(No Model.)

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PROCESS OF AND APPARATUS FOR THE PRODUCTION OF HIGHLY PURIFIED ALCOHOL.

No. 294,285. Patented Feb. 26, 1884.

Fig. 1

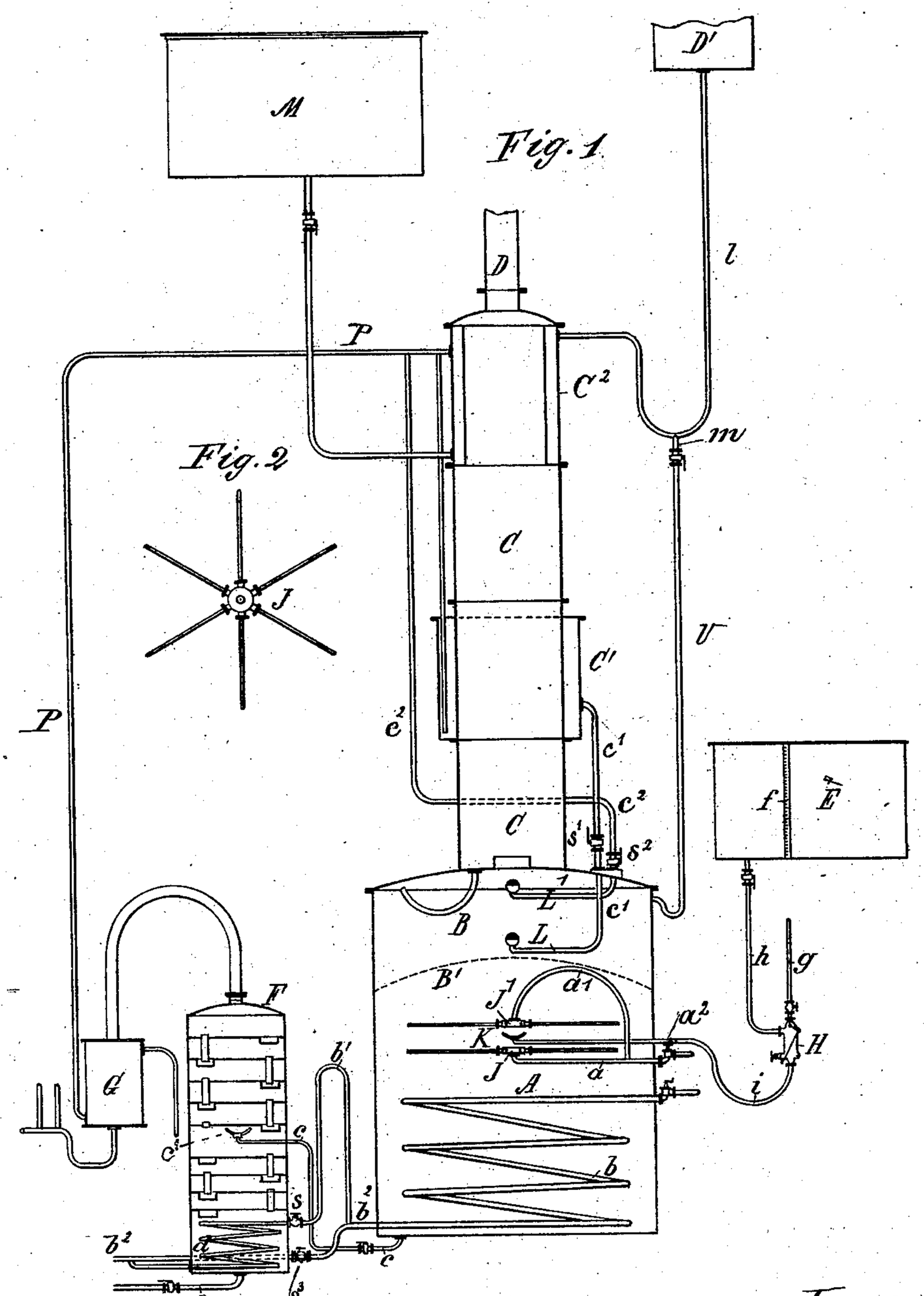

Fig. 2

Witnesses.
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PROCESS OF AND APPARATUS FOR THE PRODUCTION OF HIGHLY-PURIFIED ALCOHOL.

