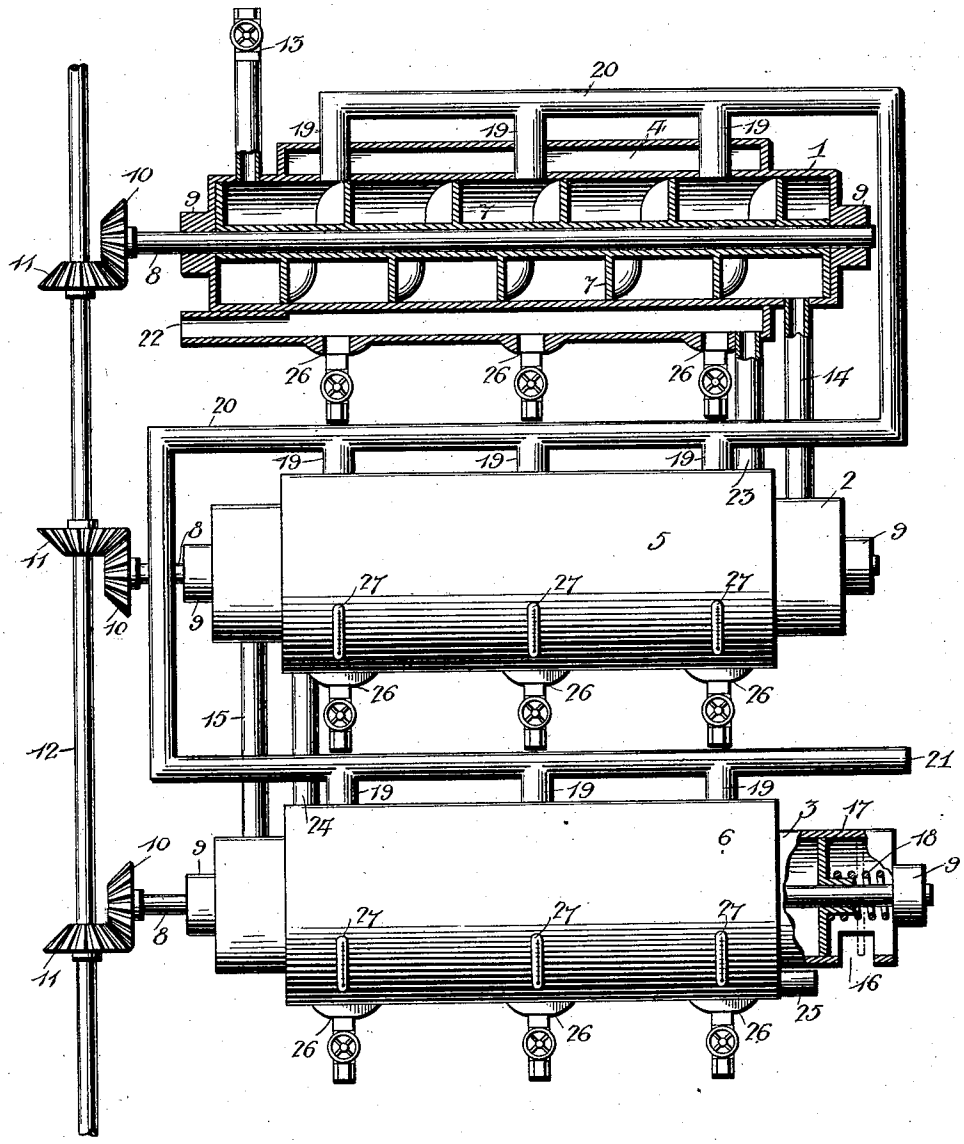
No. 689,768. Patented Dec. 24, 1901.

J. A. WATHEN.

CONTINUOUS VACUUM DISTILLING, DRYING, AND EVAPORATING MACHINE.

(Application filed Apr. 29, 1901.)

(No Model.)



Witnesses
J. L. Boobar
C. H. McEwen
K. E. Klein.

Inventor
James A. Wathen
by F. F. Brown
Associate Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES A. WATHEN, OF LOUISVILLE, KENTUCKY.

CONTINUOUS VACUUM DISTILLING, DRYING, AND EVAPORATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 689,768, dated December 24, 1901.

Application filed April 29, 1901. Serial No. 58,083. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. WATHEN, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in a Continuous Vacuum Distilling, Drying, and Evaporating Machine; and I 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.

My invention relates to a continuous vacuum distilling, drying, and evaporating machine; and it consists of a series of cylinders through which the material to be acted upon is moved by conveyers and which are surrounded by jackets through which hot air or steam is circulated. At the same time the vapor within the cylinders is exhausted, which causes the work to be done more rapidly and at a lower temperature than is required in the usual process.

