No. 877,606. PATENTED JAN. 28, 1908.

L. V. SONE, DEC'D.

I. K. SONE, EXECUTRIX.

STILL.

APPLICATION FILED JAN. 17, 1903. 2 SHEETS—SHEET 1.

Fig. 1.

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Fig. 2,

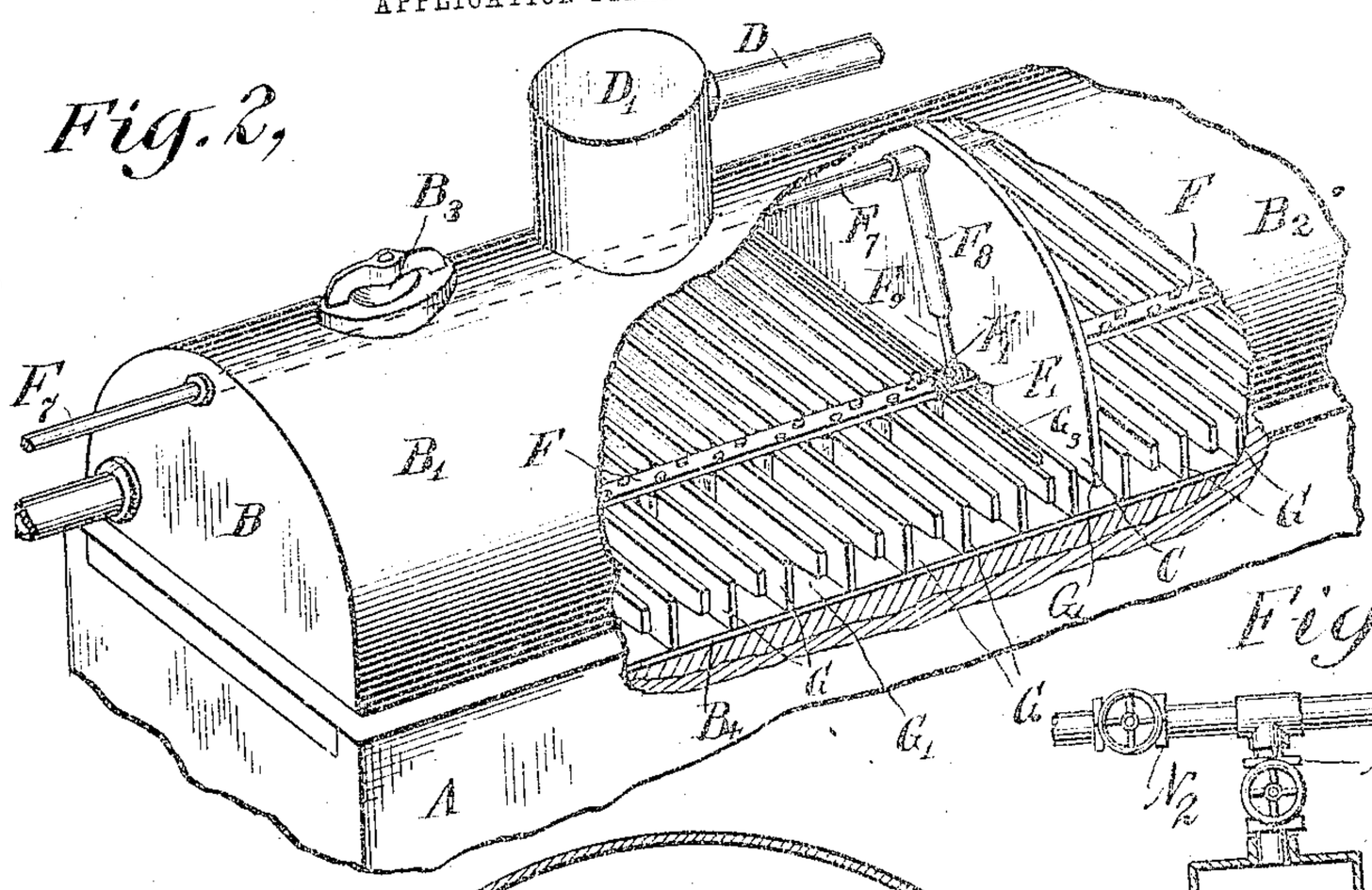


Fig. 7,

Fig. 3,

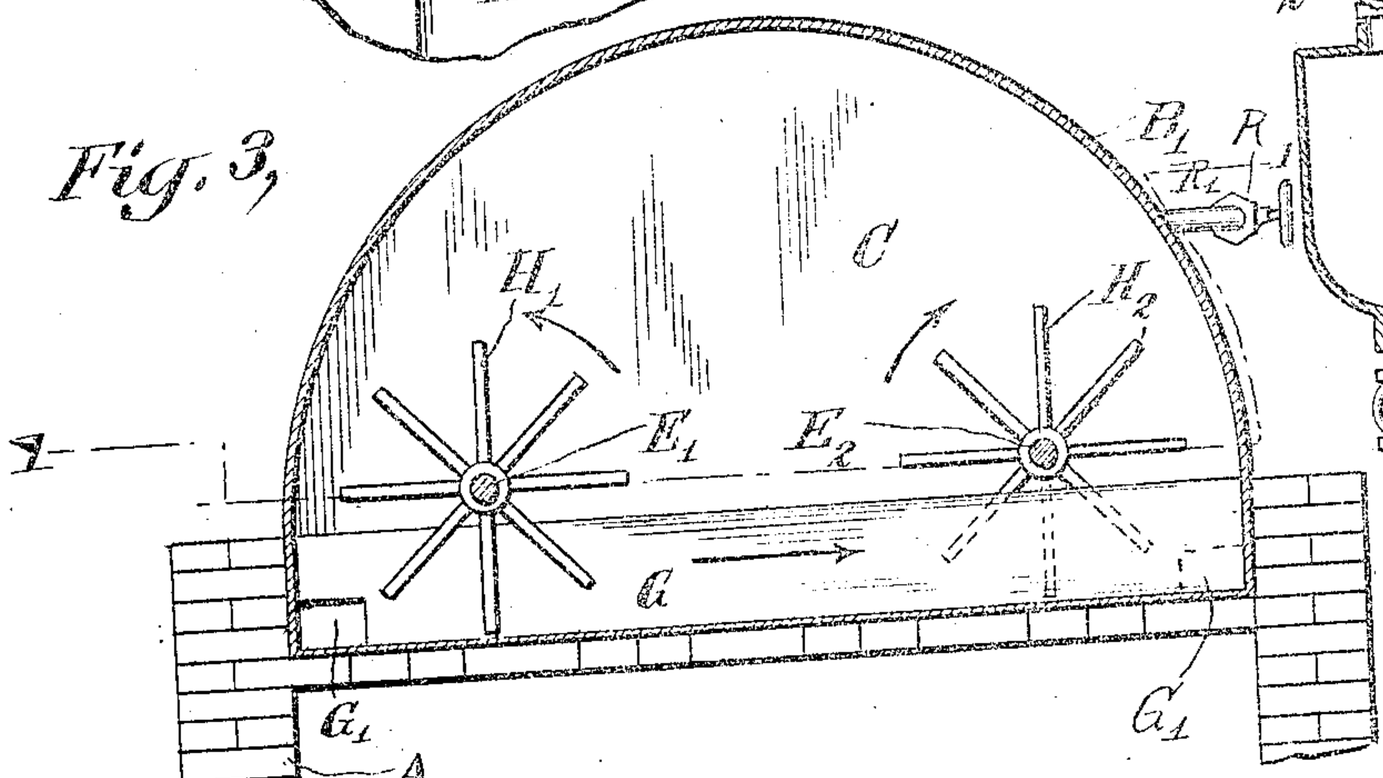


Fig. 4,

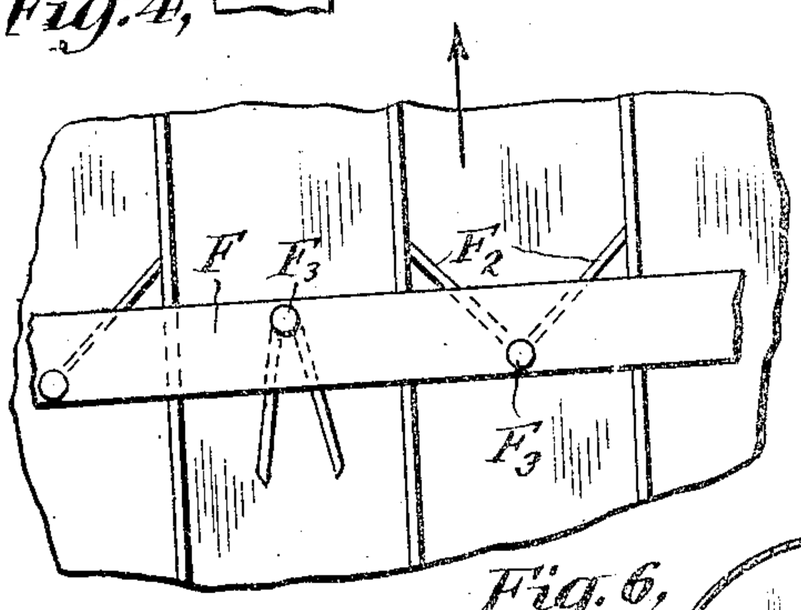


Fig. 5,

