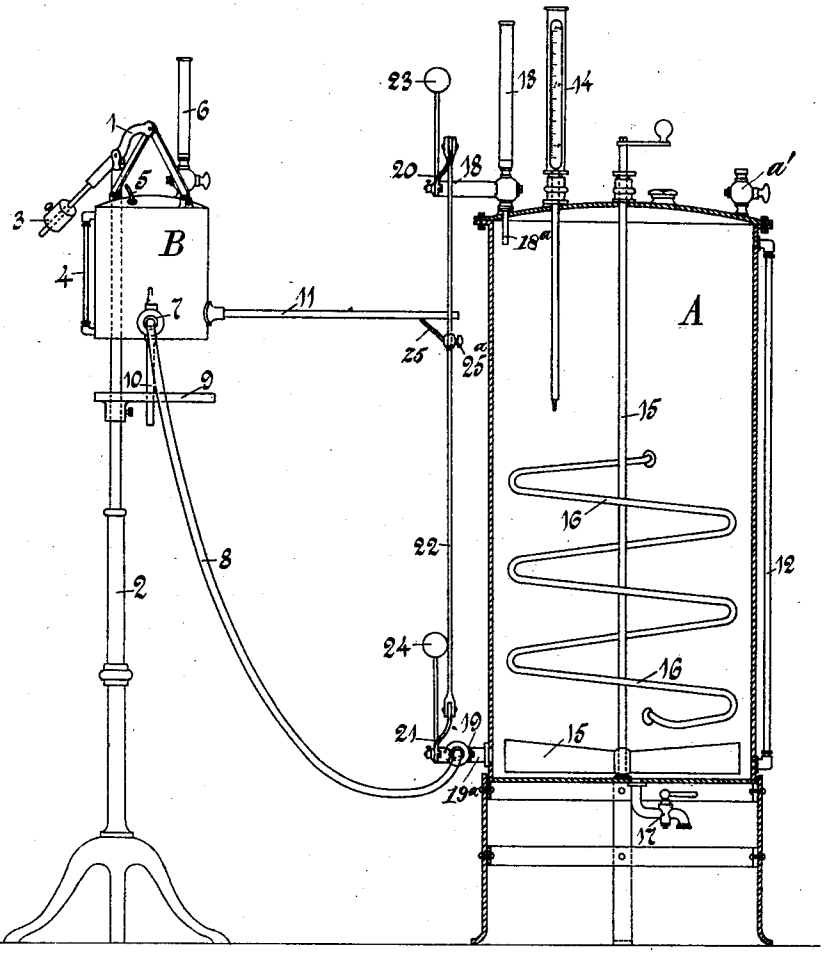
No. 628,067. Patented July 4, 1899.

N. BENDIXEN.

APPARATUS FOR PROPAGATING YEAST.

(Application filed Sept. 8, 1898.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PROPAGATING YEAST.

SPECIFICATION forming part of Letters Patent No. 628,067, dated July 4, 1899.

Application filed September 8, 1898. Serial No. 690,513. (No model.)

To all whom it may concern:

Be it known that I, NIELS BENDIXEN, a subject of the King of Denmark, residing at Hauchs Vej 16, in the city of Copenhagen, in the Kingdom of Denmark, have invented certain new and useful Improvements in Propagating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of my said invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters and figures of reference marked thereon, which forms a part of this application.

This invention has relation to apparatus for cultivating or propagating micro-organisms, &c., and more particularly for the preparation of pure ferments for use by brewers and distillers.

The invention has for its object the provision of means whereby the propagating of micro-organisms or the preparation of ferments can be made a continuous one and whereby the inoculated liquid itself can be used in the treatment of successive batches of liquid.

In the accompanying drawing I have shown by a vertical sectional elevation an apparatus embodying my invention.

A indicates the propagating vessel, provided at top with a valved branch a' for the admission thereto of the propagating liquid and with means for introducing the micro-organisms or a culture thereof, and at its bottom said vessel is provided with a discharge-cock 17. With this vessel are combined, as usual, a revoluble agitator 15, a heating-coil 16, a level-indicator 12, a thermometer 14, and a valved air-inlet and gas-outlet branch 18^a, on which is secured a sterilizing-filter 13. The vessel is further provided, near its bottom, with a valved outlet branch 19^a. The valves in the air-inlet and gas-outlet branch and in the branch for liquid are constructed in the form of stop-cocks 18 and 19, to the plugs of which are secured two armed levers 20 and 21, respectively. One of the arms of each of said levers carries a weight 23 and 24, respectively, while the other arms of the levers are connected together by a shifting-rod 22, that carries an abutment 25, adjustable thereon by means of a set-screw 25^a. The arrangement of the weighted levers 20 and 21 on the plugs of their respective stop-cocks 18 and 19 is such as to hold the plug of stop-cock 18 normally in its closed position and that of the stop-cock 19 in its open position.

