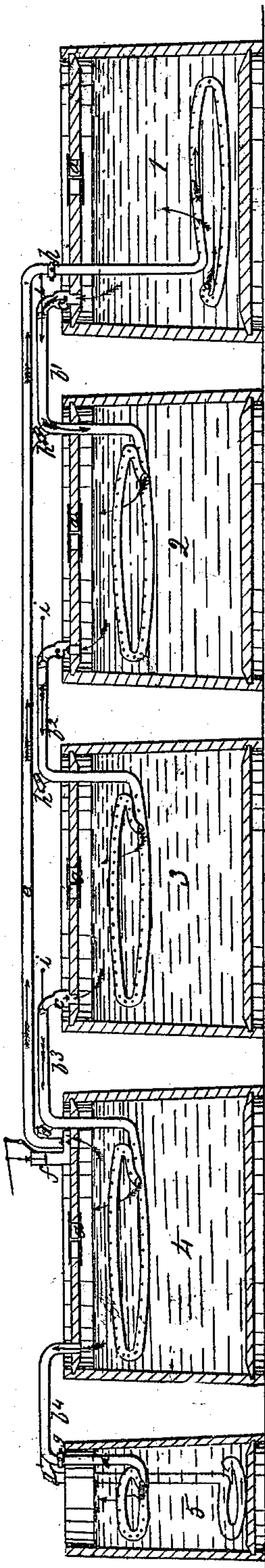


A. HARVIE & C. GUILD.
APPARATUS FOR CONDUCTING FERMENTATION.

No. 10,814.

Patented Apr. 25, 1854.



UNITED STATES PATENT OFFICE.

A. HARVIE AND C. GUILD, OF CINCINNATI, OHIO.

VINOUS FERMENTING IN CLOSED VESSELS.

Specification of Letters Patent No. 10,814, dated April 25, 1854.

To all whom it may concern:

Be it known that we, ARTHUR HARVIE and CHARLES GUILD, both of Cincinnati, Hamilton county, Ohio, have invented a new and useful Method of Conducting Vinous Fermentation; and we hereby declare the following to be a full, true, and exact description thereof, reference being had to the annexed drawing, making part of this specification.

Our invention has for its object the greater production of spirits from any given quantity of material used, by means of the return into and disseminating through fermenting liquids of the gases evolved by fermentation, in order thereby to condense, retain and reëmbody in the liquid the alcoholic vapor thrown off in conjunction with the carbonic acid gas, during the process of fermentation, and also by returning the carbonic acid gas to accelerate and render more perfect the decomposition of matter made subject to vinous fermentation, by the chemical action of the carbonic acid gas thereupon.

In the annexed sectional drawing (1, 2, 3, 4) are represented tubs, vats, or other vessels for the reception of the wort or mash, which is poured into them through manholes (a).

(b^1 , b^2 , b^3 , b^4) are pipes which communicate from the upper or gaseous part of one vat, and descend into the liquid in the next, where it terminates in a coil bent slightly downward at the extremity, and so perforated as to disseminate the gas in numerous small streams through the liquid, thereby causing the latter to condense and retain as much as possible of the alcoholic vapor which would otherwise pass off with the carbonic acid gas and be lost. These pipes may be of copper or other material and should be so fixed that they may be readily taken apart and cleaned. They should be made sufficiently large to permit free passage to the volume of gas evolved. In this manner the vat (1) communicates with vat (2), the latter with vat (3) that with vat (4) and the vat (4) with another vat (5) filled with water or other matter. This last named vessel which we call the condensing vat, may be open at the top or partially closed, leaving only a hole for the escape of the gas.

The entrance of each pipe except (b^4) has a valve (c) which opens in the direction of the current. There may also be a valved

piston or pump (i) attached to each pipe (b^1 , b^2 , b^3) in order if found necessary to accelerate at pleasure the passage of the gas and thus adjust the pressure in each vat so as to gain uniformity of action and to avoid an inordinate and dangerous strain on either vat. These pumps may be all or any number of them worked at one time, and either by manual labor, or by power, and at any relative speed required. The last of these pipes (b^4) being the one which enters the condensing vat, has two separate pipes (d, d') one (d) terminates in a coil near the top of the liquid, and the other one (d') terminates a sufficient depth in the liquid to confine to the desired extent the gases during the period of active circulation. When it is desired to use the lower coil a cock (g) in the upper one prevents the escape of the gas through it.

The vat (4) has its upper portion placed in connection with the liquid in vat (1) by a pipe (e). A pump (f) at the entrance of this pipe is necessary to force the gas back into the vat (1) as the latter is subjected to the greatest pressure. This pump may be worked by the same means the others are worked.

Cocks (h) connecting the return pipe (e) with the several disseminating pipes (b^1 , b^2 , b^3) respectively permit when opened the gas to take a shorter circuit. The valves of the disseminating pipes in this case serving to disconnect the vats beyond. This is of service when only a portion of the vats are employed, or when the first ones in the series have completed their fermentation. One, two, three or more vats may be used on this principle, and they may be placed together so as to economize the space and piping required.

When one vat only besides the condensing vat is used the gas from the returning pump passes down into the liquid of the same vat, through (b^3).

The vats after the process of fermentation is finished may be emptied in the usual way (i. e. by holes in the bottom closed by a plug when the vats are in use). The vats are filled to within about 10 or 12 inches of the head, care being taken that the liquid when in fermentation does not pass from one vat to another by their being filled too full. The manholes should be left open until the fermentation has progressed so far as to displace by carbonic acid gas the atmospheric

air which occupies the otherwise vacant space at top, when they must be shut tight.

The number of vats worked together may be varied at pleasure.

5 The advantages arising from conducting vinous fermentation in closed vessels and by causing the gas to be again conducted into fluids which are being fermented as described and represented in the
10 drawings annexed, consists in producing a more full and complete decomposition of matter made subject to vinous fermentation by the chemical action of the gas thereupon, and the gas being returned again and
15 compelled to pass and repass into and from the liquid under process before it escapes into vat (5) causes it to leave behind in the liquid a very considerable portion of spirit that would otherwise escape in combination with the carbonic acid gas, by all
20 of which a much greater amount of spirit is obtained than can be produced in the ordinary method of fermentation.

What we claim as new in the process and
25 desire to secure by Letters Patent, is—

1. The application of pumps, or of exhausters and blowers or other equivalent apparatus to draw the gas from one fermenting vat, and force it into the fermenting liquid in another or the same vat, as
30 herein described.

2. The arrangement of apparatus whereby a return current is created and the circulation of the gases caused, that is to say the return pipe (e) and pumps or mechanism
35 substantially equivalent as set forth.

3. The check valves (h) in the disseminating pipes for the purpose of preventing any contrary passage of the liquid from vat to vat, from that which is intended in combination with the turn off cocks for the purpose of isolating a portion of the vats and shortening the circuit when desired, and the whole in combination with the pumps or
40 valved pistons for the acceleration of the circulation and by this means equalizing its action and removing the danger of bursting the vats.

4. The pipe (b⁴) having two discharge nozzles at different heights of the liquid of
50 the condensing vat, and cocks in the upper nozzle in order to regulate the amount of vent or discharge.

In testimony whereof, we have hereunto set our hands before two subscribing witnesses.
55

A. HARVIE.
CHAS. GUILD.

Witnesses:

GEO. H. KNIGHT,
EDWARD H. KNIGHT.