SPECIFICATION forming part of Letters Patent No. 294,285, dated February 26, 1884.

Application filed April 2, 1883. (No model.) Patented in Germany December 9, 1882, No. 25,773; in England February 2, 1883, No. 577; in Italy May 23, 1883, XVI, 15,068, and XXX, 434, and in France November 7, 1883, No. 156,725.

To all whom it may concern:

Be it known that I, JULIUS ALFRED STELZNER, manufacturer, a subject of the King of Saxony, residing at Alt Chemnitz, in the Kingdom of Saxony, in the Empire of Germany, have invented certain new and useful Improvements in the Method of and Apparatus for the Production of Highly-Purified Alcohol by Single Rectification and Continual Working; 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to a new process of and means for obtaining fine spirit or pure alcohol, and to means whereby the rectification or distillation may be made continuous or otherwise, as desired.

In the accompanying drawings I have shown, in Figure 1, by a vertical section, the various parts of which the apparatus is composed and which embody my improvements, and in Fig. 2 one of the steam-spraying devices by a plan view.

In most of the methods now in use for rectifying crude alcohol, from which fine spirit—that is to say, alcohol without taste or smell, and practically free from water (*i. e.*, absolute alcohol)—is obtained, the crude liquor is either subjected to repeated rectification or is subjected before rectification to various preparatory treatments, such as filtration, &c.

By means of my improved processes and apparatus, neutral or nearly absolute alcohol can be obtained without preparatory treatment and by a single rectification; and the operation may be made a continuous one or not, as desired.

In order to more clearly illustrate my invention, I have omitted in the accompanying drawings such elements as the condenser, the steam-generator, thermometer, and other well-known devices, the construction and function of which are well understood, and which form no part of this invention.

Distilling or rectifying apparatus as heretofore constructed, and that do not operate continuously, may be converted into continuously-operating apparatus at a small cost and without interruption in their working.

As shown in the drawings, the apparatus is composed, essentially, of a still divided into two compartments, A B, by means of a perforated diaphragm, B′, of a distilling and rectifying column, which should be located above the still A B, as shown. The column C is surrounded by a refrigerating-jacket, C′, at a point intermediate of the still and the usual refrigerating-jacket, C^2, at its upper end, to which end the pipe D, leading to the condenser, is connected. It is further composed of a crude-liquor reservoir, E, (provided with a level-indicator, *f*,) a cold-water reservoir, M, and the necessary connecting-pipes, and, finally, of a second rectifying-column, F, for purposes hereinafter set forth. In combination with these elements, I employ the other usual and well-known accessories, hereinabove referred to as omitted from the drawings for the sake of clearness.

I would here remark that the apparatus should be well heated before beginning to rectify or distill by admitting steam thereto, and also that the crude liquor should be fed to the lower chamber, A, in a regular manner, and that the volume of crude liquor admitted should be regulated as much as possible according to the vaporizing capacity of the apparatus—that is to say, the quantity of liquor fed to the still should as much as possible be such as to be vaporized as fast as injected.

I will now proceed to describe the construction and operation of the apparatus in detail.

The crude liquor passes from reservoir E through pipe *h* to an injector, H, of any usual or preferred construction, steam being fed thereto from any suitable generator through pipe *g*, and from the latter it is forced with the steam into and through pipe *i*, said pipe terminating in a rose-head or other suitable spraying device, K. The spraying device K is located centrally of the still A, between two steam-spray pipes, J J′, the pipe *a*′, that supplies steam to the spray-pipe J′, being branched upon pipe *a*, that supplies steam to pipe J, and the said pipe *a*, leading to the generator,

is provided with a suitable stop-cock, a^2. The crude liquor forced into compartment A, in a finely-subdivided state, between two strata of finely-subdivided steam, is at once vaporized—an operation which is assisted by the heat from a steam-coil, *b*, located in the lower part of compartment A, below spray-pipe J. The finely-subdivided liquor is not only vaporized in the manner and by the means described, but it is also purified, lixiviated, or washed, and diluted. The alcohol vapors rise from the compartment A into B through one or more finely-perforated intermediate diaphragms, B′, and in said compartment B the vapors are again washed and diluted by a spray of water from rose-heads L L′, supplied from the cooling-jackets C′ C^2 through pipes c' c^2, each provided with suitable stop-cock, s' s^2.

