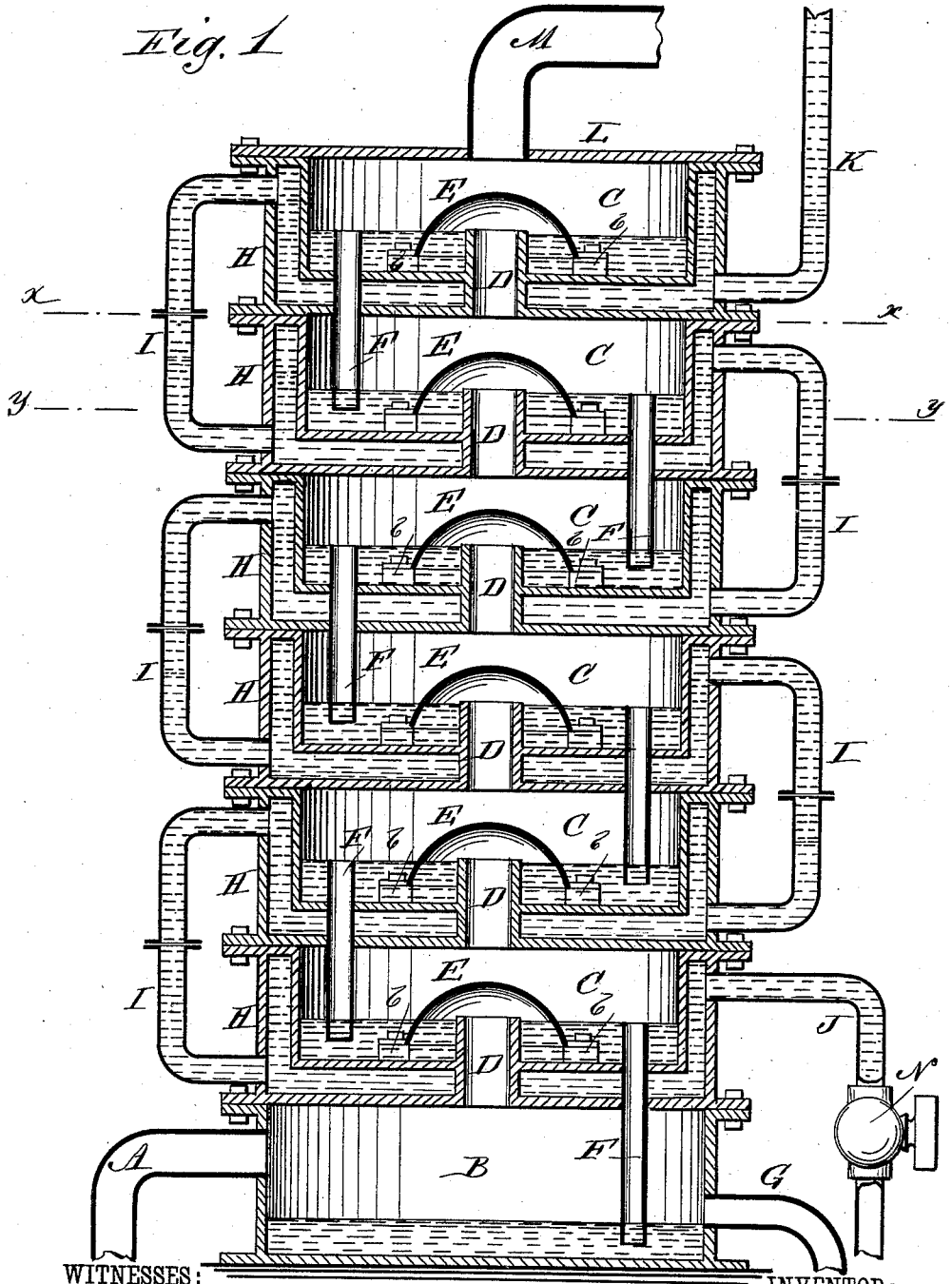
(No Model.) 2 Sheets—Sheet 1.

W. E. COLWELL.

RECTIFYING COLUMN FOR THE DISTILLATION OF LIQUIDS AND GASES.

No. 385,504. Patented July 3, 1888.

