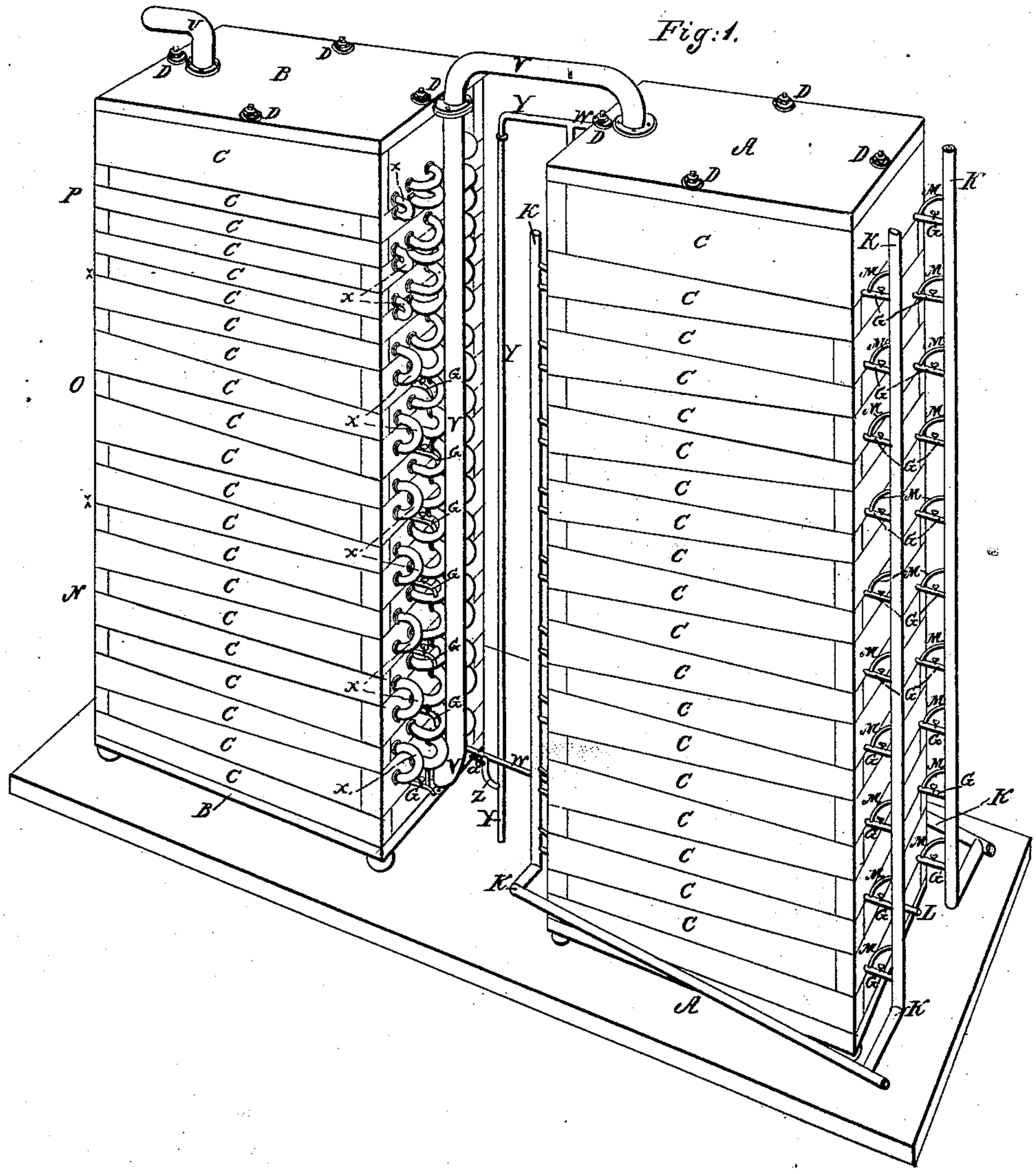
2 Sheets—Sheet 1.

E. HERRING.

Alcohol Still.

No. 18,094. Patented Sept. 1, 1857.

Fig: 1.