It will be found advantageous to employ several water-spraying devices, located one above the other, and these should be supplied with water of varying temperatures. The water supplied to the lower rose-head, L, should be of a higher temperature than the water supplied to rose-head L′ above it; and if more than two rose-heads are employed, water decreasing in temperature should be supplied to the successive rose-heads.

In practice I prefer to employ more than two such water-spraying devices. It is also of advantage to admit steam of low pressure in the form of spray between each two water-spraying devices, though this is not absolutely necessary. I also employ means for refining or purifying the alcohol, which may be mixed with the crude liquor or with the water supplied to the spraying devices. For this purpose I employ either oil or an alkali—such as carbonate of soda, carbonate of lime, carbonate of magnesia, carbonate of strontium, or another alkali in solution. The proportion of the refining or purifying material will vary according to the nature of the crude material, and can therefore not be given. The repeatedly-diluted and thoroughly washed and purified alcohol vapors by means of steam and water or by means of both the latter and a purifying or refining material pass from the compartment B of the still into the distilling and rectifying column or columns C, (several such columns may be employed,) or into like or equivalent appliances, and of any usual or preferred construction, in a well-purified state, the complete rectification being then effected in a rapid and simple manner; and the operation may be carried on for an indefinite period, as will be made more apparent hereinafter.

I have found it of advantage to surround the second section of the distilling and rectifying column with a refrigerating-jacket, C′, the water supplied thereto being taken from the jacket C^2 around the top of said column, and is therefore of considerably higher temperature than the water supplied to the latter direct from the reservoir M.

When the operation of distilling or rectifying is carried on for any length of time, it is preferable to connect the discharge-pipe *m* of the bent pipe *l*, that leads from the distilling-column C to the dephlegmator D′, with the upper chamber, B, of the still through a pipe, *l*′, as shown, to conduct the vapors condensed in D′ to said still, so as to avoid too great a pressure of such vapors within the dephlegmator, and also to prevent the collecting in the upper part of the column of condensed alcohol vapors, the boiling-point of which is nearest to that of ethyl alcohol, the pipe *l*′ passing from the dephlegmator or from the pipe *l* through one of the cooling-jackets into the distilling-column.

The waste wash is continuously discharged from the compartment A of the still through pipe *c*, and conducted into a smaller auxiliary distilling-column, F, where it is discharged through a rose-head, c^3, and in which column alcohol carried over is vaporized by the heat supplied from a steam-coil, *d*, connected by pipe *b*′ with the exhaust-pipe b^2 of the steam-coil *b* of the still, both pipes being supplied with suitable stop-cocks, *s* s^3. The exhaust-pipe of the coil *d* is or may also be connected with the exhaust-pipe b^2 beyond the stock-cock s^3, as shown.

G is a condenser, in which the vapors from still F are condensed, cold water being supplied thereto from the cooling-jacket C^2 by pipe P. The water is discharged from still F through pipe *e*, provided with a suitable stop-cock. The material employed for refining or purifying the alcohol may also be recovered, and if oil is used it may be recovered in the column F.

I call particular attention to the fact that the consumption of steam in carrying out the above-described processes is not greater than in the ordinary non-continuous mode of distilling. Inferior products—such as fine spirit or alcohol—may also be obtained in the manner hereinbefore set forth and by a continuous operation, as will be readily understood and, irrespective of the latter feature, such may be obtained at considerably less expense.

The herein-described methods of producing fine or nearly absolute acohol, spirits of wine, or fine spirit or alcohol may be carried out in the continuously-operating distilling or rectifying apparatus of usual construction with great advantage and at a comparatively slight change in their construction.

The admission of water in the form of spray or atoms below the rectifying column or columns in distilling apparatus that do not operate continuously is also of great advantange, as a finer product is obtained by first lixiviating the vapors.

