WATERS & HARNETT.

Alcohol Still.

No. 20,967. Patented July 20, 1858.

Fig. 1,

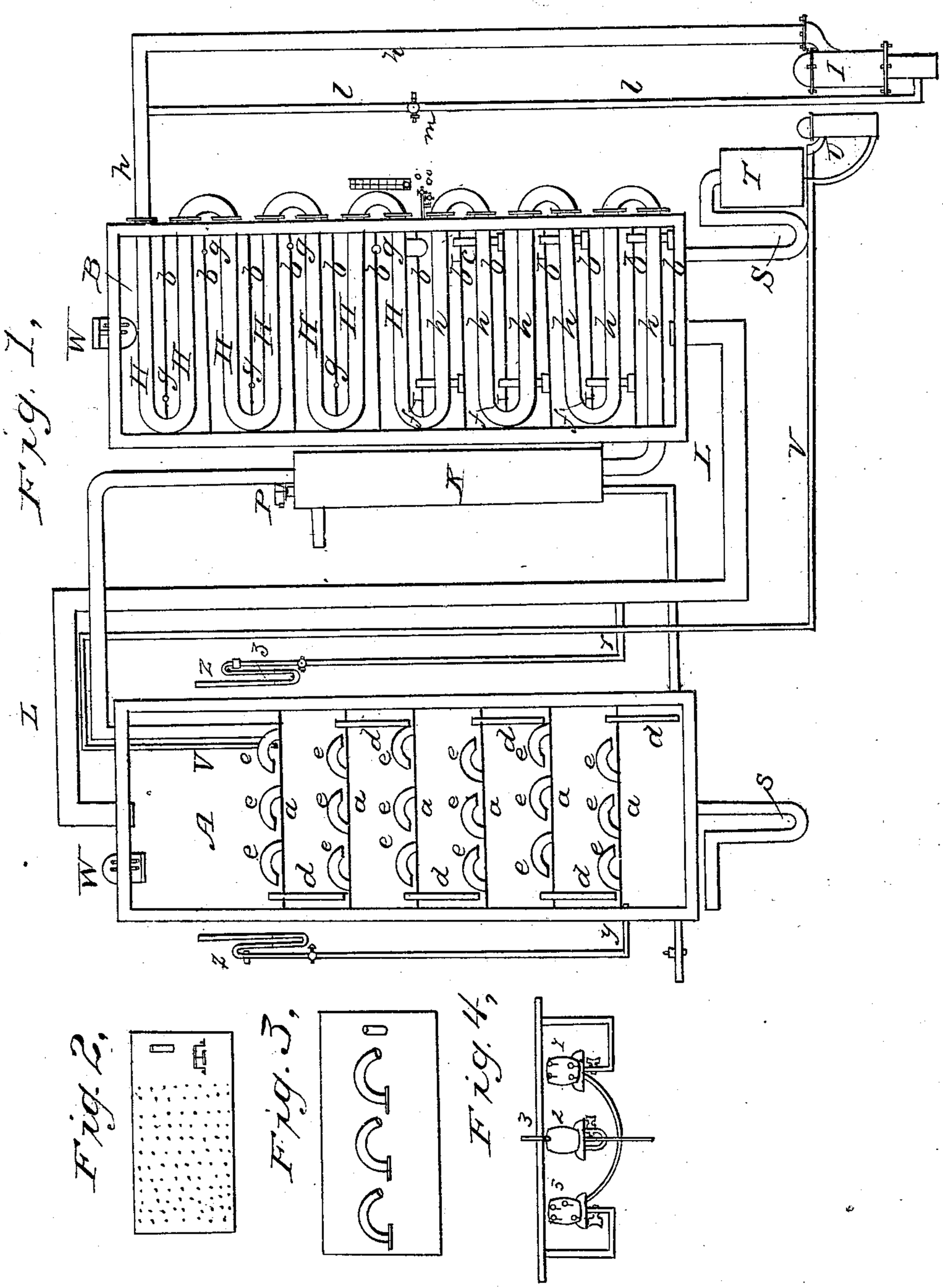


Fig. 2,

Fig. 3,

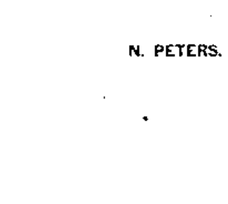
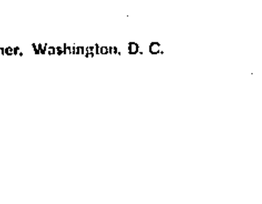