2 Sheets—Sheet 2.

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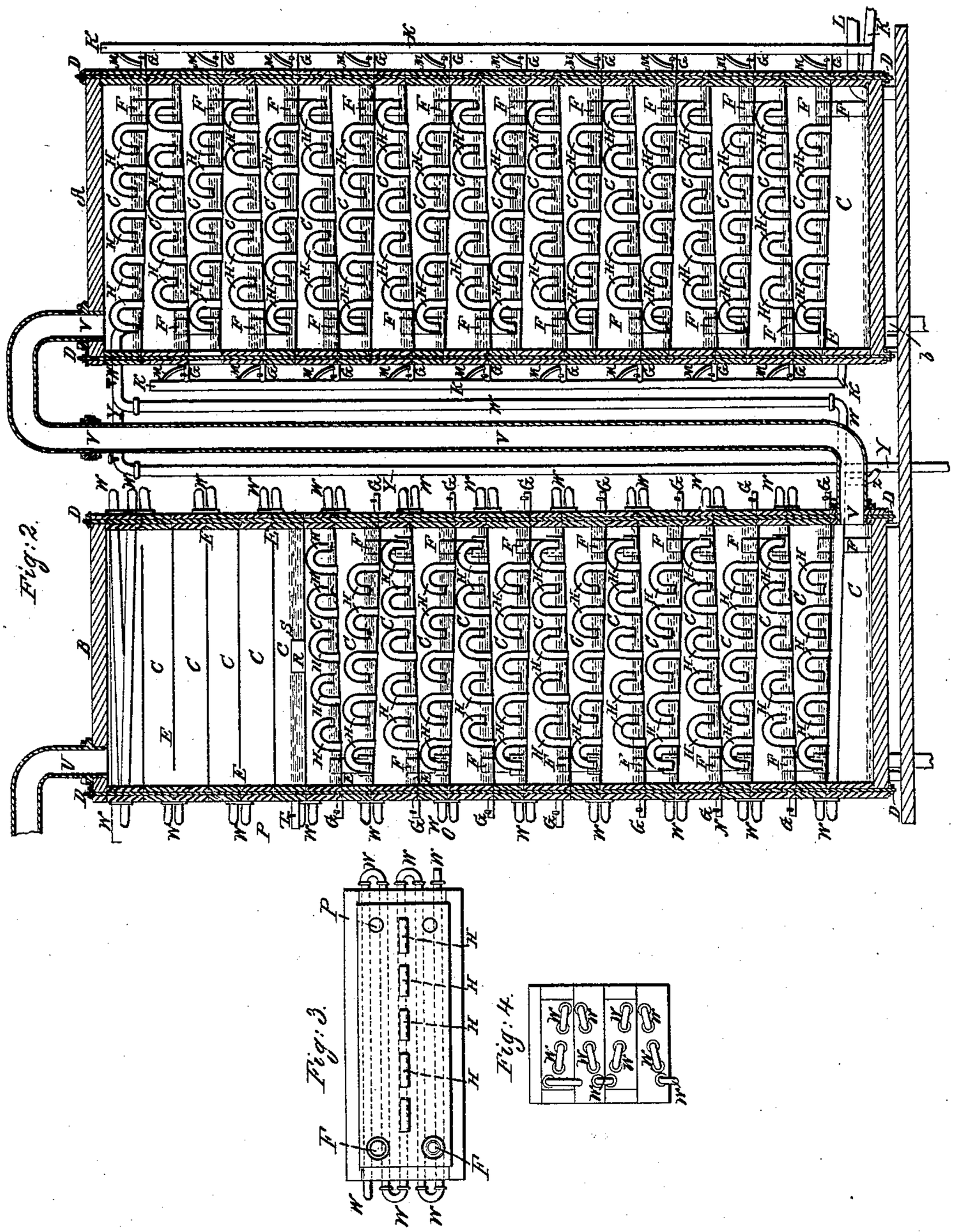

Fig: 2.

Fig: 3.

Fig: 4.

UNITED STATES PATENT OFFICE.

EDWARD HERRING, OF WALTON-ON-THAMES, ENGLAND.

