No. 855,071. PATENTED MAY 28, 1907.

T. E. SMITH.

PROCESS OF COMBINING OILS AND FATS WITH HEAVIER FLUIDS.

APPLICATION FILED NOV. 12, 1906.

Fig. 2.

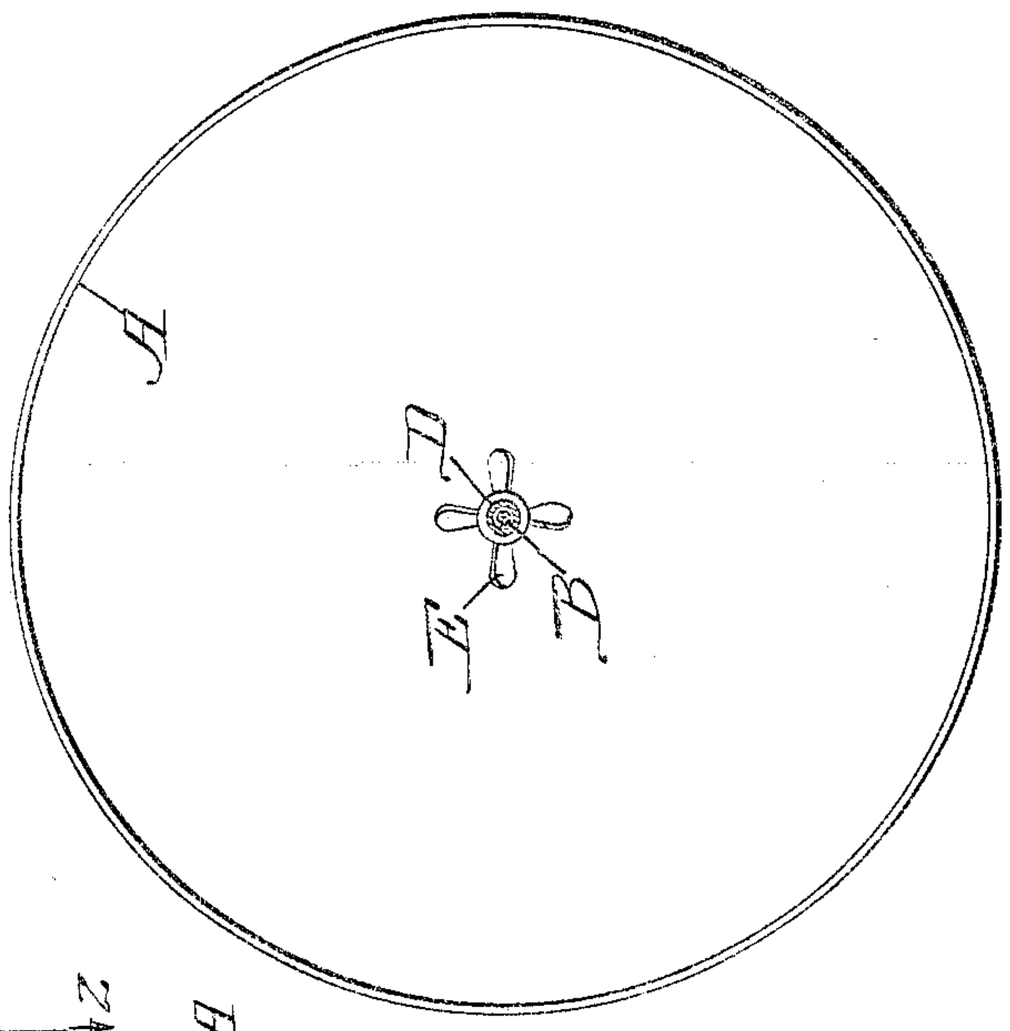
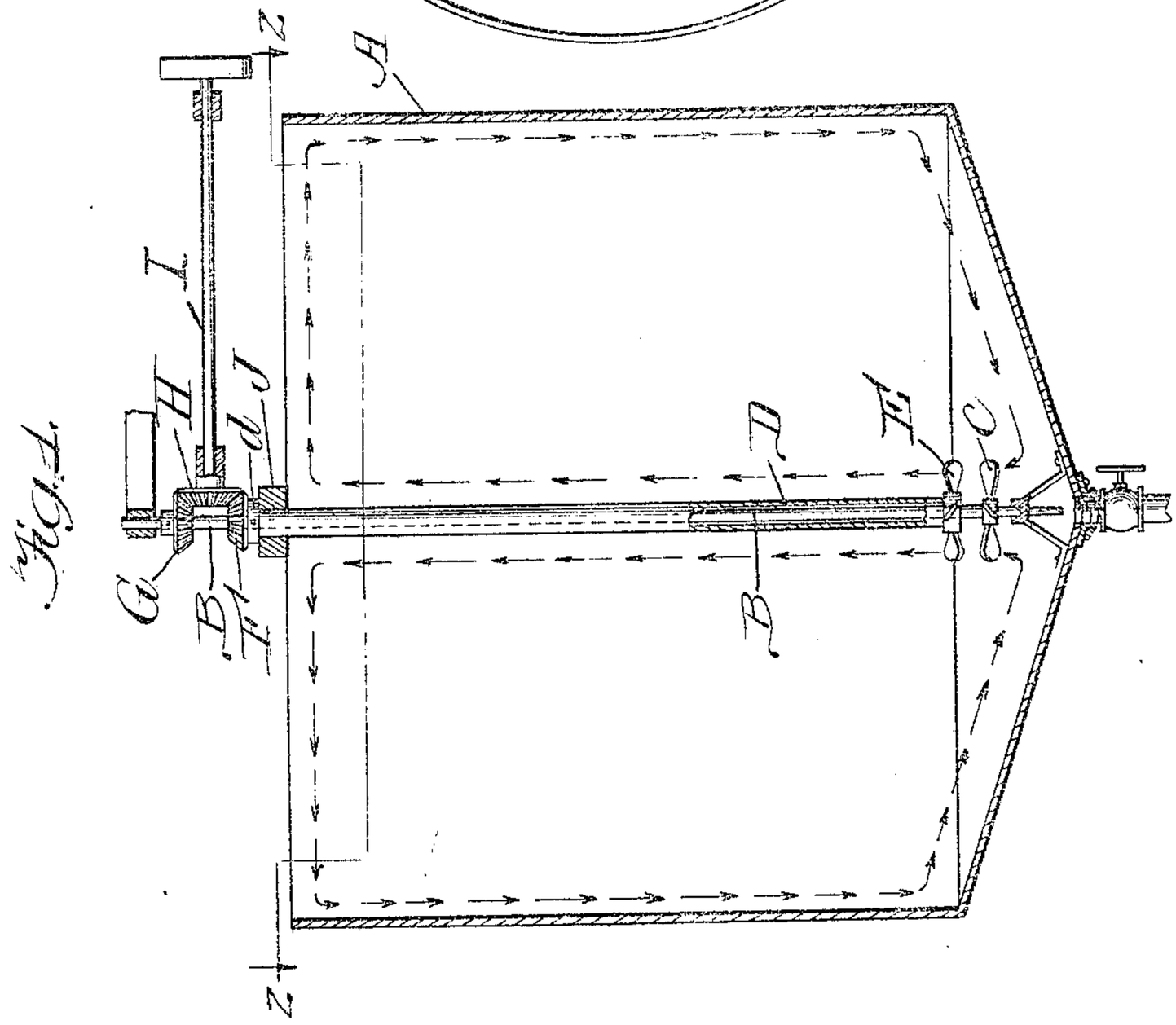


