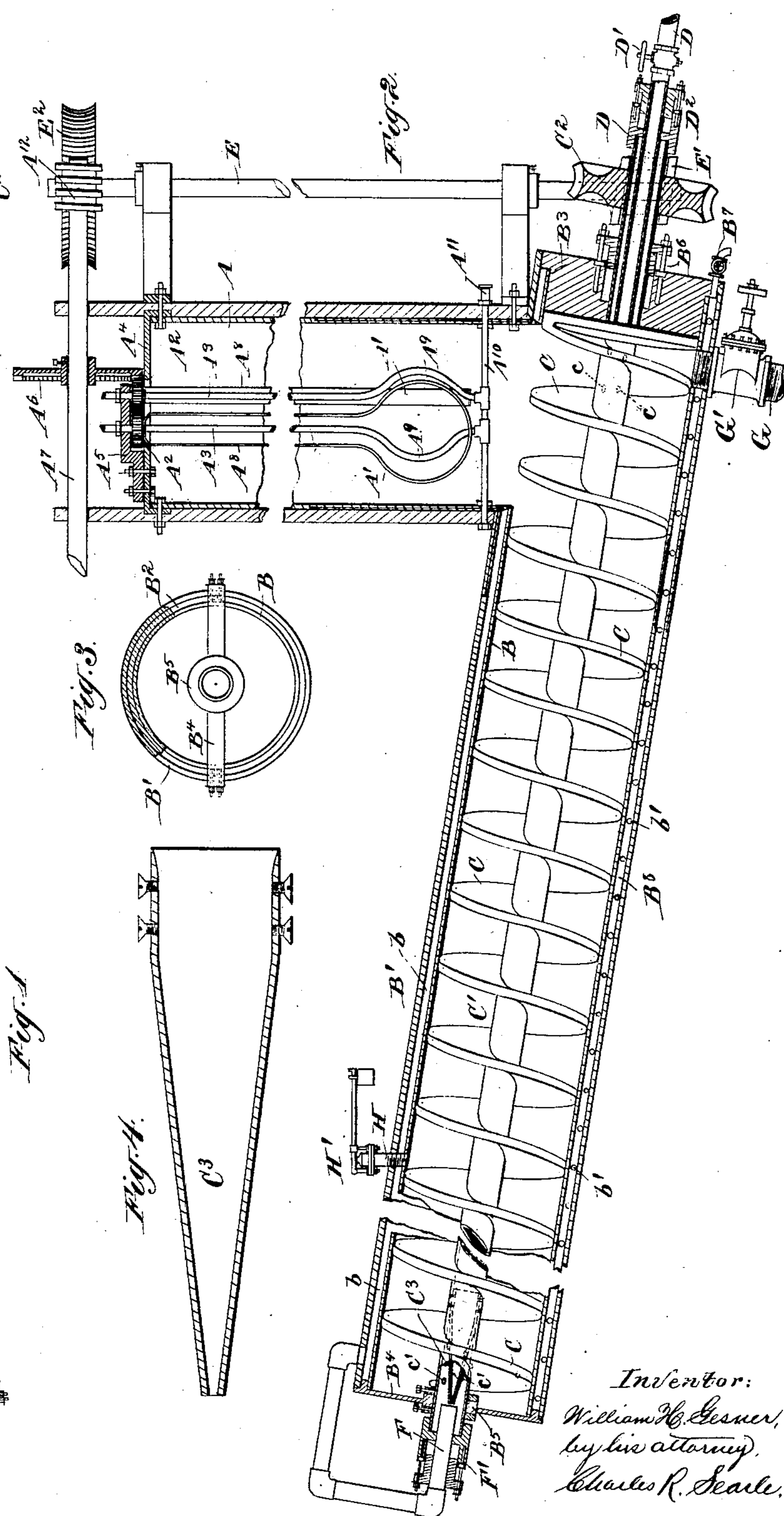


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# APPARATUS FOR CONTINUOUS TREATMENT OF MATERIAL.

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NO MODEL.



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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR CONTINUOUS TREATMENT OF MATERIAL.

SPECIFICATION forming part of Letters Patent No. 771,141, dated September 27, 1904.

Application filed October 28, 1903. Serial No. 178,938. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. GESNER, a citizen of the United States, residing in the city of New York, borough of Manhattan, in the county and State of New York, have invented a certain new and useful Improvement in Apparatus for the Continuous Treatment of Materials, of which the following is a specification.

The invention relates to continuous-process apparatus for the treatment of various materials by heat.

In many operations—such as boiling, cooking, heating, and refrigerating—it is desirable to avoid the waste of time and temperatures necessitated by emptying and recharging the receptacle in which the material is treated.

The object of this invention is to provide an apparatus in which the material may be continuously supplied, subjected to the required temperature for the required period to complete the treatment, and continuously discharged, thus permitting the treatment to be economically carried on, with the further advantage of great uniformity of product.

