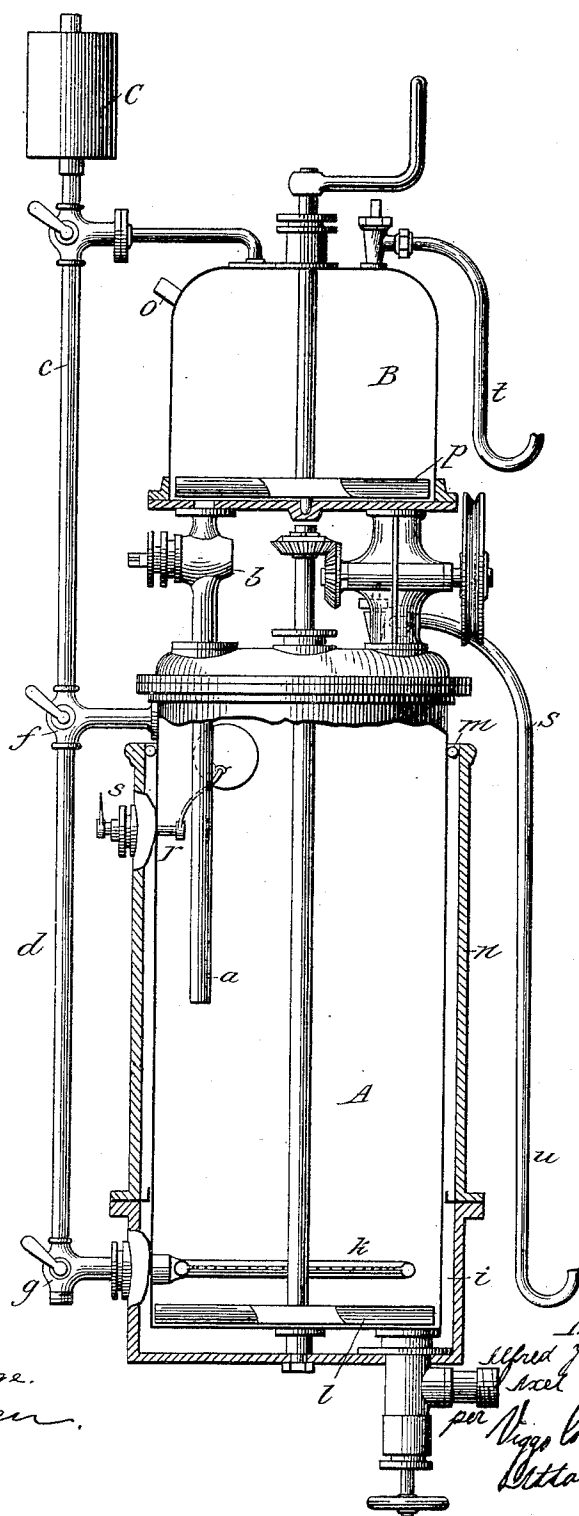


(No Model.)

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APPARATUS FOR THE PRODUCTION OF YEAST OR SIMILAR SUBSTANCES.

No. 467,993.

Patented Feb. 2, 1892.



Witnesses:

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APPARATUS FOR THE PRODUCTION OF YEAST OR SIMILAR SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 467,993, dated February 2, 1892.

Application filed May 12, 1890. Serial No. 351,554. (No model.)

To all whom it may concern:

Be it known that we, ALFRED JÖRGENSEN, a subject of the King of Denmark, residing at Copenhagen, in the Kingdom of Denmark, and AXEL BERGH, a subject of the King of Sweden, residing at Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Apparatus for the Production of Yeast and Similar Substances; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in apparatus for the production of yeast and similar substances. By his important scientific labors Dr. E. Chr. Hansen has caused a new departure in fermentation, and his system has been introduced into every country. One feature of his system is the propagating apparatus for the production of absolutely pure yeast.

The improved apparatus hereinafter described is designed to be used for the continuous development of a large quantity of absolutely pure yeast, which can be readily developed further in practice. In the construction of this apparatus the principal object has been to obviate infection, in order that, on the one hand, the operation can be effected through the medium of a sterilized liquid, and that, on the other hand, a control can be easily obtained over the aeration necessary for the yeast. The said apparatus differs, essentially, from the apparatus heretofore employed for similar purposes and presents several advantages.

The appliance, which is represented on the accompanying drawing in vertical diameter section, comprises two cylinders, which are placed one above the other and communicate with each other through a pipe *a* and a cock *b*. The cylinder A is surrounded by a jacket divided into two separate compartments *i* and *n*, of which the lowest *i*, through a steam-cock, is connected with a steam-inlet pipe, while the upper one *n* at the top has an annular aperture *m*. In both cylinders A and B are central vertical axes, which at the bottom have screw-formed stirrers *l* and *p*, which

approach as near as possible the bottom and sides. The axis and the wings of the cylinder A can be given rotary motion by the means of toothed wheel connection and pulley, and that in the cylinder B through the medium of a handle or in other suitable manner.

In the cylinder A is a water-level meter consisting of a float *r*, which is in connection with the hand *s* outside the cylinder. Bent air-exit tubes *u* and *l* are through cocks connected with the top part, respectively, of cylinders A and B.

