

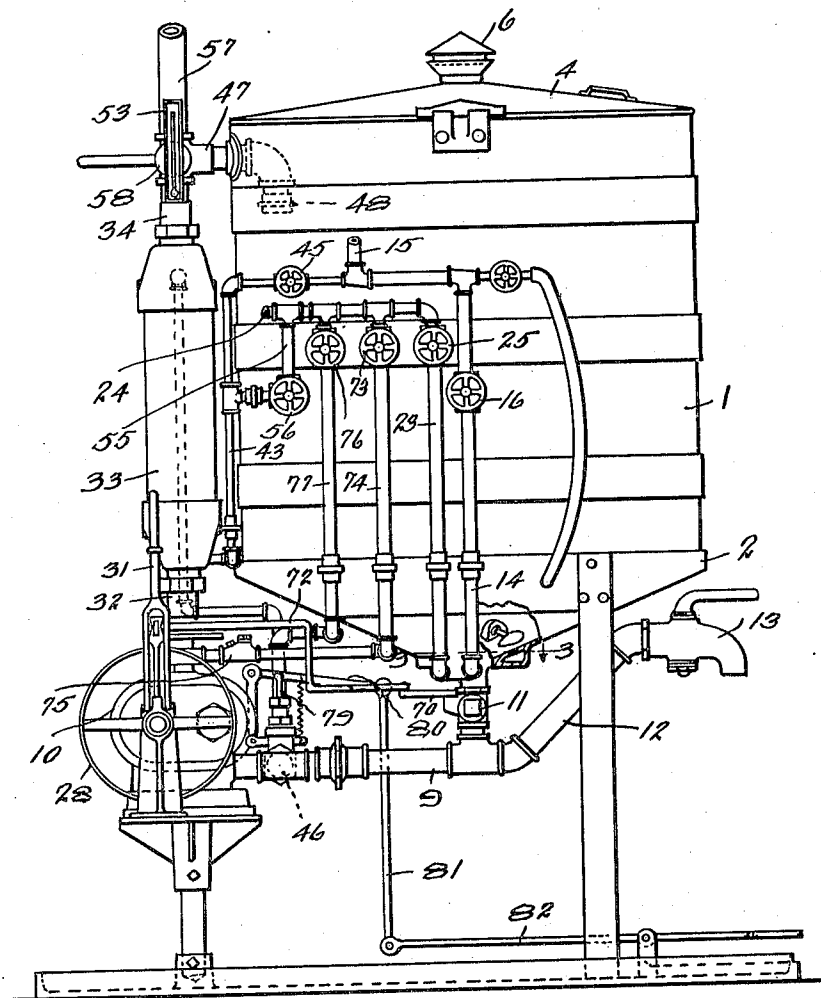
D. H. BENJAMIN.
METHOD OF PREPARING STARCH.
APPLICATION FILED SEPT. 10, 1917.

1,418,274.

Patented June 6, 1922.

