C. ORDWAY.

VACUUM EVAPORATING APPARATUS.

APPLICATION FILED FEB. 24, 1911.

1,009,782. Patented Nov. 28, 1911.

Fig. 2,

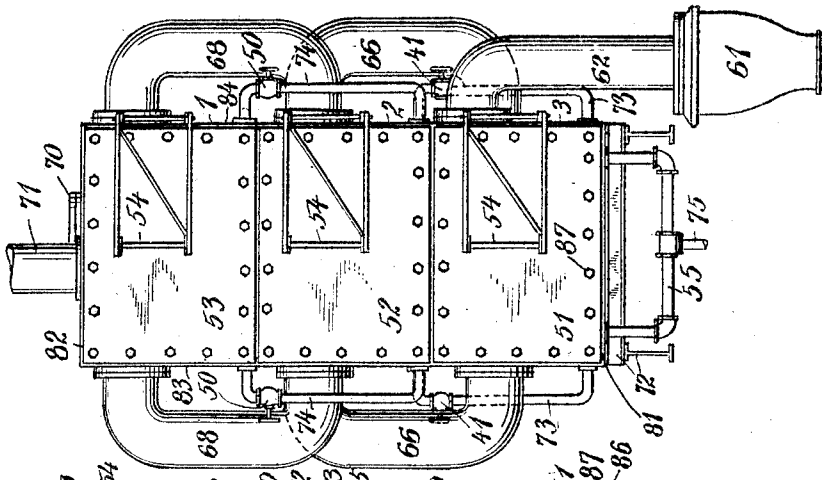
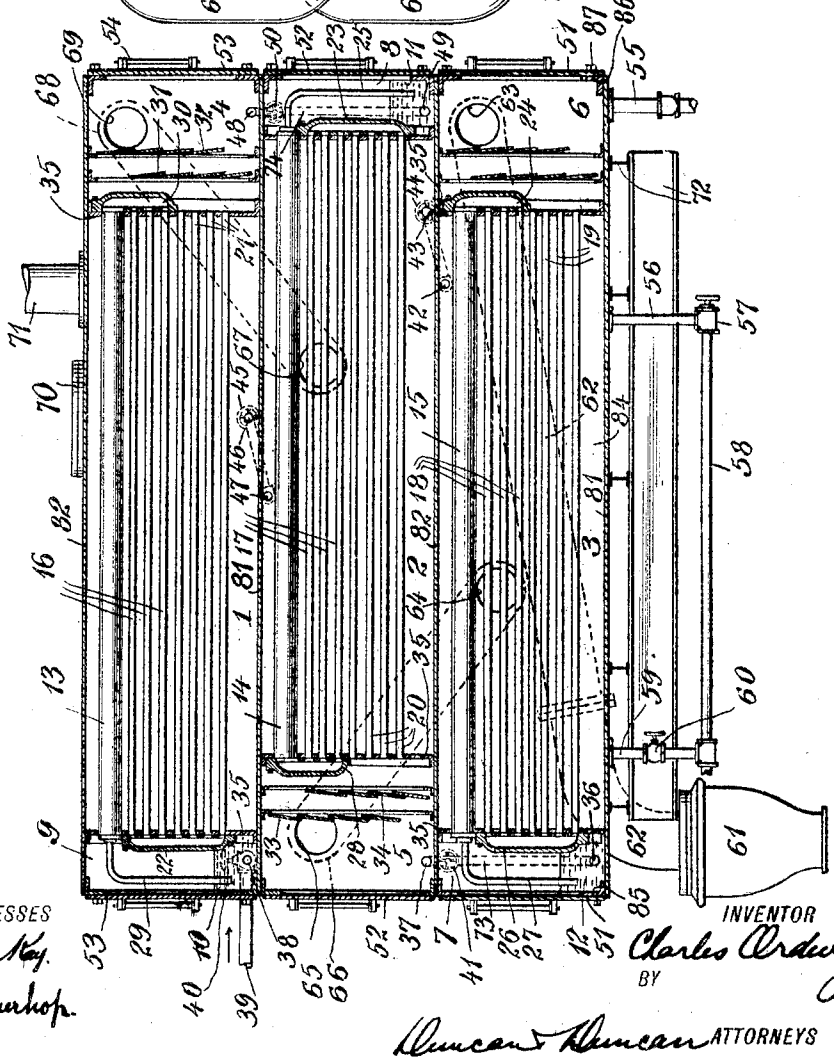


Fig. 1,



WITNESSES

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VACUUM EVAPORATING APPARATUS.