The invention consists in certain novel features and arrangements of parts and details of construction by which the above objects are attained, to be hereinafter described.

The accompanying drawings form a part of this specification and show the invention as adapted to the treatment of materials in the manufacture of soap.

Figure 1 is a plan view of the apparatus. Fig. 2 is a vertical longitudinal section, partly in elevation. Fig. 3 is an end view of a portion partly in section. Fig. 4 is a longitudinal section showing a detail on a larger scale.

Similar letters of reference indicate the same parts in all the figures.

The apparatus will serve for a variety of uses, as in the preparation of partly-cooked cereals, in the manufacture of ice-cream and ices, the production of various emulsions, or in processes in which the chemical combination of ingredients requires certain temperatures, as in saponification. I will for con-

venience describe the invention as applied to the manufacture of soap.

The apparatus as shown in the drawings comprises two main portions—a mixing-chamber or supply-receptacle in which the materials to be treated are received and intimately mingled by mechanical agitation and a jacketed cylinder containing a screw conveyer in which the mixed material is subjected to the action of cooling or in this case heating agent.

In the manufacture of soap the fats, oils, alkalies, and other ingredients are supplied in the proper proportions to the mixing-chamber A in the form of a vertical cylindrical casing in which is an agitator comprising the loops A' A', revolved oppositely in close proximity to each other, in a manner analogous to that in the well-known form of egg-beater, by spur-gears A<sup>2</sup> A<sup>2</sup>, meshing together and loosely mounted on vertical pipes A<sup>3</sup> A<sup>3</sup> and held in position upon a fixed cross-beam A<sup>4</sup> by a housing or keeper A<sup>5</sup>. Motion is imparted to the spur-gears by a crown-wheel A<sup>6</sup>, mounted on a main shaft A<sup>7</sup> and meshing with one of the gears. The loops are connected each to its spur-gear by vertical arms A<sup>8</sup> A<sup>8</sup>. The pipes serving as centers for the spur-gears extend vertically downward in the mixing-chamber and are curved outwardly at A<sup>9</sup> A<sup>9</sup> to avoid interference with the loops A' and join a transverse pipe A<sup>10</sup>, controlled by a valve A<sup>11</sup>. Steam is admitted to the upper ends of the pipes A<sup>3</sup> A<sup>3</sup> and after traversing them escapes through the pipe A<sup>10</sup>, serving to warm the materials during the mixing. The thoroughly mixed and warmed mass passes by gravity to the jacketed cylinder comprising a casing B, set at a slight upward inclination relatively to the mixing-chamber, and an inclosing shell B' of slightly larger diameter, the annular space *b* between them serving as a steam space or jacket. This space is closed at the upper or delivery end of the casing by a ring B<sup>2</sup> and at the lower end by a cap or plug B<sup>3</sup>, also closing the casing B at this end. The upper end of the casing is open except for a bar B<sup>4</sup> extending across the opening and having a central boss B<sup>5</sup> serving as a bearing for

the upper end of the screw-shaft C', the lower end being supported in a central opening in the cap B<sup>3</sup>, provided with a stuffing-box B<sup>6</sup>. The shaft is hollow and receives steam at the lower end through a pipe D, controlled by a valve D' and extending axially into the shaft through a stuffing-box D<sup>2</sup>. The shaft and its screw C are revolved in the direction to force the material upward along the inclined casing by a worm-wheel C<sup>2</sup> on the overhung lower end of the shaft engaged by a worm E' on a vertical shaft E, supported in brackets secured to the framework of the mixing-chamber. On the upper end of the shaft E is a worm-wheel E<sup>2</sup>, in mesh with the worm A<sup>12</sup> on the main shaft A', above described. Motion imparted to the main shaft from a motor (not represented) drives the agitators A' at a high rate of speed and through the system of worm-gears drives the screw at the required relatively slow speed.

The spiral thread constituting the screw C is hollow and is supplied with steam through openings *c c*, (shown by dotted lines in Fig. 2,) having a combined area equal to that of the supply-pipe D, and thus capable of admitting to the hollow screw the main portion of the steam received, which after traversing the spiral escapes again to the hollow shaft C' through the holes *c' c'* at the upper end. It is important that the shaft C' also be heated, but that the flow therethrough be checked in order to compel the main portion of the supply to follow the screw. This is accomplished by inserting within the shaft the tapered nozzle C<sup>3</sup> immediately below the openings *c'* and arranged to direct its current into the open end of a pipe F, entering the shaft C' axially at the upper end through a stuffing-box F' and delivering into the upper portion of the annular space *b*. The aperture in the nozzle is sufficiently contracted to check the flow of steam, and the shape is such that the steam escaping through it acts similar to an injector in aiding the flow of steam through the screw and holes *c'*. After circulating in the jacket and imparting heat to the casing the steam and any water of condensation escapes through the valve B<sup>7</sup> at a low point in the jacket. B<sup>8</sup> is one of a series of longitudinal strips arranged in the jacket below the casing, serving to support the latter and the screw C. Perforations *b'* in the strips allow the steam to circulate freely.