5 SHEETS—SHEET 1.

Fig. 1



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Fig. 2

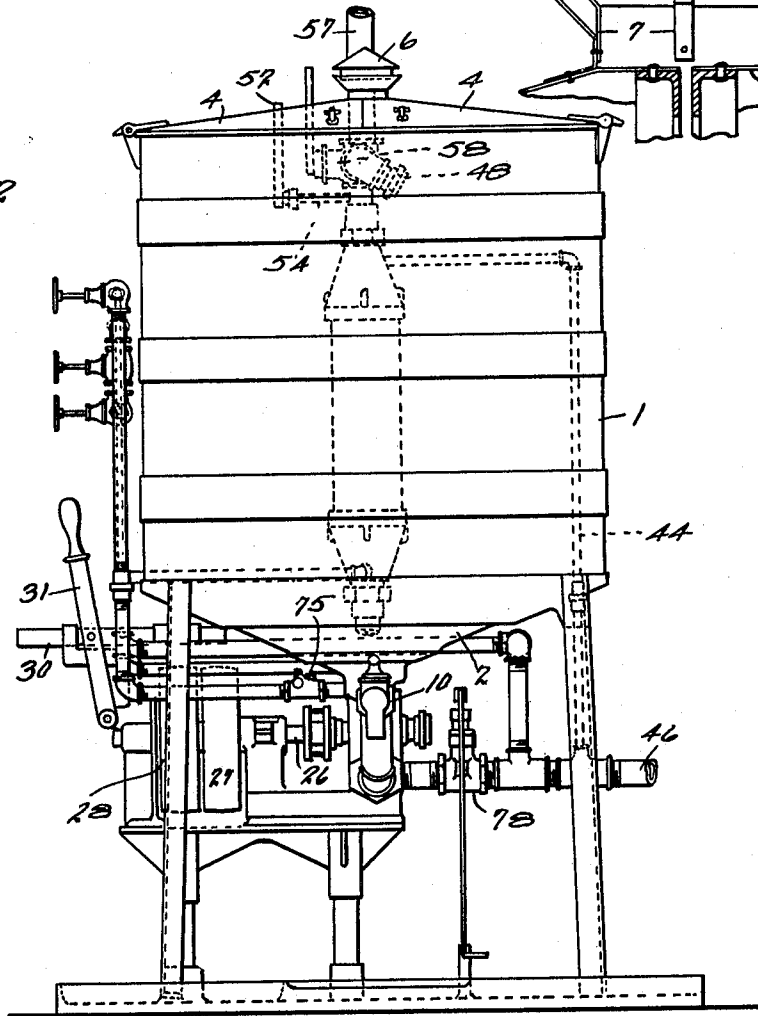
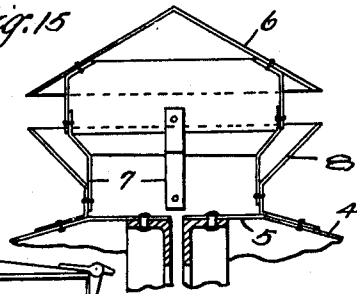


Fig. 15



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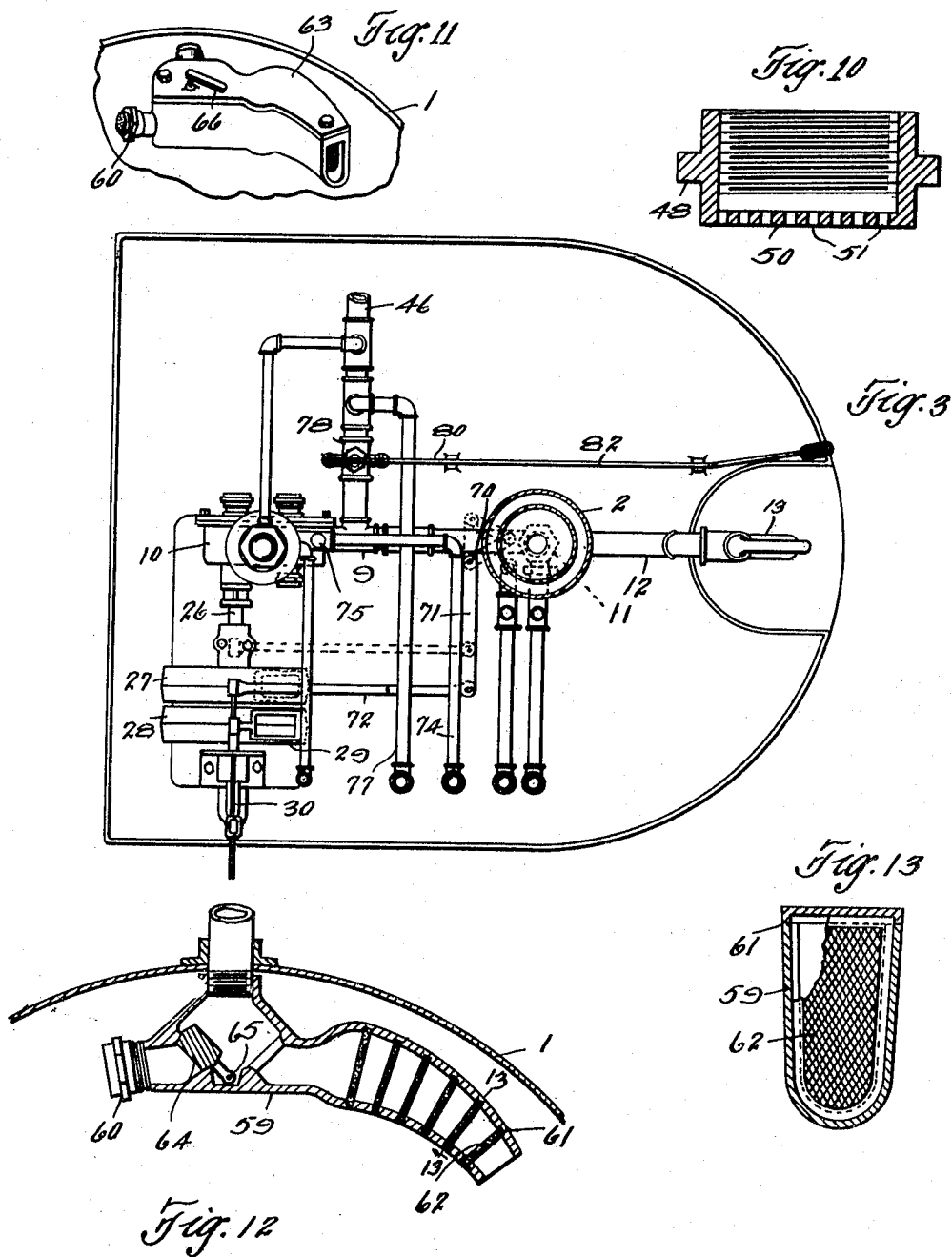
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5 SHEETS—SHEET 3.