With the propagating vessel organized as usual, except in so far as the arrangement of the stop-cocks 18 and 19 is concerned, I combine a receiver B, connected near its bottom by a flexible pipe 8 with the outlet branch 19^a of vessel A, said receiver being likewise provided with a level-indicator 4 and a valved air inlet and outlet branch carrying a filter 6 and a tube 5 for the introduction of the micro-organism or a culture thereof.

The receiver B is of small capacity as compared with the capacity of vessel A, yet of such capacity as to hold a quantity of a culture of a micro-organism sufficient for its proper propagation in the charge of propagating liquid in the vessel A. Said receiver B is suspended from one of the arms of a two-armed lever 1, whose other arm carries a weight 3, adjustable thereon by means of a set-screw. The lever 1 has its fulcrum at the upper end of a stand 2 of such height that the empty receiver B under the action of the weight 3 will be held above the level of the charge in vessel A, or substantially so. From the bottom of the receiver B projects a guide-rod 10, that is guided in a suitable opening in a platform 9, adjustable on stand 2 by means of a set-screw, and from the side of said receiver projects a rod 11 in contact with the abutment on the valve-shifting rod 22 when the receiver is in its highest position.

The operation of the apparatus may be briefly described as follows: In starting the continuous operation a dose of a culture of a micro-organism is introduced into the previously-sterilized vessel A, either before or after the charge of the propagating liquid has been admitted thereto, the quantity of liquid being such as not to completely fill the vessel, so as to leave a space above the liquid for the collection of gas. The agitator 15 is then set in motion and steam is admitted to the coil 16 to heat the liquid to the proper temperature or maintain it at the proper temperature if the liquid has previously been sterilized by heat and then cooled down to a

temperature suitable for the propagation of the micro-organism. The growth of the micro-organism or pure-ferment culture in the liquid medium results in fermentation and evolution of carbonic-acid gas, which collects above the liquid, its pressure thereon gradually increasing until it becomes sufficient to force the liquid through pipe 8 into receiver B. When the quantity of liquid inoculated with the growth of the micro-organism forced into the receiver B is sufficient to overbalance the weight 3 on lever 1, the said receiver sinks and, through its arm 11 acting upon the shifting-rod 22, moves the latter down, thereby reversing the plugs of the stop-cocks 18 and 19, so that the plug of the former will open the passage in the air-inlet and gas-outlet branch and, through the sterilizing-filter and the plug of the stop-cock 19, will close the passage through the outlet branch for liquid connected with the receiver B, at which time the latter will be seated on the platform 9, which thus serves as an abutment for limiting the downward movement of said receiver. The contents of the vessel A may now be discharged, after which the stop-cock in the discharge-pipe 17 is closed, and if shifting-rod 22 is now moved upward the plugs of the valves or stop-cocks 18 and 19 will be shifted back to their normal position to close the air-inlet and gas-outlet and open the outlet for liquid, thereby causing the liquid in receiver B to flow back into vessel A for the inoculation of the next charge of propagating liquid and the propagation of the micro-organisms.

As shown in the drawing, the weighted arms of the levers 20 and 21 on the plugs of the stop-cocks 18 and 19 bear such relation to their connected arms that but a very slight downward movement of the receiver B will carry said weighted arms over their dead-centers, so as to almost instantly reverse the plugs, thus insuring the transfer of a regulated quantity of liquid from A to B, which quantity may also be read on the level-indicator and may be varied as circumstances may require by the adjustment of the abutment on the shifting-rod or the adjustment of the weight 3 on lever 1, or both, the platform 9 being correspondingly adjusted, if necessary.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. Apparatus such as described, comprising a propagating vessel having a gas-outlet pipe provided with a valve normally closed, and with an outlet for liquid provided with a valve normally open; of a movable receiver, valve-shifting appliances operated thereby to open the valve in the gas-outlet pipe and close the valve in the outlet-pipe for liquid when said receiver moves in a given direction, and a flexible-pipe connection connecting the receiver with the outlet branch for liquid, for the purpose set forth.