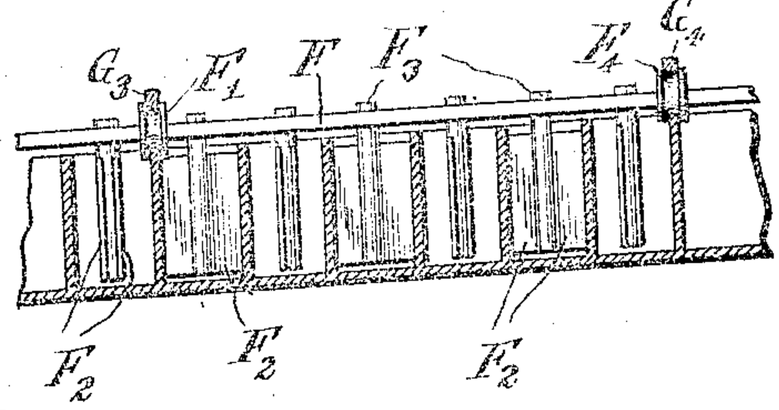
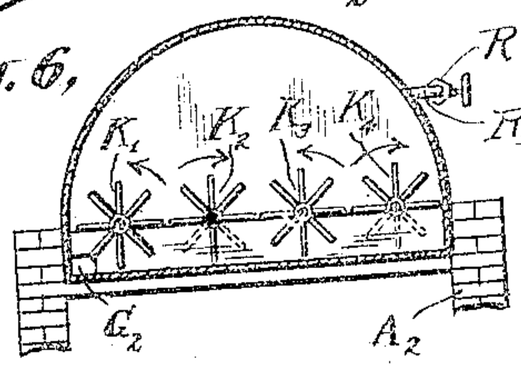


Fig. 6,



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UNITED STATES PATENT OFFICE.

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STILL.

No. 877,606. Specification of Letters Patent. Patented Jan. 28, 1908.

Application filed January 17, 1903 Serial No. 139,383.

To all whom it may concern:

Be it known that I, LOUIS V. SONE, a citizen of the United States, and resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Stills, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

This invention relates to stills and relates particularly to stills such as are adapted for distilling the heavy mineral oils in which the oil is passed through the still in an elongated conduit.