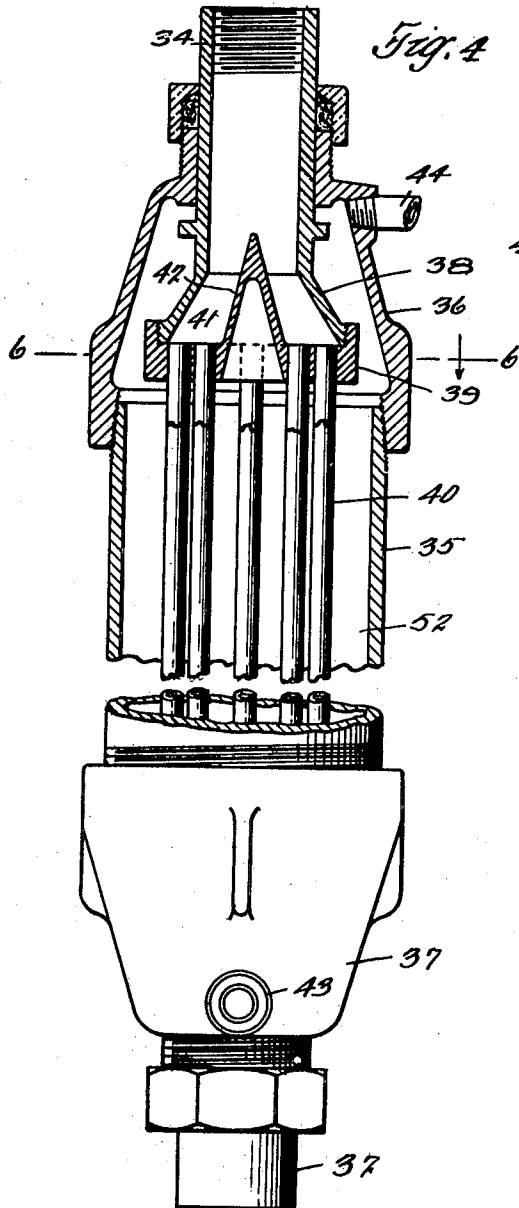
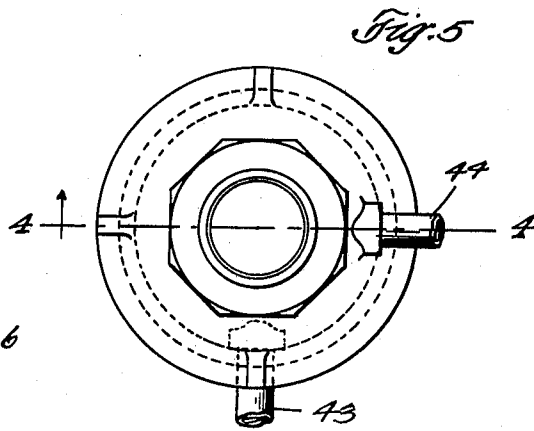
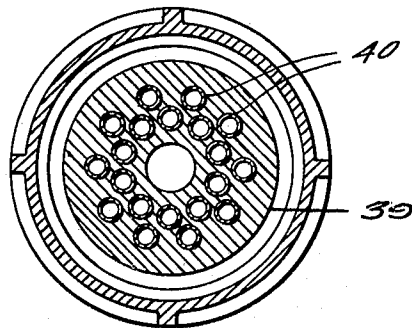
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5 SHEETS—SHEET 4.