Fig. 4,



Gardner Waters
&
Warren Harnett

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

G. WATERS AND J. W. HARNETT, OF CINCINNATI, OHIO.

IMPROVEMENT IN APPARATUS FOR RECTIFYING.

Specification forming part of Letters Patent No. **20,967,** dated July 20, 1858.

To all whom it may concern:

Be it known that we, GARDNER WATERS and JOHN WARREN HARNETT, of Cincinnati, Hamilton county, State of Ohio, have invented a new and useful Improved Distilling Apparatus for the Manufacture of Whisky, Alcohol, and all Spirituous Liquors by continuous and self-regulating distillation; and we do hereby declare that the following is a full and exact description thereof, to wit:

It is well known that Coffey's is generally considered, at least in England and in this country, to be the best adapted for general manufacturing purposes of all apparatuses designed to carry out the great principle of continuous distillation. For the sake of brevity and clearness, we shall therefore begin by saying that ours is designed to remedy the following inconveniences and defects in Coffey's apparatus, namely: First, in Coffey's apparatus the separating-plates in both columns, except a few in the top of the spirit-column, are all perforated, and these perforations in the beer-column plates are very liable to, and often do, become closed by the glutinous matter contained in the wort, thus impairing the working power of the apparatus, obstructing the distillation, and at last compelling the operator to suspend the work and open, perhaps, all the compartments in the whole column before he can discover the point at which the stoppage has taken place—a great objection even where the wort is strained, as in England, but an insuperable one where the whole mash passes into the still, as is the custom in this country; second, another objection to these perforations is, in case the steam from any cause at any time during the operation be cut off from the beer-column, all the spirit-vapor and undistilled wort in the whole column must fall through these holes into the bottom and be lost with the slop or refuse matter; third, Coffey's apparatus requires a large amount of boiler-space to insure a large supply of low-pressure steam, the necessity of which low pressure arises from the fact that the principle of distillation requires the temperature of the wort to be kept at from 169° to 176° Fahrenheit, which can be obtained only by using the steam at the low pressure of from five to seven (never over seven) pounds to the square inch; fourth, Coffey's apparatus requires an extra or reserve condenser connected with the top of the spirit-column, to condense the spirit-vapor in case the cooling power of the condensing portion of the beer-pipes from accident or otherwise should become insufficient to complete its condensation, and this condenser could not be dispensed with by cutting off the steam from the beer-column in case of an accident of this kind, because, as stated above, (2) the contents of the beer-column would thence run to waste in the slop; fifth, in Coffey's the liquid in the beer-column is prevented from falling through the perforations, and compelled to overflow through the drop-pipes by meeting a sufficient quantity and pressure of steam, and hence a certain and considerable speed of distillation, which in Coffey's apparatus is its full capacity, is absolutely necessary, whereas it is often advantageous to be able to run a much less than the usual amount per day without being obliged to break the continuous operation of the work; sixth, in working Coffey's apparatus the operator has no immediate warning of the excess or deficiency in the relative proportions of ascending steam and descending beer, but must wait until this is indicated by the gages. These are the chief inconveniences and defects in Coffey's apparatus, the best hitherto in use.

We will now briefly set forth some of the advantages of our improvement.