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To all whom it may concern:

Be it known that I, CHARLES ORDWAY, of the city, county, and State of New York, have made certain new and useful Inventions Relating to Vacuum Evaporating Apparatus, of which the following is a specification, taken in connection with the accompanying drawing, forming part of the same.

This invention relates to evaporating apparatus and relates especially to the construction of film type evaporators suitable for multiple effect work and comprising an inclosing shell for a number of effects which may have a rectangular cross-section and be provided with partition plates separating the adjacent chambers for the different effects and minimizing radiation losses therefrom, each effect if desired comprising tube sheets forming a feed chamber and vapor chamber at the ends of the effect, evaporating tubes mounted in the tube sheets and connected into coils through which the liquor is fed, the steam spaces being substantially opposite in the different effects to further minimize radiation losses.

In the accompanying drawings showing an illustrative embodiment of this invention, Figure 1 is a vertical longitudinal section; and Fig. 2 is an end elevation.

In the illustrative embodiment of this invention shown in the drawings, the inclosing shell which may be of substantially rectangular cross-section may be formed of the plates 81, 82 and the side plates 83, 84 suitably riveted, bolted or otherwise connected and stayed to the desired extent to give the proper rigidity under operating conditions. Suitable partition plates 81, 82 may be mounted within this inclosing shell so that each of these plates forms the common partition wall separating the adjacent chambers 1, 2 and 3 of the different effects in the shell and thus greatly minimize radiation losses, since not only is each effect made just as compact as possibly consistent with the desired capacity, but also radiation from one or more of its sides is prevented, because these partition plates also form the partition wall of a similarly heated adjacent effect. Suitable tube sheets 35 may be bolted or otherwise mounted within each of these effects to form feed and vapor chambers at the ends thereof, such for instance, as the feed chamber 7 and vapor chamber 6 in the lower effect, the feed chamber 8 and vapor chamber 5 in the intermediate effect and the feed chamber 9 and vapor chamber 4 in the upper effect, to the heating space 1 of which the steam is originally supplied at high pressure through the steam supply pipe 71. The steam spaces of the adjacent effects are thus substantially opposite each other to further minimize radiation or other heat losses and the feed and vapor chambers are also opposite in the different effects, it being of course understood that the alternate arrangement indicated in the drawing in which a feed chamber is opposite a vapor chamber in the adjacent effect need not be used in all cases, so that a still more exact alinement of the various chambers in the adjacent effects may be secured, if desired.

Evaporating tubes of any desired description may be mounted within each of the effects and this may be conveniently accomplished by mounting these tubes in the tube sheets and packing them therein in any desired way. If desired, the relatively larger tubes, such as 13, may be used at the beginning of each evaporating coil and connected by suitable return bends, such as 30, to a number of smaller evaporating tubes 16 which gives better evaporating efficiency in some cases. Other return bends, such as 22, feed the liquor through still other tubes, such as 21, before it is discharged into the vapor chamber 4 in which suitable baffles are arranged which may have the sectional construction 31, 32 indicated. Any desired feeding device may be arranged to feed the liquor which may be supplied through the liquor supply pipe 39 in the desired quantities as controlled by the valve 40 communicating with an opening 38 in the feed chamber to the various coils, and if desired suitable feed pipes 29 may be connected with each of the initial evaporating tubes 13 so as to supply the liquor 10 in the feed chamber thereto in the desired uniform manner. The aperture 69 in the vapor chamber 4 communicates through the vapor pipe 68 with the aperture 67 in the steam space of the next effect to heat the coils therein. The liquor from the first effect passes through the apertures 48 when the valves 50 are open so as to pass through the liquor pipes 74 and apertures 49 to form the pool 11 in the feed chamber 8. Similar feed pipes 25 feed this liquor to the first tubes 14 of the coils in this effect and then through the return bends 28 into a series of smaller

tubes 17 which communicate at their upper ends through the return bends 23 with the similar tubes 20. The vapor from the vapor chamber 5 passes through the apertures 65 and vapor pipes 66 communicating through the aperture 64 with the steam space of the last effect so as to heat the tubes therein. The liquor which is separated from the vapor by the sectional baffles 33, 34 passes through the apertures 37 when the valves 41 are open so as to pass through the liquor pipes 73 and apertures 36 to form the pool 12 in the feed chamber 7. Suitable feeding devices, such as the pipes 27, may be used to feed this liquor into the evaporating tubes 15, 18 and 19 connected into coils by suitable return bends, such as 24, 26. The vapor chamber 6 may be provided with suitable baffles as indicated and the liquor may be discharged therefrom through the liquor discharge pipe 55. The vapor may be withdrawn from this chamber through the aperture 63 and vapor discharge pipe 62 communicating with a suitable jet condenser 61. A suitable valve drip pipe 45, shown in dotted lines in Fig. 1, connects the apertures 46, 47 in the adjacent steam spaces on either side of the partition 81 and a similar valve drip pipe 44 also connects the apertures 42, 43 in the steam spaces on either side of the partition 82. The drip discharge pipes 56, 59 may as indicated communicate with the steam space of the lower effect 3 and be provided with control valves 57, 60 controlling the amount of drip entering the drip discharge pipe 58.