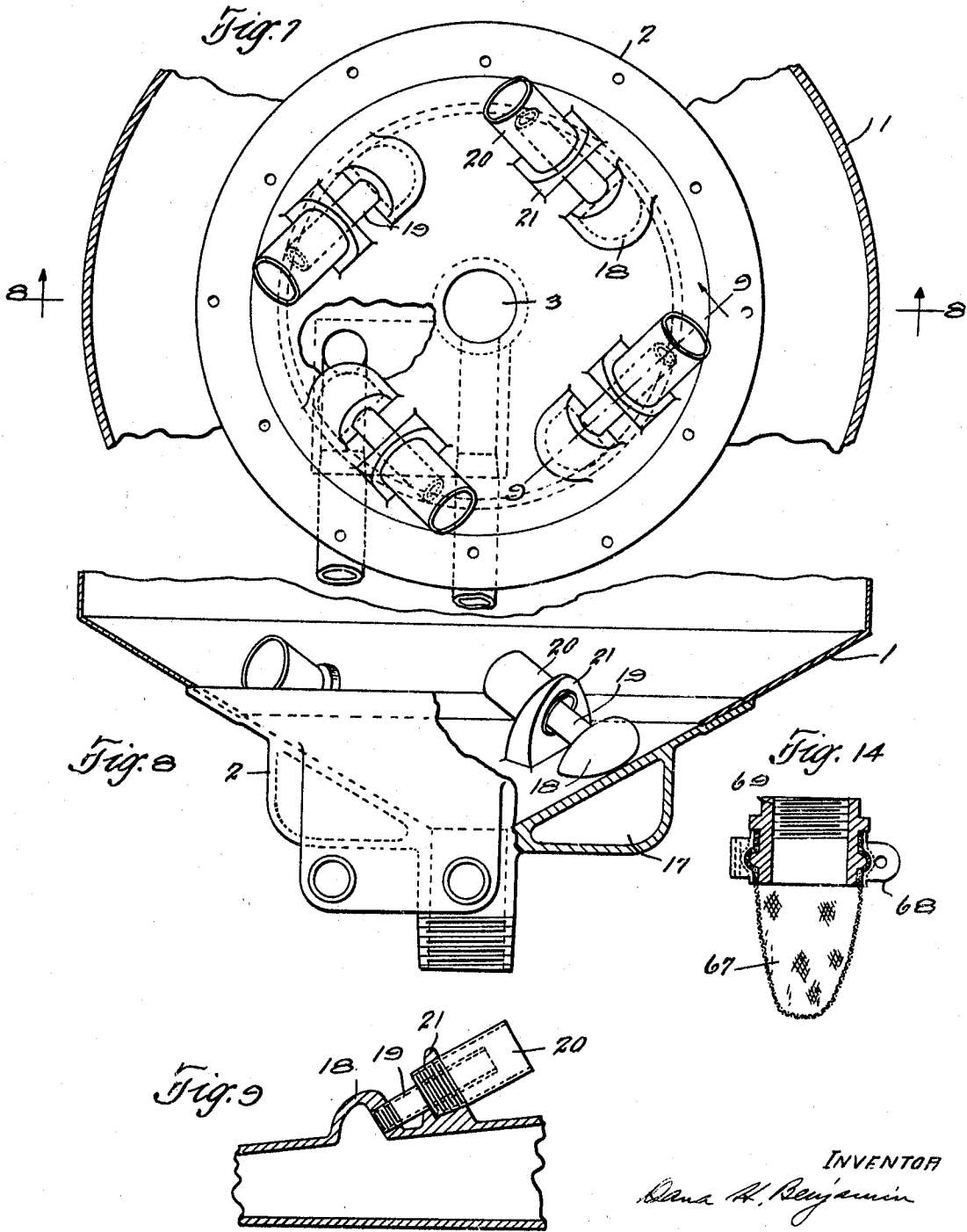


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UNITED STATES PATENT OFFICE.