First. By the substitution of solid for perforated plates or sheets in the beer-column, we prevent all possibility of any obstruction in the working of this column on account of the thickness of the mash. No matter what the consistency of the beer, or how great the quantity of meal grains, or other residuum embodied with the wort may be, a free passage of ascending steam and descending beer is secured, and perfect regularity of action maintained, and no loss of the contents of the beer-column can occur at any time, in consequence of the cutting off of the steam, or from other accident, thus obviating the first defect noticed in Coffey's apparatus, and supplying a great want.

Second. By the use of the exhaust-steam regulator we are enabled to regulate, utilize, and control the steam to a uniform pressure, destroying the intermittent puffs, and securing a steady supply of low pressure with un-

deviating precision, the necessity of which low pressure is indicated in second objection to Coffey's. The great utility of this steam-receptacle must be patent to all at a glance. 1. The economizing of steam and fuel is a great desideratum. With this plan the fuel will cost absolutely nothing, as the exhaust-steam alone of an engine capable of doing the work of a distillery would be sufficient to work the whole apparatus for the capacity of the house. 2. The cost of the receiver would be but a trifle. It could be made of wood or heavy sheet-iron, thus saving the expense of large boilers and boiler-space.

Third. By our arrangement we can accommodate the capacity of any given-sized apparatus to any less capacity—say, an apparatus is capable of running two thousand gallons of beer per hour, and it is desired to run continuously any less quantity, say, two hundred, the only change necessary is to use so much steam as will heat the quantity of beer required to be operated upon—thus combining in one apparatus what can be represented in Coffey's only by several. The advantages of this feature are incalculable, as no distillery in this country, especially no large one, is ever in a situation to run uniformly during a whole season up to its full capacity.

Fourth. By the use of the whistle-valves, in the event of neglect or the temporary absence of the operator, or in the case of any alteration in the due relative proportions of beer to steam, or vice versa, these valves send forth their notes of alarm, instinct with life itself, calling for the attention of the operator.

Instituting comparisons between Coffey's apparatus and our own improved one must, for brevity's sake, be limited to this last, leaving unnoticed minor points. Thus it will be seen that our apparatus is self-regulating in the strictest sense of the term. These whistle-valves, like watchmen, give instant alarm at the approach of danger, and place the action of the process alike beyond the reach of accident and the carelessness of men.

To enable others skilled in the art to construct an apparatus, we give the following, reference being had to the annexed drawings, making a part of this description, in which—

Figure 1 is a perpendicular section; Fig. 2, a sectional view of column B; Fig. 3, a sectional view of column A; and Fig. 4, with references, a front elevation of the sample-glasses.

