

(No Model.)

2 Sheets—Sheet 1.

S. PICK.

APPARATUS FOR EVAPORATING LIQUORS CONTAINING SALT.

No. 456,499.

Patented July 21, 1891.

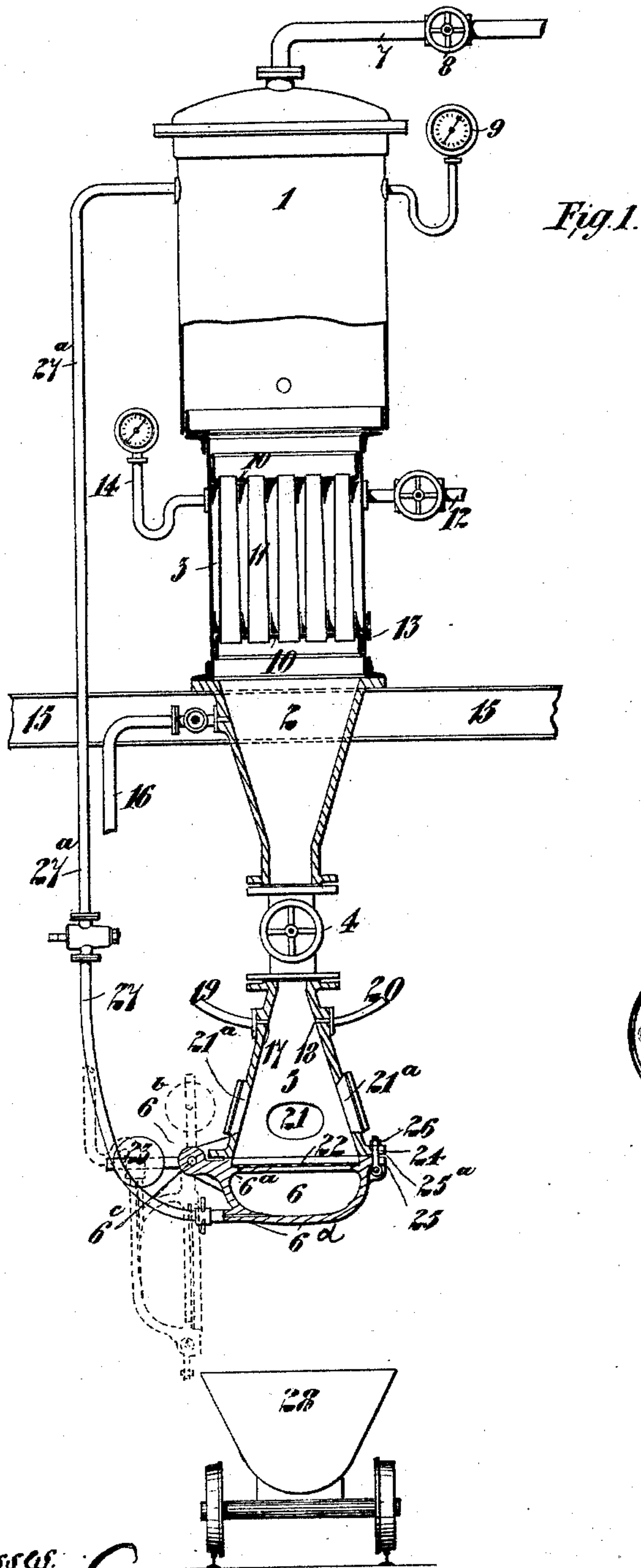
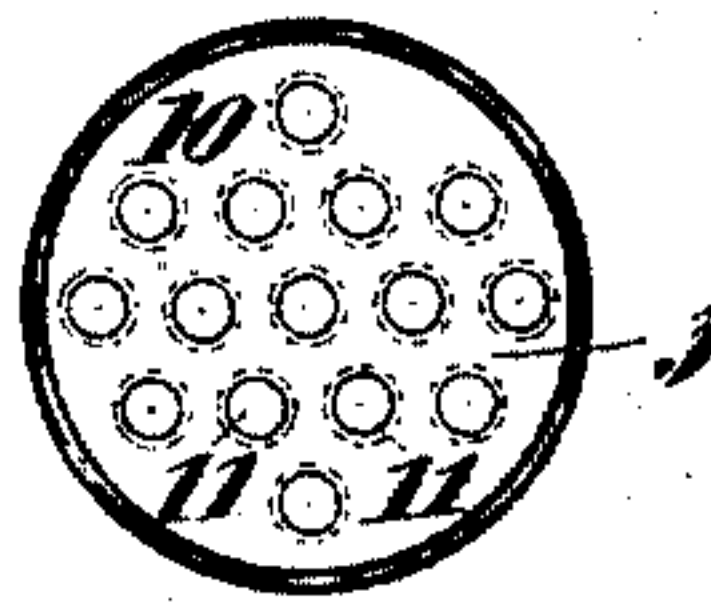


Fig. 2.



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Inventor:
S. Edmund Pick

(No Model.)