The multiple effect may be mounted in any desired way and as indicated a suitable support therefor may be formed by the longitudinal and transverse I-beams 72. It is also desirable to provide the ends of each effect with suitable doors in line with the evaporating tubes and these doors 51, 52 and 53 may be conveniently removably secured to the end plates 85, 86 of the effect by suitable stud bolts 87. Also for convenience a suitably hinged bracket 54 may be provided to support each door and guide it as it is swung into place at the end of the cooperating effect. In this way, the feed vapor chambers may be readily opened and inspected and the tubes and connections repaired when necessary. Suitable manholes, such as 70, may also be arranged in the inclosing shell at the desired points therein.

Having described this invention in connection with a number of illustrative forms, arrangements, proportions and parts thereof, to the details of which disclosure the invention is not of course to be limited, what is claimed as new and what is desired to be secured by Letters Patent is set forth in the appended claims.

1. In multiple effect vacuum evaporating apparatus of the film type, a rectangular sectioned, inclosing shell, partition plates mounted within said shell, and each forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects having tube sheets mounted to form a feed chamber and a vapor chamber at the ends of the effect, evaporating tubes mounted in said tube sheets and extending through the steam space of the effect, return bends coöperating with the ends of said evaporating tubes to connect them into coils and feed pipes in said feed chamber to feed liquor into said coils, doors removably secured to the ends of the effect in line with the evaporating pipes, sectional baffles in said vapor chamber, a vapor pipe connecting the vapor chamber with the steam space of any succeeding effect and a liquor pipe discharging liquor from the vapor chamber to any succeeding effect, the steam spaces being substantially opposite each other in the different effects and the feed and vapor chambers being substantially opposite therein.

2. In multiple effect vacuum evaporating apparatus of the film type, a rectangular sectioned, inclosing shell, partition plates mounted within said shell, and each forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects having tube sheets mounted to form a feed chamber and a vapor chamber at the ends of the effect, evaporating tubes mounted in said tube sheets and extending through the steam space of the effect, return bends coöperating with the ends of said evaporating tubes to connect them into coils and feed pipes in said feed chamber to feed liquor into said coils, sectional baffles in said vapor chamber, a vapor pipe connecting the vapor chamber with the steam space of any succeeding effect and a liquor pipe discharging liquor from the vapor chamber to any succeeding effect, the steam spaces being substantially opposite each other in the different effects and the feed and vapor chambers being substantially opposite therein.

3. In multiple effect vacuum evaporating apparatus of the film type, a rectangular sectioned, inclosing shell, partition plates mounted within said shell, and each forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects having tube sheets mounted to form a feed chamber and a vapor chamber at the ends of the effect, evaporating tubes mounted in said tube sheets and extending through the steam space of the effect, return bends coöperating with the ends of said evaporating tubes to connect them into coils and feed pipes in said feed chamber to feed liquor into said

coils, and connections between said effects, the steam spaces being substantially opposite each other in the different effects.

4. In multiple effect vacuum evaporating apparatus, an inclosing shell, a partition plate mounted within said shell and forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects comprising evaporating tubes, liquor feeding means cooperating with said tubes and connections between said effects, the steam spaces being substantially opposite each other in the different effects in said shell.

5. In multiple effect vacuum evaporating apparatus, a rectangular sectioned, inclosing shell, a partition plate mounted within said shell and forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects comprising a steam space, evaporating tubes, liquor feeding means and connections between said effects, the steam spaces being substantially opposite each other in the different effects.

6. In multiple effect vacuum evaporating apparatus of the film type, an inclosing shell, partition plates mounted within said shell and each forming the common partition wall separating the adjacent chambers for the different effects in said shell to minimize radiation losses therefrom, each of said effects comprising evaporating tubes extending through the steam space of the effect, liquor feeding means coöperating with said tubes and connections between said effects, the steam spaces being substantially opposite each other in the different effects in said shell.

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