In the accompanying drawings, in which the same reference characters refer to similar parts in the several figures. Figure 1, is a sectional plan view illustrating an embodiment of this invention taken on line 1—1 of Fig. 3. Fig. 2, is a perspective view of one of the chambers which is provided with a modified form of current producer. Fig. 3, is a transverse sectional view of one chamber taken on line 3—3 of Fig. 1. Fig. 4, is a detailed plan view on an enlarged scale of the modified form of current producer shown in Fig. 2. Fig. 5, is a longitudinal sectional view of the same. Fig. 6 is a sectional view, showing another form of rotary current producer. Fig. 7 is a longitudinal vertical section through one of the traps.

In the embodiment of the invention shown in the drawings, a series of still chambers are illustrated, as is seen in Fig. 1, although it is understood that a greater or less number of chambers may be employed as desired. Each of these chambers is preferably divided by a division plate C which as is indicated in Figs. 1 and 2, separates the chamber into compartments. Each of these compartments is preferably provided with a separate vapor drum, such as D_1 (see Fig. 2) with which the vapor pipe D is connected to take off the vapor produced in each compartment in the usual manner. The compartments are also preferably provided with man-holes B_3 of the usual form. As is seen in Fig. 2, the still chambers are preferably of arched form and are provided with a substantially level floor or bottom B_4 upon which the parallel partitions G are arranged, these partitions, as is indicated, extending completely across the floor of the compartment. Each of these partitions is preferably formed with a gate or opening G_1 at the end of the same and preferably near the bottom of the partition as indicated in Figs. 2 and 3 so as to be normally below the level of the liquid in the compartment. As is indicated, the gates in the adjacent compartments are arranged at opposite ends of the same so that each of the channels on the floor of the compartment communicates with the adjacent channels to form an elongated staggered conduit or trough for the fluid. It is, of course, understood, however, that the openings in the partitions need not in all cases be made of the shape indicated and need not be located in the exact position in which they are shown in the drawing, although it is desirable to have these gates or openings located near the end of the partitions in order that the fluid may circulate readily through the whole conduit so that there will be no opportunity for the material to collect and remain still away from the influence of the current. The partitions C, as is indicated in Fig. 2, are formed with a similar gate C_1 so that the staggered conduit allows the flow of material from the compartment B_1 to the compartment B_3.

As indicated in Fig. 1, a number of chambers are preferably connected in series in this apparatus. The compartments B_{11} B_{12} forming a single chamber are connected together in series, preferably by a suitable gate or opening through the division plate C.

The liquid or oil pipe L_2 which may be provided with a suitable valve N_2 connects the compartment B_{12} with the compartment B_{13} formed in a similar manner. The adjacent compartment B_{14} is connected with the next chamber of the series by the valved oil pipe L_3, the valve N_3 in this pipe allowing the proper regulation of the circulation of fluid therein. The material circulates through the compartments B_{15} and B_{16} of the last chamber and thence it passes into the valved oil pipe L_1 for further treatment. A trap M_1 is preferably connected with the oil pipe L_2, this trap being indicated in Fig. 7 as of the ordinary shape and being connected through the valve or stop cock N_1 with the oil pipe L_2. A similar valved discharge pipe M_3 connects with the lower portion of the trap the valve M_2 serving to regulate the discharge of material therefrom. A similar trap is indicated as connected with the oil pipe L_3. These traps are, of course, for the collection of heavy materials and the

separation of such heavy residue from the oil as desired. The various compartments dre also connected by the regulator pipes, the compartments B_{11} and B_{12} being connected by the regulator pipe R_1 which is in communication with the vapor spaces of these compartments above the fluid level of the same, as is indicated in Figs. 1 and 3. This pipe is provided with a valve R which serves to control the flow of vapor therein. The vapor space of the compartment B_{12} is connected with the corresponding portion of the compartment B_{13} by a similar valved regulator pipe R_2 which preferably arches up at its central portion to prevent the condensation of liquid therein in order to keep this pipe clear. The similar valved regulator pipes R_3 R_4 and R_5 are provided connecting the vapor spaces of the other compartments in series.