IMPROVEMENT IN SPIRIT-STILLS.

Specification forming part of Letters Patent No. **18,094**, dated September 1, 1857.

To all whom it may concern:

Be it known that I, EDWARD HERRING, of Walton-on-Thames, in the county of Surrey, in that part of the United Kingdom of Great Britain and Ireland called England, a subject of the Queen of Great Britain, have invented certain Improvements in Distilling Apparatus; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying sheets of drawings, and to the letters of reference marked thereon.

In these drawings, Figure 1 is a perspective view of my improved still. Fig. 2 is a central longitudinal vertical section showing the interior arrangement of the distillatory columns. Fig. 3 is a plan of one of the chambers in column B, showing the manner in which the wash-pipe is conducted through said chambers; and Fig. 4 is an end view of four of said chambers, showing the fall of the wash-pipe.

The nature of my invention consists in certain improvements in stills, whereby their evaporating power is increased, the movement of the wash facilitated, and the cleansing of the still rendered easier and more perfect, said improvements being epecially intended to adapt to the requirements of American distilling, in which a thick and heavy wash is employed, the best distillatory apparatus used in Europe.

To enable others skilled in the art to make and use my improved still, I will proceed to describe its construction and operation, pointing out those parts which I claim as new and of my own invention, and for which I desire to secure Letters Patent of the United States. This apparatus is intended for the production of alcohol of the highest strength and purity at one continuous operation from fermented mash, wort, or wash, avoiding all occasion for redistilling or rectifying, and requiring less than one-fourth the quantity of fuel used by the ordinary still. It can be made of enormous capabilities, producing upward of a thousand gallons of alcohol per hour.

In the drawings, the same part is indicated by the same letter of reference in all the figures.

The dimensions hereinafter stated are given merely as a guide to proportions, as I do not limit myself to any particular dimensions, as they may be varied.

A and B mark the two distillatory columns of which the body of the still is composed. These columns are made of separate compartments, C C C, &c., the walls of which are made of wood strongly framed, mortised, or dovetailed together. Each compartment when placed in the column is bolted to some three or four adjoining compartments above and below it, and the whole column is further secured by long rods or bolts D D, &c., extending from the top to the bottom. These compartments or chambers C C C, &c., are nine feet long by three feet wide and one foot deep at one end and eighteen inches at the other. The compartments in both columns are alike in form and dimensions, except some five or six of the upper chambers of column B, which are of the same depth throughout. The compartments are divided from each other by diaphragms of metal, E E, &c., placed at an inclination to give them a fall of three inches alternately toward one and the other side of the still, as clearly seen in Figs. 1 and 2. Discharge or drop pipes F, six inches in diameter, are fixed, two in each plate, at its lower end. They stand five inches above the plate, and passing down through it come within one inch of the plate in the compartment below, and at the higher end of said lower plate, as seen in the drawings. At the lowest point of these plates are two two-inch cocks, G G, &c., for the purpose of emptying the compartments entirely when the distillation is completed.

H H H H H, &c., are heated vapor-pipes, five of which are placed in each compartment, as shown. They are four inches in diameter, and are placed eighteen inches from the walls of the compartment and eighteen inches from each other along the middle line of the chamber. They ascend, as shown, considerably above the level of the upper end of drop-pipes F F, and, curving over, desend one inch below the level of the top of said drop-pipes. The construction of these chambers, it will be seen, is such that a liquid poured continuously into them would be five inches deep at the lower end and two inches deep at the upper end of each chamber. When it surpassed the depth of five inches at the lower end of any chamber, it would overflow through the drop-