Fig. 1



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

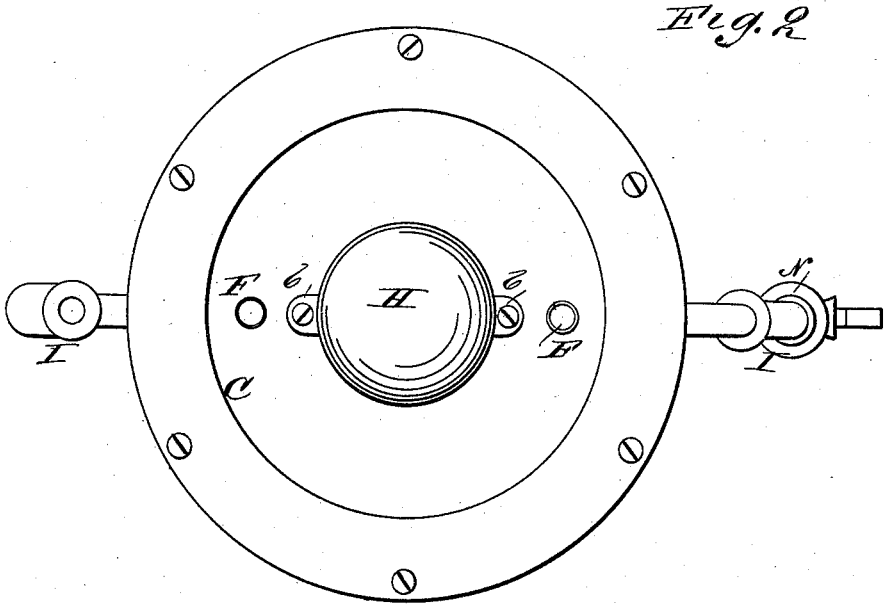
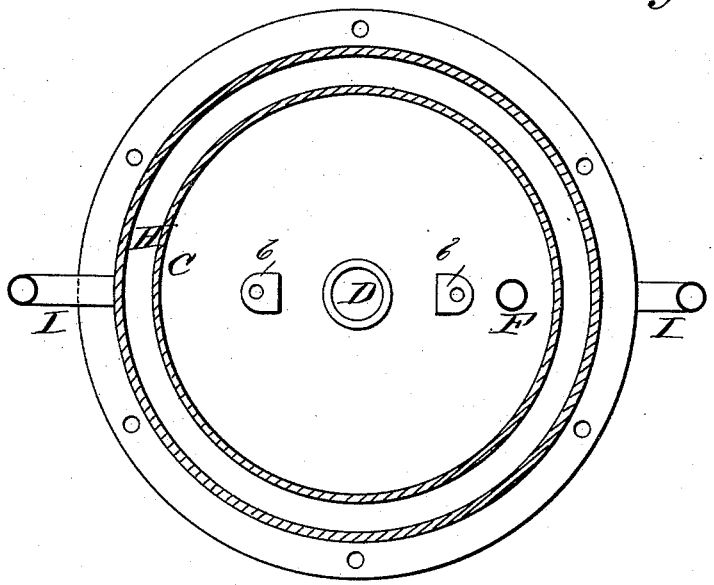


Fig. 3



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UNITED STATES PATENT OFFICE.

WALTER E. COLWELL, OF CINCINNATI, OHIO.

RECTIFYING-COLUMN FOR THE DISTILLATION OF LIQUIDS AND GASES.

SPECIFICATION forming part of Letters Patent No. 385,504, dated July 3, 1888.

Application filed October 29, 1887. Serial No. 253,717. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. COLWELL, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Rectifying-Columns for the Distillation of Liquids and Gases, of which the following is a full, clear, and exact description.

My invention is designed to be applied to stills, more especially stills used for the distillation of ammonia-gas and for producing concentrated solutions of ammoniacal salts.

The invention consists in a novel construction of the rectifying-column of a still, substantially as hereinafter described, and pointed out in the claims, whereby a reduced number of sections in the column suffices, increased facility is afforded for varying the capacity of the column, and economy in the use of the cooling-water employed in the column is secured.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical section of the complete column composed, mainly, of a number of cylindrical jacketed sections bolted together. Fig. 2 is a horizontal section of the same upon the line *x x* in Fig. 1, and Fig. 3 is a further horizontal section upon the line *y y* in Fig. 1.

A is the pipe used to convey the vapors and gases to the rectifying-column, or rather to a lower receiving-chamber, B, thereof.

C C are the series of cylindrical jacketed sections or condensing-chambers arranged one above the other, and D is a duct or pipe formed or cast in the bottom of each jacketed section C.

E is a raised cap arranged over each duct or pipe D and secured to each section C at a short distance from the bottom thereof by studs *b* and bolts or otherwise, so as to give a free passage beneath the lower edge of each cap below the upper end of each duct or pipe D.

F is an overflow-pipe, with one of which each section C is provided, and which serve to lead the condensed vapors down from each section to the next section or chamber below it, and G is a pipe connected with the receiving-chamber B for conveying said condensed vapors back to the boiling-still.