In the accompanying drawing, 1, 2, and 3 are a series of cylinders, and 4, 5, and 6 are the jackets which surround them. The cylinders are placed horizontally and preferably one above another, (but I do not confine myself to this method,) as shown in the drawing. The number of cylinders in the series can be increased or diminished to sufficiently distil, dry, or evaporate the material passing through them. If desired, the machine may consist of one long cylinder instead of a number of shorter ones. Within each of the cylinders is a conveyer 7, that in cylinder 1 alone being shown in the drawing. The shafts 8 of the conveyers pass through stuffing-boxes 9, attached to the ends of the cylinders, which excludes the entrance of air at these points. The flights on the conveyer-shafts may be perforated, if desired, so as to allow the vapor within the cylinders to readily reach the vacuum-tubes. A brush attachment may be used in connection with the conveyers for the purpose of cleaning the cylinders. The beveled wheels 10 upon the ends of the conveyer-shafts 8 are so placed in connection with the beveled wheels 11 on the driving-shaft 12 that the conveyers move the material in the first and third cylinders in an opposite direction to that which it is moved in the second cylinder, so as to pass it forward and backward through the entire series of cylinders.

The material passes into the cylinder 1 through the pipe 13 and is moved by the conveyer within to the far end of this cylinder, from which it passes through the pipe 14 into the cylinder 2. The material is now moved in the opposite direction by the conveyer in the cylinder 2, from which it passes through the pipe 15 into the cylinder 3, the conveyer of which moves it toward the outlet 16 in the opposite end of this cylinder. The outlet 16 is placed upon the lower side of the last cylinder of the series and is closed by the valve 17, which allows the material to pass out of and prevents the air from entering the cylinder and destroying the vacuum within. The valve 17 moves upon the conveyer-shaft of the cylinder 3 and is closed by the spring 18.

The pipe 13 extends upward into a tank containing the material to be acted upon, and it is provided with a suitable valve (shown in the drawing) which controls the flow of the material into the cylinders, as well as excluding the entrance of air through the pipe 13.

The cylinders 1, 2, and 3 are connected by the tubes 19 to the vacuum-pipe 20, to the free end 21 of which is attached a vacuum-pump, so that the vapor may be exhausted from the cylinders. This causes evaporation to take place at a lower temperature than by the ordinary method and lessens the danger of burning the material. It also shortens the time of distilling, drying, or evaporating.

The steam or hot air passes through the pipe 22 into the jacket 4 and from it through the pipe 23 into the jacket 5, and thence through the pipe 24 to the jacket 6. The steam or hot air passes from the last jacket of the series through the pipe 25. When hot air is used, a suction-fan is attached to the free end of the pipe 25, which causes a constant current to pass through the jackets. I prefer to use hot air in the jackets; but steam may be used, if desired, or a combination of both of these. Valves are attached to the openings 26 in the jackets 4, 5, and 6, which can be opened when it is desired to reduce the heat within if there is danger of burning the material passing through the cylinders. One of these valves is shown in the drawing attached to the opening on the left side of the jacket 6. 27 rep-

resents L-shaped thermometers the lower branches of which pass into the jackets and which indicate the temperature within.

In use the material enters the first of the series of cylinders through the inlet-pipe 13 and is moved by the conveyers forward and backward through the entire series of cylinders. The heat from the jackets causes the liquid part of the material while in the cylinders to pass upward as vapor through the tubes 19 into the vacuum-pipe. The vacuum-pump carries the vapor away as rapidly as it is formed. If desired, the vapor may be condensed to liquid form and saved. The dried material leaves the machine through the opening 16 and when cooled is ready for use.

The amount of heated air passing through the jackets can be regulated by the speed of the suction-fan.

The use of the vacuum-pump causes the liquid part of the material to vaporize at a lower temperature, thus lessening the danger of burning it, hastens the process, and reduces the cost of operating the machine.

The thermometers and valves in the openings 26 of the jacket enable one to accurately and rapidly regulate the temperature within the machine.

The material in the tank above my machine, as well as the valve on the inlet-pipe 13, prevents the entrance of air into cylinder 1 through this pipe.

My machine may be used to dry sugar, distillery-slops, and other material from which the moisture is to be extracted.

In drying distillery-slops, fermented wort, or other material the vapors passing through the vacuum-pipe may be condensed into liquid form, and thereby valuable products may be recovered, such as alcohol, acids, &c., which would otherwise be wasted, and without subjecting them to a temperature which may destroy their value, character, or efficiency.

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

A continuous vacuum distilling, drying and evaporating machine consisting of a cylinder having toward one end a valved inlet for material and an outlet toward the other end, a conveyer within the cylinder for moving the material toward the outlet, a jacket surrounding the cylinder having an inlet connected with a heat-supply and an outlet, and intermediate outlets in said jacket for the heating medium each having a valve whereby the temperature may be controlled for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES A. WATHEN.

Witnesses:
HENRY WILKEN,
JNO. C. HOWARD.