An air-supply C is, by the means of the tubes *c* and *d* and the three cocks *e*, *f*, and *g*, brought into connection with the cylinders B and A. The tube K, which is closed in its interior end, has in that portion which projects into the inner cylinder perforations in its sides, through which holes the sterilized air being led through the tube can pass into the wort, and which is placed horizontally at the bottom of the cylinder A, and is, through the cock *g*, in connection partly with the tube *d* and partly with the aperture *h*. At the top of cylinder B is an inlet-tube *o*.

The appliance is used as follows: Sterilized air can be conducted through an air-filter C, and thence through two pipes *c* and *d* and three cocks *e*, *f*, and *g* to both cylinders. The wort is preferably introduced in the sterilized state into the lower cylinder A directly from the brewery, or it may be sterilized in the same cylinder by admitting steam to a chamber *i* at the lower part of a casing which surrounds the aforesaid cylinders. After the desired quantity of wort has been admitted the air is introduced in a suitable manner. For this purpose the third or lower of the above-mentioned cocks *g* communicates with a pipe *k*, which is arranged in the lower cylinder at a short distance from the bottom of the same, this pipe being closed at one end and provided with small holes at the inner and outer sides. The three cocks *e*, *f*, and *g* are so placed that the air is forced through the filter C directly into the said pipe *k*, from which it issues on both sides. At the same time an agitator *l*, which is preferably made of helical form and arranged as closely as possible to the bottom and sides of the lower cylinder A, is caused to rotate for the purpose

of stirring the wort. The cooling is effected by causing cold water to pass from an annular pipe *m*, surrounding the upper part of the said cylinder along the outer periphery of the latter, or to circulate either in the chamber *n* at the lower part of the latter casing round the cylinder or in the entire casing. A quantity of the aerated and cooled wort is forced by air-pressure into the upper cylinder B, which is sterilized by steam or in any other suitable manner. Absolutely pure yeast produced in the laboratory is introduced through a pipe *o* into the upper cylinder and is intimately mixed with the wort by means of the helical agitator *p*, arranged at the bottom of this cylinder. In order to enable the quantity of wort which has been introduced into the lower cylinder and forced upward into the upper cylinder to be indicated without the use of a gage-glass, a float *r* is connected by means of an arm to a spindle *s*, which extends to the outside of the cylinder and carries a hand which indicates the level of the liquid in the said cylinder A. When the yeast has been intimately mixed with the wort in the upper cylinder B, the charged wort can be caused to pass through the above-mentioned cock *b* and pipe *a* back to the lower cylinder A, either at once or after it has been allowed to ferment in the upper cylinder. After the wort contained in the lower cylinder A has likewise been started and the yeast has been properly mixed with the same a definite quantity is forced into the upper cylinder B. The charged wort and both cylinders must be kept at a temperature adapted for the continuation of fermentation. As this apparatus has for its object to produce pure yeast for use on a large scale, it is a matter of course that this yeast can be removed either when the fermentation has reached its highest stage or after the yeast formed has fallen to the bottom of the cylinder. In the former case the entire mass is stirred on the third or fourth day of fermentation by means of the above-mentioned agitator *l*, and is then removed and added to the wort in a large fermenting-vessel. In the latter case the beer standing over the yeast is let off through the pipe *k* near the bottom of the cylinder and the lower of the three cocks *g* as the said pipe *k* occupies such a position that enough beer will remain in the cylinder to keep the sediment sufficiently liquid for removal. The superfluous air and the carbonic acid produced escape through two bent pipes *t* and *u*, connected with the upper and lower cylinder. In either of these cases a sufficient quantity of fermenting-wort must

be forced beforehand into the upper cylinder B for enabling a fresh fermentation to be subsequently commenced therewith in the lower cylinder A. When the yeast has been removed, the lower cylinder A is cleaned and sterilized. The wort is introduced in the manner described and treated with the yeast formed in the upper cylinder B under similar conditions, whereupon the upper cylinder B is cleaned and sterilized. This operation is repeated every time.

It is evident that the second cylinder, instead of being arranged above the first, as hereinbefore described, can be placed by the side of the same. The pipe *a*, through which the two cylinders are connected, extends so far down in the first cylinder that the level of the liquid will not descend below the same.

Sediment yeast can be used in the second cylinder B, which has been previously sterilized. In this case the latter can be made of comparatively small size. After the beer has been discharged by means of pure air a suitable quantity of the agitated sediment yeast is forced into the cylinder and kept therein until this cylinder has been supplied with aerated and cooled wort.

It will be readily understood that the improved apparatus is also adapted for development of other organisms than those used for the production of yeast for use in the manufacture of beer and spirits.

Having fully described our invention, what we desire to claim and secure by Letters Patent is—

A propagating apparatus for the production of micro organisms, especially pure cultured yeast, consisting of the combination, with lower cylinder A, provided with a central agitator and means for rotating the same, a perforated air-inlet pipe located near the bottom, and a trapped outlet-pipe leading from the top, an indicator *s*, and float *r*, and a connecting-pipe *a*, leading to upper cylinder B, of said upper cylinder B, also provided with a central agitator and means for rotating the same, and a trapped outlet for air and gases, both cylinders being provided with suitable inlet and outlet pipes for wort and yeast and with a sterilized air-supply, as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

ALFRED JÖRGENSEN.
AXEL BERGH.

Witnesses:

HILMAR BASSU,
NILJELTE CLAUSSUR.