Fig. 1.



Witnesses:
Bad. Perry
Robert H. Weir

Inventor:
Theodore E. Smith
By Raymond Hazlett
Attorney

UNITED STATES PATENT OFFICE.

THEODORE E. SMITH, OF WEEHAWKEN, NEW JERSEY.

PROCESS OF COMBINING OILS AND FATS WITH HEAVIER FLUIDS.

No. 855,071. Specification of Letters Patent. Patented May 28, 1907.

Application filed November 12, 1906. Serial No. 343,078.

To all whom it may concern:

Be it known that I, THEODORE E. SMITH, a citizen of the United States, residing at Weehawken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Processes of Combining Oils and Fats with Heavier Fluids, of which the following is a specification.

My invention relates to improvements in the process of combining oils, fats and like fluids of a relatively light specific gravity with heavier fluids, such as water, by mechanically producing a minute division and intermingling thereof, whereby a mechanical combination of such elements of different specific gravities will be produced which shall be substantially permanent, and to provide a method for producing this result which may be practiced commercially in the production of large quantities of such compounds.

While my present invention is adaptable for use in producing substantially permanent emulsions between elements of diverse specific gravities, which are normally fluid at ordinary temperatures, it is particularly useful in producing such mechanical combinations between elements, one of which is solid or semi-solid at ordinary temperatures, while susceptible of being brought to a fluid or semi-fluid condition at workable temperatures. Thus, for example, in the manufacture of butter substitutes, such as oleomargarin, butterin and the like, it is desirable that the fats and oils used shall be combined with milk which, being composed mostly of water, is of a much greater specific gravity than the olein, margarin and other fats and oils used in the manufacture of such compounds, and which, therefore, tends to separate therefrom and to reluctantly mix therewith. Furthermore, in the production of such butter substitutes, which shall be of attractive appearance and of palatable flavor and also of good keeping quality, it is absolutely essential that the watery elements shall be combined with the fats and oils in such minute particles as to be ordinarily indistinguishable, such minute division and intermingling of the elements having different specific gravities being essential to the production of a homogeneous compound, while with present processes there is a tendency for the watery elements to collect in relatively large particles, so as to be readily detected in examining the interior of a mass of such compound.

My process consists in inclosing the various elements of the desired combination in a suitable receptacle, and in a fluid or semi-fluid condition, and in then mechanically creating a rising current, whereby the heavier elements are carried upward and through the lighter elements, while at the same time the masses of the different ingredients are finely divided and intermingled until there is quickly produced an intimate molecular intermingling of the divers elements, which are thus so finely divided and so intimately intermingled that they are reluctant to separate in spite of their diverse specific gravities. When the fats and oils are of such character as to become solid or semi-solid at ordinary temperatures, this combination becomes permanent for all practical purposes as soon as the fats cool to such normal condition, but even where there is no such tendency of the elements, or of any of them, to solidify at ordinary temperatures, my process produces such a close mechanical combination between the molecules of the various ingredients that such combination will remain substantially permanent for a long time. So, also, my process is useful in the proper salting of butter substitutes, which can be most effectively done by the use of brine, which, however, being of much heavier specific gravity than unsalted water, is much more difficult to combine with the fatty elements, either uniformly or permanently, but, with my process, any desired proportion of brine may be used, with the assurance that there will be an absolutely uniform distribution thereof through the entire mass of the compound.

At present butter substitutes are salted by kneading in salt after the compound has been cooled and solidified. This is done in large, slowly-revolving, kneading machines, involving much time and labor. Then the product must be packed by hand. With my process the fats and salt water, when thoroughly emulsified and homogeneously combined, may be pumped through some cooling device, by which it will be partially solidified, and thence pumped into the package in which it is to be sold, where it "sets" or solidifies completely in a homogeneous mass.

In practicing my improved process, I con-

veniently and efficiently use, as one form of apparatus, that shown in the accompanying drawing in which—

Figure 1 is a vertical sectional view; and Fig. 2 is a view on the line 2, 2 of Fig. 1, looking in the direction indicated by the arrows.

A is the tank, having mounted therein a shaft B carrying a propeller C. The shaft B extends through a hollow shaft D, which carries a propeller E at its lower end and is provided at its upper end with a gear-wheel F, while the shaft B is provided with a gear-wheel G. These gear-wheels are rotated in opposite directions by a gear-wheel H which meshes with the gear-wheels F and G, the gear-wheel H being secured to the shaft I, which is driven in any suitable manner. The propellers C and E are arranged so that their blades are oppositely pitched and are arranged in relation to each other in the manner which I shall hereinafter describe.