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METHOD OF PREPARING STARCH.

1,418,274.

Specification of Letters Patent.

Patented June 6, 1922.

Application filed September 10, 1917. Serial No. 190,677.

To all whom it may concern:

Be it known that I, DANA H. BENJAMIN, citizen of the United States, residing at Cleveland Heights, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Methods of Preparing Starch, of which the following is a specification.

This invention relates to a method of preparing starch for use in laundry or other starching work, and more particularly to a method of cooking and mixing the starch with water and for maintaining it at the proper consistency and in a proper condition to produce the most effective results.

In laundry work, and, indeed, in any work where the article, fabrics, thread or yarn are to be treated with starch, the starch is supplied thereto either as a mixture or solution of cooked starch in water, or as a physical mixture of uncooked starch granules held in suspension in a solution of cooked starch. The latter mixture must be as thorough and complete as possible, because the uncooked or raw starch must be in suspension and the mixture must be constantly agitated to keep it homogeneous.

Experience has shown that the starching effect obtained with such a mixture varies rapidly and widely with the viscosity of the mass, which in turn varies with its temperature. Most forms of apparatus now in use for preparing starching mixture are incapable of maintaining it in the proper condition for obtaining the best results. If the temperature is allowed to go too high the raw starch may become cooked; if the mass is not thoroughly agitated it will cook in lumps or solid masses and not "cream" up to the proper consistency; and if the temperature is not maintained substantially at the proper point the viscosity may be either too high or too low, and in either event the starch will not properly penetrate the goods or produce the desired effect.

The object of this invention is to provide a method whereby the starch may be thoroughly cooked without liability to form lumps or solid masses and in a manner to produce a complete, thorough and homogeneous mixture; whereby the starch mixture including the raw starch supplied to the initial solution may be thoroughly "creamed" to the proper consistency and whereby the final

product may be cooled to and maintained within fairly close limits at the proper temperature for securing the best results as to penetration of the goods, etc.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

The invention comprises the several method steps hereinafter described and claimed.

In the drawings, which represent one embodiment of apparatus suitable for carrying out the invention, Fig. 1 is a side elevation, partly broken out and in section; Fig. 2 is a front elevation thereof; Fig. 3 is in part a plan view and in part a sectional view on the line 3—3 Fig. 1; Fig. 4 is an elevation on a larger scale, partly in section on the line 4—4, Fig. 5, and illustrating the temperature regulating device; Fig. 5 is a plan view thereof; Fig. 6 is a cross section on the line 6—6, Fig. 4; Fig. 7 is a plan view of the bottom of the mixing chamber, and illustrating the steam injectors therein; Fig. 8 is an elevation thereof, partly in section on the line 8—8, Fig. 7; Fig. 9 is a detail section on the line 9—9, Fig. 7; Fig. 10 is a detail section of a spraying device; Fig. 11 is a perspective view, from the inside, of the upper portion of the mixing tank, and showing a modified form of spraying device; Fig. 12 is a horizontal section thereof; Fig. 13 is a section on the line 13—13, Fig. 12; Fig. 14 is a detail section, showing another form of spraying and straining device; and Fig. 15 is a detail sectional view, on a larger scale, and illustrating the vent cap for the mixing chamber.

The method forming the subject matter of my invention consists in introducing into a proper vessel or container sufficient raw starch and water to form the cooked starch solution. Preferably the starch is mixed with a portion of the water before introducing it into said vessel, the remaining portion of the water being introduced to said vessel as required during the cooking operation, experience and practice serving best to determine the relative quantities of starch and water.

In said vessel the starch mixture is cooked to expand the granules, preferably by the introduction of steam or other suitable heating medium to said vessel, while at the same

time the mixture therein is agitated to keep it in motion so as to avoid the formation of lumps or solid masses. This may be accomplished by causing the steam itself to produce a circulating motion of the starch mixture in said vessel, for example a swirling motion of said mixture such as to cause it to rise along the walls of the vessel and flow downwardly along its axis to replace the material forced upwardly. The steam supply to the vessel is maintained until the starch is sufficiently cooked, and the agitation or swirling of the mixture in the vessel prevents the formation of lumps or masses.