H is a chamber or hollow jacket inclosing the sides and bottom of each section C, and I is a pipe running from the upper portion of each jacketed chamber or space H to the lower part of the jacketed space of the section C next below it.

J is a pipe arranged to run from the upper part of the jacket or jacketing of the bottom section C to the sewer or waste.

K is a water-supply pipe connected with the lower part of the jacketing H of the upper section C, on the reverse side of the latter to that occupied by its pipe I.

L is a cover bolted on the top section, and M a discharge-pipe on the top section C, for conveying the uncondensed vapors and gases away from the column.

N is a valve on the pipe J for regulating the flow of water through the jacketings.

The number of jacketed sections C of course may be varied; but the drawings represent six of such sections and one receiving-chamber, all properly bolted together, and fitted, as described, with pipes for the inlet and discharge of the gases and vapors, connecting-pipes between the interior of the sections arranged to carry the gases and uncondensed vapors upward and condensed vapors back to the boiling-still, and also pipes for conveying the cooling-water to and from the jackets of the several sections.

The operation is as follows: The vapors and gases generated in the boiling-still, which latter is not shown here, but which may be of the ordinary or of any approved kind, passing up the pipe A, first enter the lower or receiving chamber, B, of the column, thence pass upward through the lower pipe or duct, D, and are deflected downward by the cup-shaped cap E over said pipe D. This action is repeated for all the sections C as the uncondensed vapors and gases pass upward from one section to another throughout the whole length or height of the column, and as said gases or vapors are deflected downward by the caps E they are forced or caused to pass through the liquefied vapors in the lower portions of the jacketed sections. The condensed vapors in each section are returned as they sufficiently accumulate down to the next lower section or chamber by the return or overflow

pipes, F, which are so adjusted as to keep the liquid at a proper depth around the caps E, and which pipes enter the liquid in each lower section or chamber, so as to form a trap in order that the uncondensed vapors and gases may not pass up through said pipes F. From the bottom chamber, B, the condensed vapors, as they accumulate ultimately, are returned to the boiling-still through the pipe G. The sides and bottoms of each section C are economically cooled by a constant flow of cooling-water through the jackets or jacketings H. Said cooling-water under pressure first enters the upper jacket, H, by the pipe K, at or near the bottom of the top section C, and flowing along the bottom of said jacket and around the cylindrical jacket on its interior, rises upward as it is heated, being lighter than when entering, and passes out at the upper part of the opposite side of the jacket by the upper pipe, I. This last-named pipe conducts such overflowing water to the bottom of the next lower and warmer section C, or rather to the jacket H inclosing it, where the water is still further heated, and so on in a downward direction successively around the remaining sections C—that is, through the jackets inclosing them. Finally, said water is discharged, hot, into and through the waste-pipe J connected with the lowermost section C. The pipe K is opened to the full pressure of water-supply, the flow of the water being entirely regulated by the valve N, arranged at any convenient part of the pipe J. Any suitable form of valve may be used. In this way or by these means the uncondensed vapors and gases are uniformly lowered in temperature as they ascend from each lower section C to the next section above it, where the water in the jacket or jackets is cooler, the water in each succeeding jacket in a downward direction being warmer than the water in the preceding jacket above, and the uncondensed vapors and gases finally escaping from the column, where they are surrounded by the coolest water.

All of the jacketed sections C are made alike, so as to be interchangeable, and are placed one upon the other, using as many or as few as circumstances may require.

By the form or construction of the rectifying-column, as described, there is, first, a completeness produced by making the jacket of each upper condensing-section form the top of the next section below it, thereby diminishing the number of sections requisite; secondly, the capacity of the column may be largely reduced or increased by simply removing or adding one or more of the similar and interchangeable jacketed sections; and, thirdly, there will be a large economy in the use of the cooling-water passing through the jackets, and which, entering at the top of the column, where the uncondensed vapors and gases are coolest, finally leaves at or near the bottom of the column at a high temperature approaching that of the entering vapors and gases.

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

1. In rectifying-columns for the distillation of liquids and gases, the combination, with a receiving-chamber, of a series of communicating condensing-chambers, C, having jackets surrounding the sides and bottom, and arranged one above the other, and the pipes I, extending from the upper part of each jacketed chamber to the lower part of the one next below, substantially as herein shown and described.

2. In rectifying-columns for the distillation of liquids and gases, the combination, with the receiving-chamber B, of the series of condensing-chambers C, having central ducts or passages, and provided with jackets surrounding the sides and bottom, the pipes I, extending from the upper part of each jacketed chamber to the lower part of the one next below, and the pipes F, leading from each condensing-chamber to the one below it, substantially as herein shown and described.

WALTER E. COLWELL.

Witnessess:

DANIEL C. STONE,

THOS. H. BIRCH.