The action of a propeller rotated at the bottom of a tank and in a fluid body and in a direction to cause an upward circulation of the fluid is such, as I have demonstrated by experiments, as to cause the fluid to flow upwardly and outwardly, the lateral flow depending upon the pitch of the propeller-blades, but whatever the pitch may be, so long as there is any pitch to cause an upward flow of the fluid, such pitch will cause a lateral flow, with the result that there is always a very limited upward circulation of the fluid. Consequently, unless the tank is very shallow, the operation of the propeller will be merely such as to cause the fluid to rise slightly and then to flow in a curve toward the side of the tank and then downwardly. Consequently a large propeller may be rapidly rotated in a tank without causing any appreciable vertical circulation or intermingling of the divers elements constituting the contents of the tank. While the initial rotation of a single propeller in a tank of fluid may result in some slight vertical agitation, the laceral movement caused by the rotation of the propeller will shortly so dominate the vertical movement that the entire contents of the tank will take on a rotary movement with no appreciable or useful vertical circulation. If, however, a second propeller be arranged above the first propeller with its blades having an opposite pitch, the two propellers being rotated in opposite directions so as to cause an upward movement of the contents of the tank, the second propeller will catch the current rising from the first propeller as it begins to diverge toward the side of the tank and will tend to cause such diverging currents to diverge in the opposite direction. When advantage is taken of this fact, the resultant of the opposing action of these two propellers will be a substantially vertical current of sufficient force to carry the fluid from the propellers to the surface, along which it will flow toward the side of the tank and thence downwardly to the propellers. Consequently, the heavy contents of the lower part of the tank will be rapidly forced to the surface through the overlying lighter elements, thereby quickly and finely dividing and commingling the elements of different gravities into a homogeneous and permanent mixture. The relations of the propellers to each other will vary according to the diameter of the propeller wheel and according to the pitch of the propeller-blades. With 18 inch propellers, used in a tank 12 feet in diameter and somewhat over 10 feet deep, I find that valuable results can be obtained by locating the propellers so that the blades clear each other by about 1½-inches.

Where, for example, salted water or milk and the oils and fats used in butter substitutes are placed in the same tank, the brine and the milk will settle to the bottom of the tank. As soon as I start the apparatus in operation, the lower propeller will start an initial current of the brine and milk, at the bottom of the tank, to rise upwardly and outwardly but as the current of brine and milk begins to diverge, it will be diverted by the upper propeller rotating in a direction opposite to the lower propeller, whereby a resultant current is created which rises substantially as indicated by the rising arrows in Fig. 1. The propulsive force of this current is such that the relatively heavy brine and milk will be driven upwardly through the oils and fats, and in actual service a pair of propellers 14 inches in diameter will create such a strong rising current in a tank over 10 feet deep that there will be a violent ebullition of the rising current at the surface of the tank, the rising current actually rising several inches above the normal level of the fluid contents of the tank when the tank is full. As the rising current reaches the surface, it diverges to the side of the tank and an induced return current is created, as shown. At the same time these forcibly driven currents of heavier fluids, rising through the lighter fluids, diverging and then descending, serve to thoroughly break up and intermingle the heavier and the lighter fluids, whereby an intimate, molecular intermingling of the various fluids is rapidly attained. As illustrating the certainty and rapidity of the action of this apparatus, I note that two pounds of fluid coloring matter may be incorporated in sixty thousand pounds of fluid in less than five minutes so efficiently as to produce a uniform color throughout the entire sixty thousand pounds contained in the tank. So in a relatively short time my process of intermingling oils and fats with heavier fluids by projecting a mechanically created current of the heavier fluid upward through the overlying lighter fluids and permitting an induced return cur-

rent will so effectively and minutely combine these various fluids as to produce an emulsion of great stability, even where all the elements remain fluid, while, when the principal elements are such as to be fluid only under heat and to be solid or semi-solid at ordinary temperatures, the emulsion will remain permanent until the compound shall be cooled and set, whereupon the combination will be permanent for all purposes, and in this manner I can combine, for example, as much as 25% of milk with the fatty elements used in a butter compound and in such a manner that there will be no visible watery spots or particles in the butter compound, and I can also project any desired quantity of brine through butter compound or butter substitutes so as to produce an absolute uniformity of seasoning throughout the entire mass.

While I have, for purposes of concrete illustration, shown the use of my process in the manufacture of butter compounds and butter substitutes and in the seasoning thereof, the process is not limited to such use, but is adaptable for use in various arts where it is necessary or desirable to produce a like intimate mechanical combination between oils and fats and fluids of a heavier specific gravity, and my process is of high commercial value in the manufacture of the uniform product which results therefrom, because of the much larger proportion of the heavier fluid which can be successfully incorporated in the compound, because of the rapidity with which the compound may be produced, and because of the inexpensive cost of installation and the cheapness of operation.