When the starch is sufficiently cooked it is thoroughly "creamed" so as to give it the proper consistency for use in starching goods or the like. For example, if the goods to be starched is yarn or warp threads which can be treated with starch mixture at a relatively high temperature, say 200° Fahrenheit, the mixture may be creamed without the addition of raw starch thereto either at or above the temperature for cooking, or below the same. If the goods are collars, cuffs, shirts or the like, which require the starch at a temperature of 100° or so, the mixture may be allowed to cool by standing, but is preferably subjected to the effect of a cooling medium, such as cool water, either by circulating the water through pipes passing through the vessel, or, as shown herein, by circulating the hot starch mixture through a suitable cooling device, through which the cooling water also flows. At the same time the mixture can be creamed to obtain or give it the proper consistency, which is accomplished by withdrawing the mixture from the lower portion of the cooking vessel and reintroducing it into said vessel through a creaming device having a large number of small holes or perforations for straining the mixture and delivering it in the form of fine jets.

Where a mixture of cooked and raw starch is to be supplied to the articles to be treated at a low temperature, say 100° Fahrenheit, the initial batch of cooked mixture is cooled as before described and the proper quantity of raw starch mixed with water is introduced to the cooking vessel. The mixture of cooked and raw starch is then circulated through the creaming device to bring it to the proper consistency.

With either a cooked starch solution or a mixture of cooked and raw starch the temperature of the mixture is maintained as near as possible at the proper point to produce the best results by either cooling said mixture or supplying additional heat thereto from time to time as may be required.

The drawings illustrate one suitable form of apparatus for carrying out the invention, although it is to be understood that the invention may be carried out with various

forms of apparatus and is not limited to the particular form shown in the drawings. The apparatus illustrated is of the same form shown, described and claimed, in a prior application of Ernest W. Miller for starch preparing apparatus, filed Aug. 21, 1916, Serial Number 116074, said apparatus comprising a suitable tank or reservoir 1, which may be of any suitable form or shape, and is shown as a large cylindrical sheet metal tank having a hopper bottom 2 whose walls converge toward a central opening 3, and whose top is closed by a cover consisting of two members 4 hinged to the side wall of the tank. The adjacent edges of the cover members are cut out to form a vent opening 5, and one of said members has riveted or otherwise secured thereto a suitable vent cap, through which steam inside the reservoir may escape, but which prevents loss of the starch mixture by splashing or spattering. In the form shown the vent cap comprises an inverted conical member 6 supported by bars 7 above a funnel-shaped member 8. Any steam arising from the mixture in the vessel passes out between the bars 7 and between the cones 6 and 8, but should any mixture be splashed upwardly into said cap it drains back again into the reservoir.

The bottom central opening 3 of the reservoir communicates with two pipes the first of which, marked 9, is connected to the suction side of a suitable pump 10. In said pipe is a valve 11, and beyond said valve is a branch 12 terminating in a hand-regulated valve or faucet 13. By opening the valve 11, the mixture may be withdrawn by the pump from the bottom of the reservoir 1, and by opening faucet 13 may be discharged into a pail, or both, as will be readily understood. The second pipe communicating with the opening 3, marked 14, is connected to a source of water supply, such as the conduit 15 or the like, and is provided with a controlling valve 16.

The opening 3 at the bottom of the tank is in a heavy metal casing illustrated more particularly in Figs. 7 and 8. Said casting is cored out to form an annular chamber 17 whose upper wall is provided with hollow bosses 18 into which are threaded a series of injector nozzles 19, each of which has its outer end entering and extending part way through a hollow sleeve or tube 20 carried by a boss 21 of the casting. The chamber 17 also communicates by a hollow passage 22 with a pipe 23 leading to a source of steam supply, such as the conduit 24, and in said pipe 23 is a valve 25. When said valve is opened, steam flows into the chamber 17 and is distributed to and discharged through the several nozzles 19 whose outer ends are within the tubes 20, the latter being open at both ends. This arrangement produces an in-

jector action at each nozzle, so that any fluid mixture in the reservoir will be sucked into the back ends of the tubes 20 and forced out of their front ends. As the several nozzles 19 are spaced uniformly around the vertical axis of the reservoir and are disposed substantially tangentially to its circumference, and are also inclined upwardly therein, said nozzles produce a thorough circulation of the mixture in the reservoir, giving it a swirling upward movement along the inner wall of the reservoir with a corresponding downward movement of the mixture along the reservoir axis to take the place of that forced upwardly.