pipes F F into the chamber below. The still is furnished with one or more pipes, K K, for hot air, and also with one or more pipes, L, for steam. These pipes are four inches in diameter. The steam employed is supplied by an ordinary boiler, and the hot air derives its heat from the furnace of the same boiler. The supply-pipe, by which water is introduced into the boiler, passes through the reservoir of hot-spent wash, which is fed by pipe *b*, as hereinafter described. This arrangement raises the water to a high temperature before it passes into the boiler, thus effecting a considerable saving of fuel. The hot-air pipes K are connected with the compartments by means of cocks G G above alluded to. They are also connected with them by the small hot-air pipes M M, &c., which issue from the main K at a height of eight inches above the lowest point of the chamber they are intended to supply, so that their upper ends shall be entirely above the level of any liquid in that compartment, and render its escape into pipe K impossible. These pipes M, I make one inch in diameter. When the still is not in operation, and it is desired to cleanse it, the hot-air pipe K becomes a waste-pipe by opening into it the cocks G G G, connected with the lowest ends of the chambers. The wash thus run off is preserved for redistillation.

Column A, whose construction has just been described, is called the "mash-still." Column B is called the "vapor-still," and is divided into three divisions, N O P, the lowermost of which, N, is the whisky-still, the middle one, O, the spirit-still, and the upoermost one, P, the alcohol-still. The whisky and spirit stills N and O are constructed in the same manner as column A, each of their compartments having the same fall, pipes, cocks, and connections as those in that column. They have, however, in addition the coils of wash-pipe W, hereinafter to be described.

Above the highest plate of the whisky-still is the bottom plate of the spirit-still O. At the side of the chamber is fixed a pipe, Q, four inches in diameter, and three inches above the bottom plate of the chamber. It communicates with a worm-tub or refrigerator, but has a cock or valve to be closed at pleasure when it is desired to allow the whisky to proceed upward and become alcohol.

At the bottom of each of the plates of the whisky-still, and of one plate above the same, is a cock, G, for removing the fusel-oil and impure spirit when the distillation is completed. These cocks are one inch in diameter. The plates of the spirit-still have cocks G for the same purpose. The upper chambers of column B form the alcohol-still P, and are separated by plates of metal E E, &c,, placed horizontally, and having no vapor or drop pipes, but large passages or openings for the ascent of the vapor, at alternrte sides of the still, as shown in Fig. 2. The bottom plate of this still is a plain horizontal sheet of metal (copper) having in its center a hole, R, one foot in diameter, from which a pipe or tube, S, ascends six inches. This still has no overfiow or drop pipe, but a pipe, T, at the side, four inches in diameter, opening to the exterior of the still, and connecting with a worm-tub, its office being to conduct the condensed but still very hot alcohol to be cooled. At the top of the alcohol-still P is a large pipe, U, one foot in diameter, which serves as a vent for the incondensable gases and uncondensed alcohol. It commuuicates with a refrigerator or worm-tub.

From the top of column A a large pipe, V, one foot in diameter, descends to the bottom of column B, for the purpose of conducting the hot air and vapor from the mash-still A to the vapor-still B. The columns are also connected by wash-pipe W, which, starting from the wash-pump, enters the top of column B, is coiled five times in each chamber, as shown in Fig. 3 of that column, emerges at its bottom, and rises to the upper compartment of column A, and there discharges itself. In every chamber of column B there is a coil of these pipes; but in order not to confuse the drawings they are only represented in Fig. 2, in the top chamber of column B. Each chamber is traversed by five lengths, as shown in Fig. 3, having a fall of half an inch right through and half an inch at the bend. Each of these coils is connected outside with those above and below, (see X X, &c., Fig. 1,) thus forming one continuous pipe, leading from the wash-pump through all the chambers of column B, rising from the bottom of the whisky-still N to the top chamber of column A, and there discharging itself one inch from the bottom plate of said chamber. Fig. 4, being an end view of the upper four chambers of column B, shows the course and fall of the wash-pipe W. The wash-pump (which is not shown in the drawings) is capable of supporting more liquor to the still than is required, and therefore its rising main, between columns A and B, is furnished with pipes Y and Z, leading back to the suction, and furnished with stop-cocks *a a'*, by which arrangement part or all of the wash may be allowed to run back to the suction, and the supply to the still be thus perfectly regulated.

