

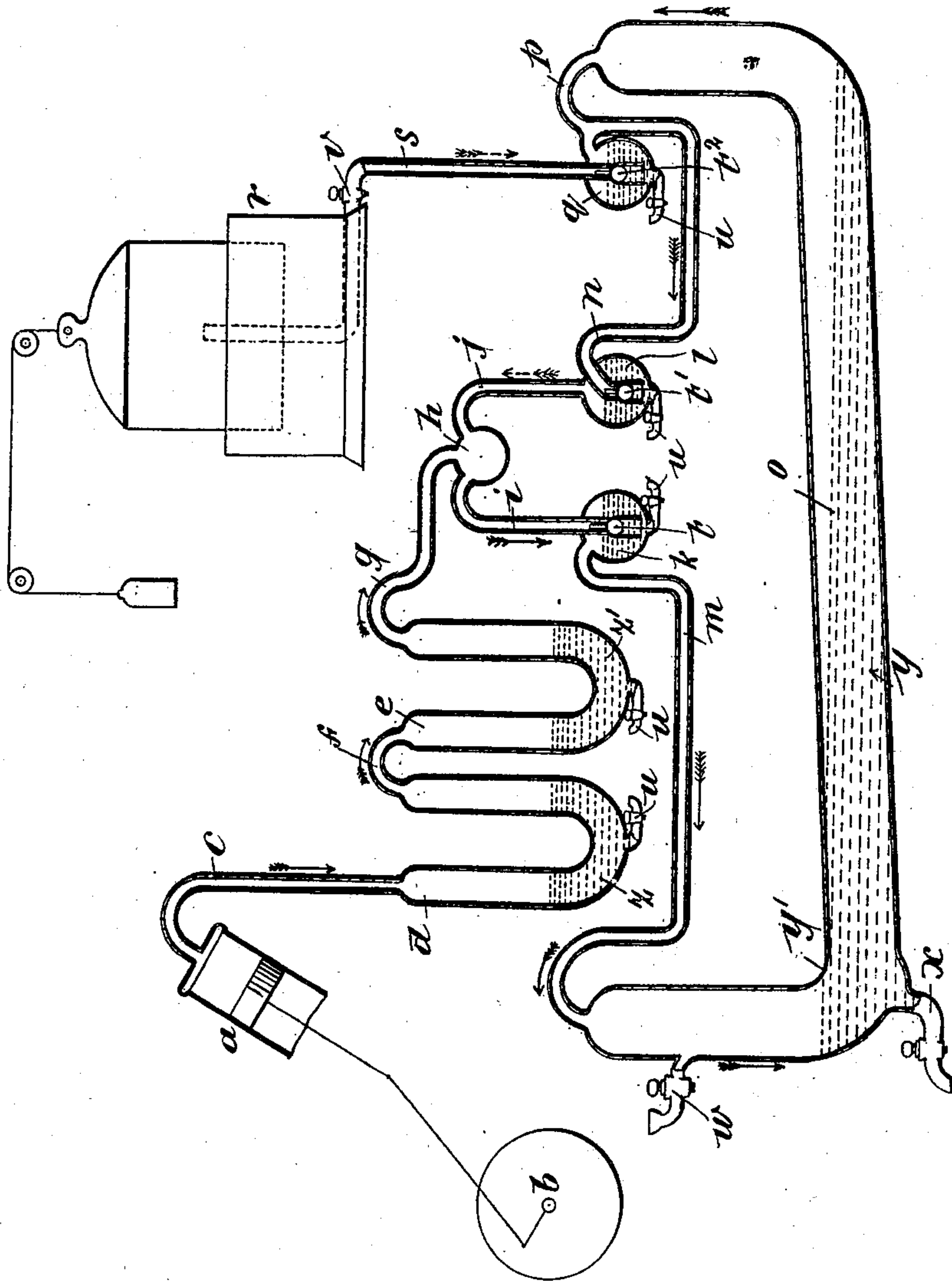
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Patented Mar. 19, 1901.

J. B. HILLIARD.  
APPARATUS FOR PUMPING AIR OR GAS.

(Application filed Sept. 22, 1900.)

(No Model.)



WITNESSES:

*Ella L. Giles*  
*Clara D. Frohlich*

INVENTOR

*Joseph Banks Hilliard*

BY

*Richard R.*

ATTORNEYS

# UNITED STATES PATENT OFFICE.

JOSEPH B. HILLIARD, OF GLASGOW, SCOTLAND.

## APPARATUS FOR PUMPING AIR OR GAS.

SPECIFICATION forming part of Letters Patent No. 670,399, dated March 19, 1901.

Application filed September 22, 1900. Serial No. 30,850. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH BANKS HILLIARD, surgical-instrument maker, a subject of the Queen of Great Britain, residing at 20 Renfield street, Glasgow, Scotland, have invented certain new and useful Improvements in Apparatus for Pumping Air or Gases, of which the following is a specification.

This invention relates to apparatus for pumping air or gases; and it has for its object to so construct the apparatus that the gas or air being pumped shall not at any time come in contact with the pump-piston or cylinder. The advantage of the arrangement is that the pump-piston and cylinder are not subject to chemical action due to the air or gas being pumped, while at the same time the air or gas is not contaminated by lubricants and such like.

My invention may be applied to various uses, but by way of illustration or example I have shown on the drawings annexed a diagram of the apparatus as constructed and arranged for treating alcoholic liquids with oxygen gas.