I claim:

1. The process of mechanically combining fluids of different specific gravities which comprises mechanically projecting a current of heavier fluid upwardly through and in continuous contact with an overlying body of lighter fluid.

2. The process of mechanically combining fluids of different densities which comprises projecting an unconfined and undivided current of a heavier fluid upwardly through an overlying body of a lighter fluid.

3. The process of mechanically combining fluids of different densities which comprises projecting an unconfined and undivided current of a heavier fluid upwardly through and in continuous contact with an overlying fluid body of less density.

4. The process of mechanically combining fluids of different densities which comprises projecting a current of the denser fluid vertically through and in free and continuous contact with a body of lighter fluid and also causing induced descending return currents until the fluids of different densities are brought into homogeneous intimate molecular combination with each other.

5. The process of mechanically combining water with fats and oils which comprises projecting a mechanically created current of water vertically through and in free and continuous contact with a body of fats and oils.

6. The process of combining water with fats and oils which comprises sufficiently heating the fats and oils to hold the same in a sufficiently fluid condition and then projecting a mechanically created current of water through and in continuous contact with the body of fats and oils until said elements are brought into such intimate molecular contact with each other as to form a homogeneous mass.

7. The process of producing a homogeneous compound containing water and fats or oils, which are solid or semi-solid at ordinary atmospheric temperatures, which comprises bringing the fats or oils to a sufficiently fluid condition, projecting a mechanically created current of water through and in continuous contact with an overlying body containing the fats or oils and producing induced return currents, while the fats or oils are maintained in a sufficiently fluid condition, until said elements are brought into thorough intimate molecular combination with each other, and then cooling the homogeneous mass to solid or semi-solid condition.

8. The process of combining fluids reluctant to mix which comprises projecting an unconfined and undivided current of one fluid, having a substantially uniform diameter, through and in continuous contact with a body of the other fluid until a mechanical combination of said fluids is produced.

9. The process of combining fluids reluctant to mix which comprises bringing the fluids together in a vessel and mechanically generating through the fluid body in the vessel an undivided and unconfined rising current having a substantially straight path, said current being in continuous contact with the surrounding body of fluid.

10. The process of combining fluids reluctant to mix which comprises bringing the fluids together in a vessel and creating opposing currents near the bottom of the vessel whereby a resulting single vertical current is produced which is projected vertically through the entire fluid body and in continuous contact therewith.

11. The process of combining fluids reluctant to mix which comprises bringing the fluids together in a vessel, creating an initial rising and diverging current near the bottom of the vessel and simultaneously creating a second rising and diverging current in such

a manner that a single, vertical current is created as the resultant of said two initial currents and is projected vertically through and in continuous contact with the body of fluids in said vessel.

12. The process of combining materials which are reluctant to mix, at least one of which is solid or semi-solid at ordinary atmospheric temperatures which comprises associating said materials together in a fluid condition, projecting through the body of said fluids from a point near the bottom thereof a vertical current in free and continuous contact with said fluid body and so as to produce return descending currents until an intimate mechanical combination of said fluids is obtained, bringing said fluids when so combined within the influence of a cooling medium whereby they are sufficiently cooled to make the combination thereof permanent, the primary body of said fluids being continuously intermingled as above set forth, while such combined fluids are being conveyed to such cooling influence, whereby the mechanical combination of said elements is continuously maintained until said elements are cooled into a solid or semi-solid mass.

13. The process of combining fluids reluctant to mix, which comprises projecting through and in continuous contact with a body of said fluids a vertical current having a substantially uniform diameter which is relatively small in comparison with the diameter of the entire fluid body through which it is projected.

14. The process of combining fluids reluctant to mix which comprises projecting a fluid current through and in continuous contact with the body of said fluids and maintaining said fluid body inert and without agitation except for said projected current and the return and entrained currents resulting therefrom.

THEODORE E. SMITH.

Witnesses:
J. F. DOYLE,
JOSEPH A. KREUZER.