The apparatus described to this point is used for cooking the starch mixture. The starch is either first mixed with water or is introduced in pulverized form into the reservoir to which is also supplied, by way of the pipe 14, the proper quantity of water for the mixture. The steam supply is then turned on and thoroughly circulates the starch mixture in the reservoir and cooks the starch granules, causing them to expand and produce the starch solution, as will be readily understood. By gradually adding the starch to the rapid circulating hot water the starch may be cooked without the formation of lumps or solid masses.

The pump 10 may be of any suitable form and driven by any suitable motor, such as an electric motor, and is illustrated as a rotary centrifugal pump whose shaft 26 is provided with loose and fast belt pulleys 27, 28, above which is a belt shifter 29 on a sliding bar 30 actuated by a hand lever 31. The discharge end of said pump communicates by a pipe 32 with the bottom of a temperature correcting device 33, illustrated in Figs. 4, 5, and 6 and having an outlet pipe 34 at its upper end. The upper and lower ends of said temperature correcting device are of identical form. It comprises an outer casing 35, shown as a tube threaded at its opposite ends into a cap 36 and a base 37 sleeved upon the pipes 32 and 34, whose inner ends are flared, as at 38, and threaded into heads 39, said heads being provided with a number of openings to receive a series of circumferentially spaced longitudinal pipes or tubes 40, establishing communication between the chambers 41 in the opposite ends of the tubes 32, 34. Each head is further provided with a hollow conical extension 42 extending into the adjacent pipe 32 or 34, as the case may be. The base 37 and cap 36 are also provided with side openings into which are threaded laterally extending pipes 43, 44, of which the pipe 43 communicates by way of a valve 45 with the water supply pipe 15, while pipe 44 communicates (see Fig. 2), with a drain pipe 46 leading to the sewer, and which drain pipe also communicates with the pipe 9, as shown in Fig.

1. The outlet pipe 34 from the temperature correcting device has two branches, one of which, marked 47, passes in through the wall of the tank and terminates in a suitable screening or beating device, several forms of which are shown in the drawings. One form illustrated in Fig. 10, is a hollow cap 48 threaded onto the end of the pipe 47 and having an end wall 50 provided with a large number of small ports or openings therein.

When the starch solution has been thoroughly cooked and mixed, as before described, the steam supply through the pipe 23 is turned off, the water supply to the hollow chamber 52 in the temperature correcting device around the pipes 40 is turned on, and the pump 10 is started. The solution in the tank 1 is therefore circulated or bypassed through the tubes 40 of the temperature correcting device, and the cold water circulated around said pipes cools down the solution. When said solution is cool enough so that it will no longer cook the starch, say at a temperature of about 130° Fahrenheit, the uncooked starch for the mixture is introduced into the top of the reservoir 1. The mixture is then circulated from the tank 1 to the temperature correcting device 33 and back again for some length of time, to "cream" the mixture and give it the desired consistency. During all of this time the temperature of the mixture is maintained closely at the desired point, which may be determined by a thermometer 53 in a branch pipe 54 communicating with the outlet pipe from the temperature correcting device. Should the temperature get too low the water supply to the chamber 52 may be turned off and steam circulated through said chamber and around the pipes 40 from a steam pipe 55 communicating with the steam supply pipe 24 and connected by way of a valve 56 to the pipe 43, as shown in Fig. 1. The arrangement enables the temperature of the mixture to be maintained within very narrow limits and by beating the mixture in the tank and circulating it through the apparatus, it can be "creamed" to a fine consistency.

The second branch of the outlet pipe 34 of the temperature correcting device, marked 57, may lead to a starching tank or machine in which the goods to be starched are subjected to the starch solution, and the mixture circulating through the pump may be discharged either into the reservoir 1 or to said starching machine, by turning a two-way valve 58 to the proper position.

The nozzle 48, as shown in Fig. 10, merely sprays the mixture into the mixing tank 1. By setting the axis of said nozzle at an incline, as shown in Fig. 2, the mixture may also be given a swirling movement.