$a$  is an ordinary air-pump operated from a motor-shaft  $b$  by means of a crank and connecting-rod. From the cylinder of the pump a pipe  $c$  leads to a U-shaped reservoir  $d$ , and this reservoir is connected with a second reservoir  $e$ , also of U shape, by means of a pipe connection  $f$ . From the top of the reservoir  $e$  a pipe  $g$  passes to a chamber  $h$ , from which a pipe  $i$  descends and dips into a chamber  $k$  and a pipe  $j$  descends but does not dip into a chamber  $l$ . A pipe  $m$  passes from the top of the chamber  $k$  to the one end of a large tubular trough  $o$ , which has an inclined body and upwardly-projecting ends. Dipping into the chamber  $l$  is a pipe  $n$ , which connects with a pipe  $p$ , passing from the opposite end of the trough  $o$  from that where the pipe  $m$  is connected. This pipe  $p$  leads to a chamber  $q$ . Dipping into this chamber is a pipe  $s$ , leading from a gasometer  $r$ .

$t$   $t'$   $t''$  are automatically-acting valves.

$u$  represents filling and drain pipes provided with cocks.

$v$  is a cock on the pipe  $s$ .

$w$  is a filling-pipe with cock for the trough

$o$ , while  $x$  is a drain-pipe with cock for the same trough.

The dotted lines at  $y$  represent the liquid in the trough undergoing treatment, and, as will be seen, the inclination of the trough is such that the liquid is sealed at the point  $y'$ .

$z$  represents water in the reservoir  $d$ , and  $z'$  alcohol in the reservoir  $e$ . The chambers  $k$ ,  $l$ , and  $q$  are partially filled with water or other liquid. Oxygen gas is in the gasometer  $r$  and the same gas is in the pipes  $g$ ,  $i$ ,  $j$ ,  $n$ ,  $s$ , and  $m$  and in the chambers  $h$ ,  $k$ ,  $l$ , and  $q$ .

At the instroke of the piston of the pump  $a$  the column of air in the pipe  $c$  is caused to move in the direction of the arrow and move the water in the reservoir  $d$ . This movement is transmitted by the column of air between the two reservoirs to the alcohol  $z'$  in the reservoir  $e$ . The alcohol in its turn acts upon the oxygen in the pipes  $g$ ,  $i$ , and  $j$  and chamber  $h$ , with the result that the float-valve  $t$  is forced open, while the valve  $t'$  is closed. As a result oxygen gas bubbles through the liquid in the chamber  $k$  and passes by the pipe  $m$  to the left-hand end of the trough  $o$  and slowly passes through the alcoholic liquid  $y$ , a certain amount being absorbed during such passage by the liquid, while the remainder collects at the right-hand end of the trough. The arrows shown in full lines clearly indicate the action, as afore described. At the out or back stroke of the piston of the pump  $a$  the columns of air, gas, and liquids in the pipes  $c$ ,  $f$ ,  $g$ ,  $i$ , and  $j$  and in the reservoirs  $d$  and  $e$  move in a reverse direction to that previously described, with the result that the valve  $t$  is closed by being sucked up against its seat at the bottom of the pipe  $i$ , while the valves  $t'$  and  $t''$  are opened and oxygen sucked into the chamber  $h$  from the gasometer  $r$  and the right-hand end of the trough  $o$ . At the next instroke of the piston of the pump  $a$  the oxygen gas thus collected in the chamber  $h$  is forced through the alcoholic liquid  $y$ , as before. This pumping of the oxygen through the liquid  $y$  is continued until the liquid has been sufficiently treated, when it is drained off by the pipe  $x$  and a fresh supply of liquid to be treated filled in by the pipe  $w$ .

It will be seen that in no case does the oxy-



gen with which the liquid is being treated come in contact with the pump *a*.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent; is—

1. In combination a pump, two liquid-reservoirs of U shape partially filled with liquid, pipe connections connecting the reservoirs and the pump together, a chamber *h* connected with the reservoirs, admission and emission valves arranged to coöperate with said chamber, substantially as set forth.

2. In combination a pump, two liquid-reservoirs of U shape partially filled with liquid, pipe connections connecting the reservoirs and the pump together, a chamber *h* connected with the reservoirs and pipes placing said chamber *h* in communication with two other chambers provided with admission and emission valves substantially as set forth.

3. In combination a pump, two liquid-reservoirs of U shape partially filled with liquid, pipe connections connecting the reservoirs and the pump together, a chamber *h* connected with said reservoirs, a pipe leading from said chamber *h* and dipping into a second chamber partially filled with liquid, an automatic valve at the bottom of this pipe, an outlet-pipe leading from this second chamber, a pipe connection leading from the first chamber to a third chamber partially filled with liquid, an air or gas admission pipe leading from a source of gas or air supply and dip-

ping into the third chamber, an automatic valve at the bottom of this admission-pipe, and means for supplying liquid to the reservoirs and the second and third chambers, substantially as set forth.

4. In combination a pump, a receptacle into which the air or gas has to be pumped, two liquid-reservoirs of U shape partially filled with liquid, pipe connections connecting the reservoirs and the pump together, a chamber *h* connected with said reservoirs, a pipe leading from the said chamber and dipping into a second chamber partially filled with liquid, an automatic valve at the bottom of this pipe, an outlet-pipe leading from the second chamber to the said receptacle, a pipe connection leading from the chamber *h* to a third chamber partially filled with liquid, an air or gas admission pipe leading from the source of gas or air supply and dipping into the third chamber, an automatic valve at the bottom of the admission-pipe, means for regulating the admission of air or gas from the source of supply and means for supplying liquid to the reservoirs and the second and third chambers, substantially as set forth.

Signed at Glasgow, Scotland, this 12th day of September, 1900.

J. B. HILLIARD.

Witnesses:

WILLIAM GALL,  
WILLIAM FLEMING.