2. Apparatus such as described, comprising a propagating vessel having a gas-outlet pipe provided with a valve, and with an outlet-pipe for liquid likewise provided with a valve, and weights acting upon said valves to hold one closed and the other open; of a receiver having a rising motion under the action of a weight acting thereon, and a descending motion under its own weight when more or less filled, and valve-shifting appliances operated by the receiver in descending and acting upon the weights to cause the latter to reverse the valves so as to open the one in the gas-outlet and close the one in the outlet for liquid, and a flexible-pipe connection connecting the latter outlet with the receiver, for the purpose set forth.

3. In apparatus such as described, the combination with a propagating vessel having outlets for gas and liquid, each provided with a valve, a weighted lever on the stem of said valves arranged to normally keep the valve in the gas-outlet closed and the one in the outlet for liquid open, and a shifting-rod connected to both levers so as to reverse the relative positions of the valves when moved in one direction and restore the same to their normal positions when moved in a reverse direction; of a receiver, a weighted lever from which said receiver is suspended, means acting upon the aforesaid shifting-rod and set in operation by the downward movement of the receiver whenever its weight overbalances the weight on its supporting-lever to reverse the valves and thereby open the gas-outlet and close the outlet for liquid, and a flexible-pipe connection between the latter outlet and the receiver, for the purpose set forth.

4. In apparatus such as described, the combination with a propagating vessel having a gas-outlet and an outlet for liquid, each provided with a weight-controlled valve, said weights arranged to hold the valve in the gas-outlet pipe so as to normally close the passage therethrough and to hold the valve in the outlet-pipe for liquid so as to normally keep the passage therethrough open, and so that by a slight displacement of the weights the relative positions of said valves will be reversed opening the gas-outlet and closing the outlet for liquid; of a receiver having a rising-and-descending motion respectively under a weight acting thereon and under its own weight when the latter overbalances the acting weight, mechanism set in motion by the descent of the receiver and acting upon the valve-weights to displace the same and thereby reverse the relative positions of said valves, and a flexible-pipe connection between the receiver and the aforesaid outlet for liquid, for the purpose set forth.

5. In apparatus such as described, the combination with a propagating vessel having a gas-outlet and an outlet for liquid, each provided with a weight-controlled valve, said weights arranged to hold the valve in the gas-outlet pipe so as to normally close the passage therethrough and to hold the valve in

the outlet-pipe for liquid so as to normally keep the passage therethrough open, and so that by a slight displacement of the weights the relative positions of said valves will be reversed opening the gas-outlet and closing the outlet for liquid; of a receiver having a rising-and-descending motion respectively under a weight acting thereon and under its own weight when the latter overbalances the acting weight, mechanism set in motion by the descent of the receiver and acting upon the valve-weights to displace the same and thereby reverse the relative positions of said valves, an adjustable abutment for limiting the descending motion of the receiver, and a flexible-pipe connection between the receiver and the aforesaid outlet for liquid, for the purpose set forth.

6. In apparatus such as described, the combination with a propagating vessel having a gas-outlet and an outlet for liquid each provided with a stop-cock, a two-armed weighted lever on the plug of said stop-cocks, the weighted arms of said levers being on their upper vertical dead-centers when their respective valves are closed and open, and a shifting-rod connected with the other arms of said levers; of a receiver having ascending-and-descending motion under the action of a weight thereon and under its own weight, respectively, whenever its own weight is sufficiently increased, and means actuated by the receiver on descending, and acting upon the shifting-rod to move the weighted arms of the aforesaid levers over their dead-centers, and thereby reverse the relative positions of the valves, and a flexible pipe connecting the receiver with the aforementioned outlet for liquid, for the purpose set forth.

7. In apparatus such as described, the combination with a propagating vessel having gas and liquid outlets each provided with a stop-cock, the weighted levers 20 and 21 on the plugs of said cocks, the connecting-rod 22 connected to one arm of each lever, and a vertically-adjustable abutment on said rod; of the stand 2, the adjustable platform 9, the weighted lever 1, and the receiver B suspended from said lever and provided with the actuating-arm 11 and the guide-rod 10, and a flexible pipe connecting said receiver with the outlet for liquid of the propagating vessel, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

NIELS BENDIXEN.

Witnesses:

S. AMMÜND, Jun.,

AUG. ANDERSEN.