The compartments may be heated to the desired extent in any way. As is seen in Figs. 2 and 3, the chambers are mounted upon the brick work A which is provided with a firing space A_1 below the chambers by which they may be heated in the ordinary manner. It is very desirable to employ a current producer of some description to maintain the proper circulation of fluid throughout the elongated conduit of this still and if desired the chambers may be inclined to aid this flow. The current producer may be of the rotary form indicated in Figs. 1 and 3 in which two shafts E_1, E_2 are indicated passing longitudinally through the chamber, preferably slightly above the upper edge of the partitions G. The shaft E_1 is provided with paddles H_1 which enter every alternate channel of the conduit and are rotated in the direction indicated by the arrow in Fig. 3. The other similar shaft E_2 is also provided with paddles H_2 which enter the other channels of the conduit and by their rotation in the direction indicated maintain a circulation of fluid throughout the whole staggered conduit. A rotary current producer of this description is also very effective in preventing the stratification of the fluid in the conduit and produces a uniform flow of material through the conduit in conjunction with the submerged gates G_1 in the partitions. As is indicated in Fig. 1, the partitions G in the several chambers are preferably spaced apart at different distances so as to allow for the evaporation of the material in these compartments as it passes through them in series. The conduit may also, if desired, have a varying width or cross-section in a single chamber or compartment to allow for the diminution of the material flowing therethrough and this may be accomplished, of course, by varying the spacing of the partitions in such chamber or compartment.

The current producer may be of the form indicated in Fig. 6 in which four sets of paddles K_1, K_2, K_3 and K_4 are indicated mounted upon appropriate shafts. Two of these sets of paddles K_1 and K_3 rotate in the same direction and operate in the same alternate channels of the conduit. The paddles K_2 and K_4 upon the other shafts rotate in opposite directions and operate in the other channels of the conduit to cause a continuous flow of material through the staggered elongated conduit. If desired, however, the current producer may be formed in other ways, such, for instance, as is indicated in Figs. 2, 4 and 5 in which a reciprocating current producer is illustrated. A series of paddles F_2 are illustrated in those figures, preferably pivotally mounted about the pins F_3 in the bar F. This bar reciprocates across the tops of the partitions and is provided with suitable wheels or grooved rollers F_1, F_4 which engage the tops of the partitions and are guided by the top guides G_3 G_4, as illustrated in Fig. 5. These paddles F_2 swing outward in every alternate channel of the conduit as the current producer is reciprocated, the paddles taking the position indicated in Fig. 4 when the current producer moves in the direction of the arrow. The paddles in the other channels fold together into the inoperative or feathering position so that the fluid is positively urged forward in every alternate channel of the conduit at each movement of the current producer. As the current producer moves in the opposite direction, the paddles swing outward and become effective in the other channels to urge forward the material therein while the paddles which are shown in their extended position in Fig. 4 fold inward into their feathering position. This current producer may be reciprocated by any desired means. The oscillating shaft F_7 may be mounted in suitable bearings in the top of the chamber, as indicated in Fig. 2, and may be provided with the arms F_8 secured thereto. The rods F_9 telescope with the arms F_8 and these rods are pivoted to the bar F so that as the shaft F_7 oscillates the current producer is reciprocated in an obvious manner.

In the operation of this still the material, such, for instance, as a heavy mineral oil, is supplied to the first compartment of the series by the valved supply pipe L, the quantity of this material fed to the still being regulated by the valve or stop cock B. The various compartments are heated to the proper temperature, each succeeding compartment of the series being preferably somewhat hotter than the preceding one, so that the lighter distillates may be successively removed, the vapor in each compartment being of a different character. The fluid passes under the influence of the current producer along the staggered conduit and from one compartment to the next of the series employed, the

heavier materials being removed from time to time, if desired, by the traps in the oil pipes between the chambers. These traps also allow for the disconnection of one of the chambers in case of necessity, since, for instance, the valve N_2 in the oil pipe L_2 might be closed and the total amount of liquid issuing from the compartment B_{12} might be allowed to pass through the trap M_1 and out of the discharge pipe M_3 so as not to pass through the compartments B_{13} and B_{14}. During the operation of the still slight irregularities in the withdrawal of the vapor from the various compartments might cause variations in pressure. To obviate any disadvantages that might be caused in this way, the regulator valves may be opened and the vapor pressure may thereby be kept at the proper amount in the several compartments and the regular and proper flow of material from compartment to compartment may thus be insured.