Figs. 11, 12, and 13 illustrate a modified

form of nozzle for the end of the delivery pipe through which the mixture is discharged into the mixing tank. Said nozzle in Fig. 12 comprises a hollow casing 59, of Y form. One of the legs of the Y terminates in a nozzle 60 of the same form shown in Fig. 10 while the other leg is provided on its inner surface with a series of grooves or channels 61 to receive a series of screens 62, held in place by a cap or cover 63. At the crotch of the Y is located a valve member 64, turning with a shaft 65 extending outside of the casing 59 and there provided with an operating handle 66. By turning said valve to one position or the other, mixture can be discharged either through the nozzle 60 or through the series of screens 62. These screens filter the mixture and are useful in mixing the cooked starch before the uncooked starch is added thereto, so as to remove any lumps or masses which may have formed therein. The same result may be secured by the straining device illustrated in Fig. 14, which is a cloth or fabric bag 67 secured by a clamping ring 68 to a fitting 69 secured to the end of the pipe 47.

The apparatus is preferably so arranged as to prevent the withdrawal of any material from the bottom of the reservoir 1 except when the pump is operated, thereby insuring a homogeneous and uniform mixture. For this purpose the valve 11 in the pipe leading to the pump or to the faucet 13 is provided with an operating lever 70 connected by a link 71 to an arm 72 fastened to the belt shifting bar 30. When the belt shifter is in one position say the position shown in dotted lines in Fig. 3, the pump is operating and valve 11 is open, while when the belt shifter is moved to its other position, shown in dotted lines in Fig. 3, the pump is stationary and the valve 11 is closed.

The apparatus is self-cleaning and draining. For example, the steam supply pipe 24 is connected by way of a valve 73 and pipe 74 to the pipe 32 leading into the bottom of the temperature regulating device. In the pipe 74 is a non-return check valve 75 seated away from the pipe 32. By opening valve 73 steam may be introduced into the bottom of the temperature correcting device for the purpose of blowing and cleaning out the starch line and pipes and tubes in the temperature correcting device. The steam supply pipe 24 also communicates by way of a valve 76 and pipe 77 with the drain tube 46, so that any water of condensation in the steam pipes may be conveyed to the drain and not circulated through the apparatus. The drain pipe 46 is also provided with a suitable valve 78 whose stem 79 (Fig. 1) is connected by a lever 80 and link 81 to a suitable operating device, such as the foot treadle 82. By opening the valve

11 and depressing the treadle 82 the entire mass or mixture in the reservoir 1 may be discharged into the sewer.

The method described enables the starch mixture to be properly prepared and maintained in a condition which produces the best results when said mixture is applied to the articles or material to be treated. The mixture has high penetration qualities and produces the best results. The method can be carried out continuously in a simple form of apparatus, requiring very little attention by the operator.

What I claim is:—

1. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, and circulating the mixture between the vessel and a temperature controlling device, where any departure of the mixture from normal temperature is corrected.

2. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, cooling the mixture, and supplying raw starch to the cooled mixture.

3. The method of preparing starch cooled mixture comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, circulating the starch mixture between said vessel and a cooling device, and supplying raw starch to the cooled mixture.

4. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, cooling the mixture supplying raw starch to the cooled mixture, and creaming the same.

5. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, cooling the mixture, withdrawing the mixture from the lower portion of said vessel, and creaming said mixture.

6. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture therein and cook the starch granules, withdrawing mixture from the lower portion of said vessel, and introducing the mixture thus withdrawn into said vessel in the form of fine jets.

7. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said

vessel in a manner to circulate the mixture therein and cook the starch granules, circulating the mixture to a cooling device, and introducing the mixture to said vessel in the
5 form of fine jets.

8. The method of preparing starch mixture, comprising introducing starch and water into a vessel, supplying steam to said vessel in a manner to circulate the mixture
10 therein and cook the starch granules, withdrawing the mixture from the lower portion of said vessel, reintroducing the mixture thus withdrawn into the vessel in the form of fine jets, and correcting the temperature
15 of said mixture from time to time.

9. The method of creaming starch mixture, consisting in withdrawing a portion of the mixture from a vessel containing it, and spraying the withdrawn mixture into the upper portion of the vessel above the level
20 of the mixture therein.

10. The method of creaming starch mixture, consisting in withdrawing a portion of the mixture from a vessel containing it, spraying the withdrawn mixture into the
25 upper portion of the vessel above the level of the mixture therein, and simultaneously cooling said mixture.

In testimony whereof I affix my signature.

DANA H. BENJAMIN.