acid; second, by treatment with sulfuric acid of definite strength and subsequent treatment with water; third, by distillation in a retort with the aid of a current of superheated steam, and, fourth, by heating with water, with or without a small percentage of an alkali or alkaline earth or metallic oxid, in a closed vessel known as an "autoclave" for five or ten hours at a temperature between 350° and 400° Fahrenheit and under the pressure resulting from such temperature. My invention more closely resembles the latter of these processes, but wholly avoids the following objections to the treatment in an autoclave: (*a*) it subjects the material to the heat much more uniformly, as only the exterior of the autoclave imparts the heat to its contents; (*b*) it permits the use of a pressure much in excess of that due to the temperature, which greatly facilitates the decomposition without burning or discoloring the products; (*c*) it avoids the explosions which result from the lack of circulation within an autoclave, which sometimes causes the sudden vaporization of water within the mass; (*d*) it avoids the loss of heat which is necessitated in recharging the autoclave and which necessitates the cooling of the vessel and its contents in changing the latter; (*e*) it permits a larger quantity of the oil or fat to be treated daily in a given apparatus by making the process continuous, and thus avoiding interruptions to the decomposition; (*f*) it secures the movement of the material in contact with the heated surface, and thus maintains the intermixture of the elements, while it thus avoids the burning or discoloring of the same at a temperature which would produce such results in an autoclave.

From the above description it will be seen that the pipe *g* forms a continuous heated channel in which pressure is applied mechanically to the contents, which enables me to operate upon the fats and oils more effectively, and thus accomplish the desired results in a shorter time.

I have found that the employment of a pressure higher than that which is due to the temperature facilitates the decomposition of the material, and I thus apply the pressure mechanically, so as to increase the rapidity of the process without injuring the quality of the products. The operation may be made entirely continuous during the maintenance of such mechanical pressure by regulating the discharge from one end of the channel and displacing the contents gradually by introducing the fresh emulsion at the opposite end of the pipe. In first charging the apparatus the contents of the heated channel are necessarily held therein a sufficient length of time for decomposition before the cock is opened and the graduated discharge is commenced, and it is obvious that the entire contents of the channel may then be displaced by a fresh charge and the outlet-cock *i* closed again until such fresh charge is suitably treated. Such intermittent method of treatment is less desirable than that in which the material is moved uninterruptedly within a channel, as it is more likely to overheat and injure the material at some part of the pipe. By keeping the material in constant motion through the pipe a higher temperature and pressure can be employed and the material

decomposed with less liability to injury of the product.

It is well known that a relatively small tube or pipe withstands a higher pressure than a receptacle like an autoclave under the same conditions of thickness and nature of the metal, and the above-described process takes advantage of this fact and employs a pipe successfully to form a continuous heated channel.

Having thus set forth the nature of the invention, what is claimed herein is—

1. The process of treating glycerids to separate the glycerin from the fatty acids, which consists in forcing the glycerid mingled with water into a continuous heated channel and applying pressure mechanically thereto, whereby the emulsion is simultaneously subjected to a specified temperature and pressure for a suitable period of time, and may, when sufficiently treated, be displaced from one end of such channel, by introducing a portion of the fresh emulsion.

2. The process of treating glycerids to separate the glycerin from the fatty acids, which consists in first emulsifying the fat or oil comprising the glycerid, second, forcing such emulsion through a continuous heated channel and discharging the same at a regulated rate from the outlet of such channel, and third, applying pressure mechanically to the contents of the channel during the said treatment, whereby the emulsion is simultaneously subjected to a specified temperature and pressure for a suitable length of time, and discharged continuously from the heated channel.

3. The process of treating glycerids to separate the glycerin from the fatty acids, which consists in first emulsifying the glycerid with water and a small percentage, as one per cent., of an alkaline agent, as an earth or metallic oxid, second, forcing the emulsion through a continuous heated channel, and third, applying pressure mechanically to the contents of the channel, whereby the emulsion is simultaneously subjected for a suitable length of time to a suitable temperature and a higher pressure than that due to said temperature.

4. The process of treating glycerids to separate the glycerin from the fatty acids, which consists in first emulsifying the fat or oil comprising the glycerid, second, forcing such emulsion through a continuous channel heated to a temperature above 350° Fahrenheit, and third, applying pressure mechanically to the contents of the channel during the said treatment, whereby the material is subjected to a pressure in excess of that due to such temperature.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JONAS WALTER AYLSWORTH.

Witnesses:
JAMES ALBERT BURR,
THOMAS S. CRANE.