It is, of course, understood that many variations may be made in this apparatus without departing from the spirit of this invention. Variations may be made by those skilled in the art in the proportion and size of the parts and in the number of elements which may be employed. Furthermore, parts of this apparatus may be omitted and parts may be used in connection with other devices without sacrificing the advantages of this invention. I do not, therefore, desire to be limited to the disclosure which has been made in this case, but

What I claim as new and what I desire to secure by Letters Patent is set forth in the appended claims.

1. In a still, a series of chambers, means to heat said chambers, division plates in said chambers to divide them into compartments, means to conduct the vapor from said compartments, a series of parallel partitions extending across said compartments along the floor of the same, said partitions being spaced apart at varying distances in the various compartments, gates formed at the ends of said partitions near the lower portion of the same to form an elongated staggered conduit through said compartments, valved oil pipes connecting said chambers in series, valved traps connected to said oil pipes, rotary current producers in said compartments extending along either side of the same and provided with paddles entering the alternate channels of said conduit to cause a continuous circulation of material throughout the length of said conduit and valved regulator pipes connecting the vapor spaces of said compartments in series.

2. In a still, a series of compartments, parallel partitions extending across said compartments and provided with gates in the ends of the same to form an elongated staggered conduit through said compartments, valved traps between said compartments and a movable current producer to cause a circulation of material throughout said conduit.

3. In a still, a series of connected compartments, means to heat said compartments, parallel partitions on the floor of said compartments provided with openings to form a staggered conduit throughout said compartments along which material flows and valved traps between said compartments to separate the heavier products from the material flowing through said conduit.

4. In a still, a series of compartments, means to heat said compartments, partitions in said compartments to form a staggered conduit therein, valved oil pipes connecting the several compartments in series and valved traps connected to said oil pipes.

5. In a still, a series of compartments, means to heat said compartments, parallel partitions extending across the floor of said compartments and provided with gates at the lower portions of the ends of the same to form a staggered conduit through said compartments, a current producer to cause a circulation of fluid throughout said conduit, means to remove the vapor from said compartments, and a valved regulator pipe connecting the vapor spaces of said compartments.

6. In a still, a series of compartments, means to heat said compartments, means to remove the vapor from said compartments, partitions extending across the floor of said compartments to form a staggered conduit through said compartments and a valved regulator pipe connecting the vapor spaces of said compartments.

7. In a still, a still chamber, means to heat said chamber and to remove the vapor therefrom parallel partitions extending across the floor of said chamber to form a staggered conduit through said chamber and rotary current producers coöperating with said conduit to feed material throughout the length of the same, said current producers comprising continuously rotating shafts extending on either side of said chamber above the partitions therein, and paddles upon said shaft, the paddles on each shaft extending into the alternate channels of said conduit.

8. In a still, a still chamber comprising a series of compartments, means to heat said compartments and means to remove the vapor therefrom, parallel partitions extending across the floor of said compartments and provided with gates in the lower portions of the ends of said partitions to form a staggered conduit through said compartments and rotary current producers coöperating with said conduit to feed material throughout the length of the same, said current producers comprising continuously rotating shafts ex-

tending on either side of said compartment above the partitions therein and paddles upon said shafts, the paddles on each shaft extending into the alternate channels of said conduit.

9. In a still, a compartment, means to heat said compartment and to remove vapor therefrom, partitions extending along the floor of said compartment to form a staggered conduit therethrough and a rotary current producer coöperating with said conduit to feed material throughout the length of the same, said current producer comprising rotary paddles mounted on a shaft extending along said compartment and entering every alternate channel of said conduit.

10. In a still, a compartment, partitions extending across said compartment and provided with gates at the lower portion of the ends of the same and a rotary current producer operating in said conduit adjacent said gates to agitate the material therein and to feed it throughout the length of said conduit.

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