The fats, oils, and alkalies intimately mingled and warmed in the mixing-chamber are received in the lower end of the casing and the mass immediately engaged by the screw, receiving heat from the screw and its shaft and also from the inclosing casing. When it has been thus boiled for a sufficient period, depending upon the temperature of the steam, the length of the screw, and the character of the ingredients, saponification takes place, and the resulting soap in a semisolid mass is dis-

charged continuously from the upper end of the casing, whence it is carried away to be cut or molded into bars or cakes and allowed to harden. The spent lye and other liquids not incorporated with the soap may flow downward along the bottom of the casing and be drawn off at intervals through the drain-pipe G, controlled by the gate-valve G'.

H' is a safety-valve on a pipe H, communicating with the interior of the casing at a point near the line of saponification to relieve the pressure if the latter exceed that due to the head or level of the supply in the mixing-chamber, and thus prevent a backward movement of the liquid mass in the casing.

By inclining the casing B the opening thereto from the mixing-chamber is normally submerged, and thus sealed. The mass while in a liquid condition tends toward this end of the casing, and the action of the screw in this portion is mainly to agitate and raise the temperature of the liquid mass; but as soon as stiffened by saponification it is picked up by the screw, carried forward and upward between the hot surfaces until sufficiently solidified, and then delivered.

Modifications may be made in the forms and proportions within wide limits, and parts of the invention may be used without the whole. The inclination of the casing B may be varied to suit the requirements of the material treated. Slower solidification requires greater inclination and a longer screw and treatment. Although I have described the invention as using steam as the heating agent, hot water or air may be employed in some processes, or a refrigerant may be used, as ammonia-gas or cold brine, in the continuous manufacture of ice-cream or other frozen products. Other forms of mixing devices may be substituted for the egg-beater construction shown, and the methods of imparting motion to the mixer and screw conveyer may be varied.

I claim—

1. In an apparatus of the character set forth, a mixing-chamber, a casing below the same inclined and having its lower end beneath said chamber arranged to receive material directly therefrom and adapted to have its communication therewith normally submerged and sealed, a steam-jacket inclosing said casing, a hollow conveyer in said casing and means for supplying steam to said jacket and conveyer.

2. In an apparatus of the character set forth, a mixing-chamber, an inclined casing beneath the same with its end beneath said chamber adapted to receive material directly therefrom and to have its communication therewith normally sealed, a steam-jacket inclosing said casing, a hollow shaft extending through the casing, a hollow screw on said shaft, and means for supplying steam to said jacket, shaft and screw.

3. In an apparatus of the character set forth, a mixing-chamber, a casing inclined and hav-

ing one end adapted to receive material directly from said chamber, a steam-jacket inclosing said casing, a hollow shaft in said casing having openings at one end thereof, an  
 5 obstruction in said shaft between said openings for the purpose set forth, a hollow screw on said shaft, and means for supplying steam to said jacket, screw and shaft.

4. In an apparatus of the character set forth,  
 10 a casing, a steam-jacket inclosing said casing, a hollow shaft extending axially of said casing, a hollow screw on said shaft, and means for supplying steam to the latter at one end and delivering it at the other to said jacket,  
 15 openings from said shaft to said screw at one end, openings from said screw to said shaft at the other end, a nozzle having a contracted aperture arranged as an obstruction in said shaft to compel a portion of the steam re-  
 20 ceived in said shaft to traverse the interior of said screw, and serving by the escape of steam through said aperture to induce a current of steam through said screw.

5. In an apparatus of the character set forth,  
 25 a mixing-chamber, a mixer therein comprising two revolving loops, spur gear-wheels on said loops in mesh with each other, a main shaft extending transversely of said chamber, a crown-wheel thereon meshing with one of  
 30 said spur gear-wheels, a worm on said main

shaft, a vertical shaft, a worm-wheel thereon in mesh with said worm, a casing below said mixing-chamber at an inclination to the latter, a screw-shaft extending axially of said casing, a worm-wheel on said screw-shaft, and  
 35 a worm in mesh therewith on said vertical shaft.

6. In an apparatus of the character set forth, a mixing-chamber adapted to receive material to be treated, a mixer therein, a casing below  
 40 said chamber at an upward inclination to the latter and arranged to receive material directly therefrom, a screw conveyer in said casing, a shell inclosing said casing with a space between them serving as a jacket, a cap  
 45 closing the lower end of said casing, and means for supplying heat to said screw conveyer and jacket, whereby material supplied to said chamber will be mixed, flow to said conveyer,  
 50 be treated by heat in said casing, and be delivered from the open upper end of said casing.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

WILLIAM H. GESNER.

Witnesses:

ROBT. CONNOR,  
 CHARLES R. SEARLE.