The hot air, which is an important addition to this still, both for the heating and agitation of the wash, is supplied by a force-pump or condensing-fan, which drives air through a coil of the hot-air pipe K, so placed that the flame of the boiler-furnace shall play upon it. Thence it passes up the pipes K and into the several compartments through the small pipes M, the cocks G G, &c., being stopped. It hastens the vaporization of the wash, and at the same time, by the agitation it keeps up, prevents the settling and caking of sediment on the plates of the chambers.

The operation of my improved still is as follows: When commencing distillation, the wash-pump is set in operation to force the wash through the various coils of the wash-pipe W in column B until it begins to flow into the top

chamber of column A. The top return-cock, *a*, of the wash-return pipe Y is then partially opened, but so as still to allow a little wash to fall into A and gradually cover its various chambers. As soon as the wash has reached and covered the bottom plate of column A the retrun-pipe to wash force-pump must be entirely opened and the stop-cock to column A closed. The hot-air pump or fan is now to be put in operation, and the steam-pipe L from the boiler to be opened at the bottom of column A. The hot air and steam rapidly vaporize the wash, and the heated vapor, passing up through the various chambers of column A by the hot-vapor pipes H H, &c., issues from the top chamber into the large pipe V, which conducts it to the bottom chamber of column B, through the various chambers of which it again rises, enveloping the coils of the wash-pipe W and rapidly heating the wash contained in them. The cock at discharge-pipe of wash-pump is now opened and the return-cock *a* partially or entirely closed, to allow the wash to descend into A and the distillation to proceed continuously. The wash, nearly boiling, flows in a continuous stream into the various chambers of the mash-still A, and passes downward from chamber to chamber through the overflow or drop pipes F F, &c., and in its passage is spread into strata as many times as there are diaphragms in the column. The inclination of the diaphragms keeps up a constant flowing action in the liquid, which continually exposes new surfaces to the most searching action of the hot air and steam, either separately or combined, which, constantly blowing into the wash, rapidly deprive it of its alcohol. By the time the wash reaches the lowest chamber of column A it is completely robbed of spirit, and is discharged through pipe *b*, which is in the form of an inverted siphon many feet deep, to prevent the escape of hot air and steam along with the now spent wash. The reservoir which receives the hot spent wash has passing through it in a coil the water-supply pipe of the boiler, so as to raise the water to a high temperature before it enters the boiler, and thus economize fuel. Though the heated vapor, on issuing from the top of column A and descending into the bottom of B through pipe V, contains much alcohol, it is not yet strong or pure enough; but in ascending through the various chambers of column B it envelops the various coils of wash-pipe W and parts with its heat to the wash that is passing through them. This condenses its more watery portion, fusel-oil, &c., upon the coil of pipe W, and these condensed matters, falling upon the diaphragms, descend through the drop-pipes F. On reaching the bottom chamber of column B these aqueous portions, fusel-oil, &c., are found still to contain a little alcohol, and are therefore drawn off through pipe *c* and conveyed to the hot faints vessel or suction of wash force-pump, and are thence pumped with the wash into column A and entirely deprived of spirit. The vapor thus becomes more and more alcoholic as it ascends until it reaches the uppermost chambers of column B, when it is perfectly pure, and as the wash in pipe W is in this part of the still nearly or quite cold it condenses the heated vapor into alcohol, (boiling,) and in this state it passes through pipe T into a refrigerator. The incondensable gases and such alcohol as has not been condensed pass through the large pipe U, and thence into a refrigerator.

The boiler and furnace, the hot-air force-pump, the wash-pump, the worm-tubs, &c., are omitted in the drawings, as being unnecessary to a clear understanding of the invention, they being of any convenient construction and operating in the usual way.

Having thus fully described my invention and in what manner the same is to be constructed and operated, what I claim, and desire to secure by Letters Patent of the United States, is—

1. Giving to the diaphragms which separate the chambers an inclination or fall toward alternate sides of the still, as described and represented, and for the purpose specified.

2. The introduction of hot air substantially in the manner described for the purpose of aiding in the evaporation of the wash and keeping it in agitation to prevent the clogging of the still.

The above specification signed and witnessed this 6th day of June, A. D. 1857.

EDWARD HERRING.

Witnesses:
H. H. YOUNG,
CHAS. F. STANSBURY.