Having thus described my invention, what I claim is—

1. The herein-described method of distilling or rectifying alcohol, which consists in injecting the crude alcohol into the still in the form of spray, vaporizing and purifying the same

by means of steam injected into the sprayed alcohol, and injecting water in the form of spray into the combined steam and alcohol vapors, to dilute and purify the same, as set forth.

2. The herein-described method of distilling or rectifying alcohol, which consists in injecting the crude alcohol into the still in the form of spray, vaporizing and purifying the same by means of steam injected into the sprayed alcohol, and injecting water in the form of spray of gradually-diminishing temperature into the combined steam and alcohol vapors as they rise on their way to the rectifying-column, as set forth, for the purposes specified.

3. The herein-described method of distilling or rectifying alcohol, which consists in injecting the crude alcohol into the still in the form of spray, vaporizing and purifying the same by means of steam injected into the sprayed alcohol, subjecting the latter to the action of an alkali or an oil, and injecting water in the form of spray into the alcohol-vapors, substantially as described, for the purposes specified.

4. The herein-described method of distilling or rectifying alcohol, which consists in injecting steam in the form of spray into the sprayed alcohol, subjecting the latter to the action of an alkali in solution, or an oil, and injecting into the combined sprayed liquids and vapors water in the form of spray, and of gradually-decreasing temperature, as said vapors pass from the still to the rectifying-column, substantially as described, for the purposes specified.

5. In a distilling or rectifying apparatus, the combination, with a rectifying-column and a still divided into a series of distilling-chambers, of an injector, a heater, and steam-spraying devices for injecting the alcohol in the form of spray into one of the stills, vaporizing the same and injecting steam in the form of spray into said alcohol vapors before they reach the second still, and spraying devices for injecting water in the form of spray into the combined vapors as they enter the second still and before they reach the rectifying-column, substantially as described, for the purpose specified.

6. In a distilling apparatus, a still divided into a series of distilling chambers or compartments by means of perforated diaphragms, a rectifying-column, a cooler at the upper end thereof, and a dephlegmator, in combination with a second cooler, C′, applied to said rectifying-column between the still and upper cooler, and a connection for connecting the dephlegmator, through one of the coolers, with the still, substantially as described, for the purpose specified.

7. In a rectifying apparatus, the combination, with a rectifying-column, of a refrigerator located at its upper end, a still divided into two or more compartments by means of perforated diaphragms, an injector, heater, and steam-spraying devices located in the initial compartment, into which the alcohol is injected in the form of spray, spraying devices located in the terminal compartment, for injecting water in the form of spray into the combined vapors as they arrive from the initial compartment, and a second refrigerator, C′, located on the rectifying-column intermediate of the terminal compartment of the still and the upper refrigerator on the column, all combined for co-operation, substantially as described, for the purposes specified.

8. In a distilling or rectifying apparatus, the combination, with a rectifying-column and a still, of two or more superposed spraying devices, L L′, for injecting water at gradually-decreasing temperatures into the alcohol vapors on their way to the rectifying-column, substantially as described, for the purposes specified.

9. In a distilling and rectifying apparatus, the combination, with a distilling and rectifying column, a still, its steam heating-coil, and the exhaust-pipe thereof, of an auxiliary rectifying-column, F, and its steam heating-coil *d*, connected with the exhaust-pipe of the coil of the still, substantially as described, for the purpose specified.

10. In a distilling and rectifying apparatus, the combination, with a distilling and rectifying column, a still, its steam-heating coil, and the exhaust-pipe thereof, of an auxiliary rectifying-column, F, its steam heating-coil *d*, and the exhaust-pipe thereof, both connected with the exhaust-pipe of the coil of the still, substantially as and for the purposes specified.

11. In a distilling apparatus, the combination, with a still and a distilling and rectifying column, of a dephlegmator connected by a siphon-pipe with the rectifying-column and by a discharge-pipe with the still, substantially as and for the purposes specified.

12. In a distilling and rectifying apparatus, the combination of a still, an injector provided with a spraying-nozzle for injecting the liquid into the still in the form of spray, and two steam-spraying pipes, J J′, located, respectively, above and below the injector spraying-nozzle, substantially as described, for the purposes specified.

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

JULIUS ALFRED STELZNER.

Witnesses:
BRUNO UHLY,
AUGUST ZUADARGEL.