Beer-column A is divided into twenty-two chambers by sheets marked *a*. The sheets thus marked are each furnished with drop-pipes *d* and vapor-pipes *e e e*, whose terminations are below the level of the orifices of the drop-pipes *d*. Spirit-column B is divided into thirty-three compartments by sheets *b*. Twenty-six of these are perforated and furnished with drop-pipes *c* and valves *f*. Seven sheets in the upper part of column B have simply perforations *g* reversed in successive order, for the purpose of directing the vapor through the whole length of pipes *b*, inserted to the number of four coiled lengths, extending from the back of each chamber to a distance to enable workmen to flange them together outside. Through the pipes *h* a constant stream of beer or wort is forced by the pump *j*, which charges and supplies the whole apparatus. The supply may be regulated either by the speed of the power that works the pump *j* or by means of a return-pipe, *l*, branching out of *h*, and having a stop-cock, *m*. The beer is discharged into the top of column A at a temperature of about 180° Fahrenheit, and vapor of spirit rising at 169° to 176°, while vapor of water at not less than 212°, the former yields much more readily to the action of steam, which comes into immediate contact with the wort at this point, and thus the spirit-vapor becomes disengaged from the aqueous matter, and is directed through pipe L into the lower chamber of column B, where it is forced through the perforated sheets, becoming stronger as it ascends, and likewise heating the pipes containing the beer in their passage through the chambers till it reaches the spirit-collector N, when, coming in contact with the cooling-pipes above that point, it becomes condensed and is drawn off at cock *o*. This vapor in its passage upward heats the beer in the condensing-pipes *b;* but the beer, being continuously displaced by the action of the pump J, maintains the equilibrium of the condensing power. The "feints" and essential oils, being of greater gravity than the fine spirit, are returned from sheet to sheet through the drop-pipes *c* and siphon S into the feints-receiver T, whence, by the pump U, through pipe V, they are returned into the top chamber of column A, to be operated upon by the steam. The contents of each sheet in this manner are operated upon as many times as there are sheets in the column, and before the beer reaches the bottom sheets, whence it is drawn off by the action of siphon S, it is deprived of the last particle of spirit which it contained. From the lower chamber a small pipe, *y*, is continued to the sample-condenser, (indicated at Fig. 4 by No. 3,) showing a sample of what is passing through the beer-column at any moment during the continuance of the process. There is also a branch of this pipe *y* connecting with a mercurial gage, *x*, which indicates the pressure of steam in the column and its condition generally. *z* is another gage to indicate the condition of column B; also, a branch from the same gives a sample of the spirit that is running into the refrigerator. (Indicated at Fig. 4 by No. 1.) Pipe *o o* conveys a sample of the spirit that is running from the spirit-collector N, and flows into sample-glass No. 1. Pipe *g* flows into glass marked No. 2. *r* is discharged through No. 3. * * are beads of glass, the globes of which are made hollow, and the stem secures their proper action. These beads are prepared and marked with the number of the proof they have to represent, and three or four of them, arranged some above and below the

required proof, show at a glance what proof is running. When the spirit is as high a proof as a bead is marked, it immediately sinks. Should the spirit be running too fast, the proof falls, and the bead instantly rises to the surface. Glass No. 3 is arranged in a similar manner. Glass No. 2 should always show water, and has only one bead, which is so adjusted that it shall float in water; but should there be even one per cent. of spirit it sinks to the bottom of the glass, and of course indicates that spirit is passing away with the slop, and silently, but imperatively demands the attention of the operator to its investigation. On the top of each column we place a curiously-constructed contrivance which we designate "whistle-valves," which act thus: Should the steam-power obtain a preponderance, the valve on column B opens outward, and that whistle sounds its note of alarm until the derangement be regulated. Should the beer-supply obtain the ascendency, the valve of column A opens inward in consequence of vacuum, and whistles in like manner, in either case directing the attention of the operator to remedial measures.

The steam-regulator K may be of any desired form or dimensions proportionate to the capacity of the apparatus.

The *modus operandi* is thus: The pipes in the spirit-column B being charged, steam is admitted from the regulator, or from a common boiler, or both together, into the beer-column A, whence it will pass into column B through the vapor-pipe L, and heat the pipes *h h h h* as high as the spirit-collector N. The pump *j* is then set in motion and the supply regulated as described above.

We do not of course claim the principle of continuous distillation, nor any of the various modes by which Pistorious, Derosne, Coffey, and others have rendered its practical application more and more simple and easily regulated. Neither do we claim the beer and spirit columns, or the general arrangement and mode of operating Coffey's apparatus; but

We claim as our invention—

1. The use of solid plates with bent pipes, or their equivalents, instead of perforated plates in the beer-column, in the manner and for the purposes set forth.

2. The use of the exhaust-steam regulator in distillation, by this or other apparatus, whereby steam of any degree of tension may be taken from the boiler and reduced to any less desired uniform pressure, and whereby the exhaust-steam from engines may be regulated in like manner, using the exhaust-steam and steam from boilers together or separately, as may be desired, in the manner and for the purposes set forth.

3. The combination of the beer and spirit columns with the exhaust-steam regulator, with or without the whistle-valves acting as described, and for the purposes set forth.

GARDNER WATERS.
JOHN WARREN HARNETT.

Witnesses:
JOHN A. HOOK,
W. S. ROSECRANS.