2 Sheets—Sheet 2.

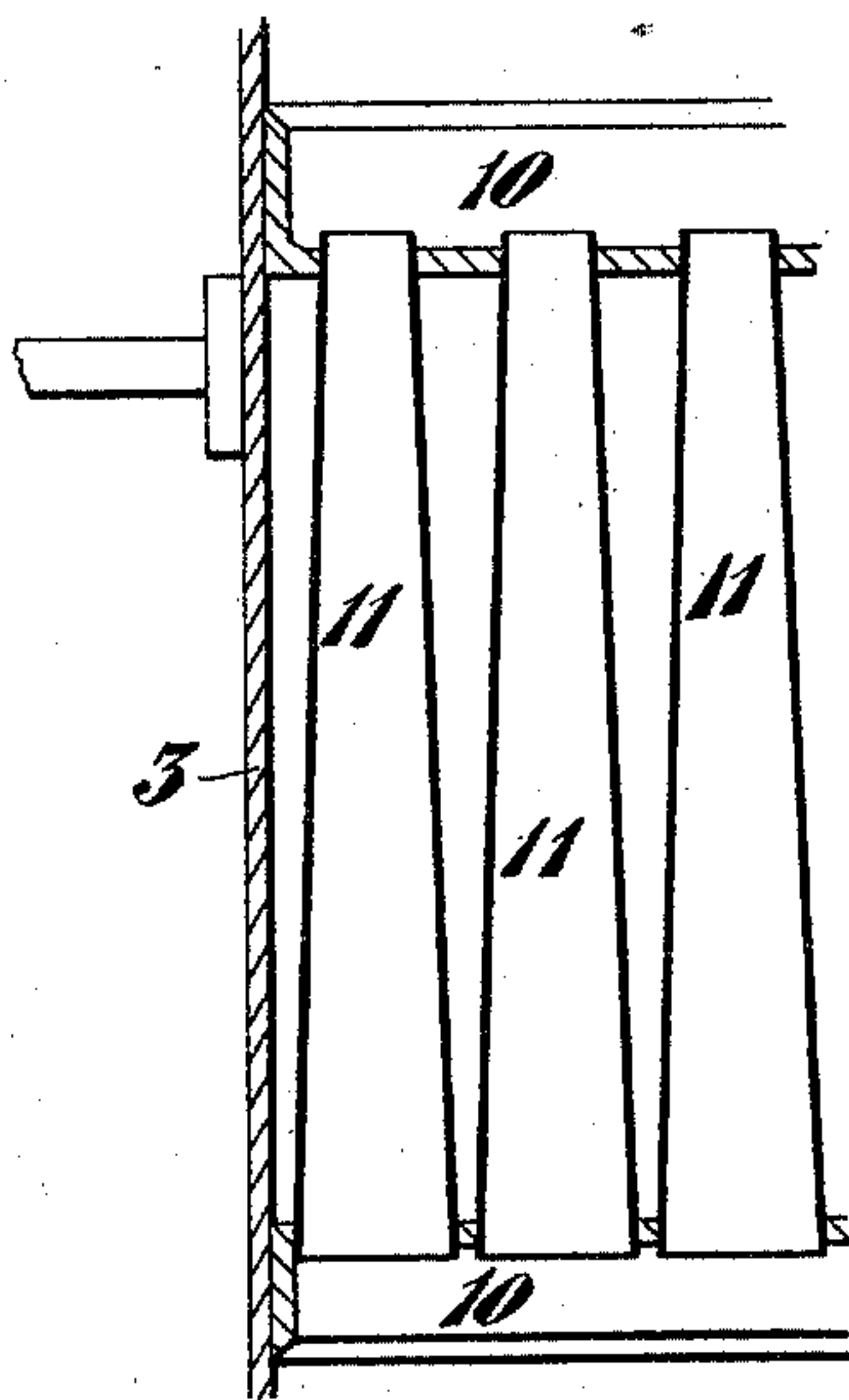
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Fig. 3.



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SIGISMUND PICK, OF SZCZAKOWA, AUSTRIA-HUNGARY.

APPARATUS FOR EVAPORATING LIQUORS CONTAINING SALT.

SPECIFICATION forming part of Letters Patent No. 456,499, dated July 21, 1891.

Application filed April 15, 1890. Serial No. 348,005. (No model.)

To all whom it may concern:

Be it known that I, SIGISMUND PICK, a subject of the Emperor of Germany, residing at Szczakowa, Galicia, Austria-Hungary, have invented Improvements in Apparatus for Evaporating Liquors Containing Salts and for Separating such Salts when Rendered Insoluble by Evaporation, of which the following is a specification.

This invention has reference to improvements in the apparatus of the kind described in the specification of an application for Letters Patent of the United States filed by me, dated April 15, 1890, Serial No. 348,004, for evaporating liquors containing salts and separating the salts deposited from the concentrated liquors. The apparatus described in that specification comprises a number of boilers—three in the example illustrated—each provided with a central internal heating-chamber formed by two tube-plates traversed by tubes that place the upper and lower parts of the boiler in communication. These boilers are so connected that the steam generated by the evaporation of liquid in one is utilized for evaporating liquid in another, as in the well-known Rillieux triple-effect apparatus.

To separate the salt precipitated by the evaporation of the liquor, each boiler is provided at its lower end with a vacuum-filter comprising two main parts—viz., a top part that can be placed in communication with the lower end of the boiler above it by a sluice-valve (or it might be otherwise) and a bottom part that can be placed in communication with the upper portion of the same boiler by a pipe. The filtering medium is arranged between the top and bottom main parts of the filter, which are connected together when the apparatus is in use. The side wall of the top part of the filter is provided with an air-inlet pipe, a pipe with rose for supplying water to wash separated salt, and with a man-hole through which the separated salt can be withdrawn from time to time, as required.

Now the present invention has for objects to improve the construction of the above-described apparatus and to render it more efficient and economical.

To adapt the apparatus for effectively treating large quantities of liquor at a time, the upper part of the boiler is made of greater

diameter than the heating-chamber. With this construction the depth of liquor will be small, even when treating a comparatively large quantity, and the boiling of the liquor can be more advantageously carried on than heretofore. In order to facilitate the descent and deposit in the lower part of the boiler of the salt precipitated by evaporation of liquor and to prevent deposit of scale on the tubes of the heating-chamber, these tubes are made of gradually-increasing cross-sectional area from their upper to their lower ends. By this construction increased heating-surface is also obtained.

To enable the separated salt to be quickly discharged by gravity from the top part of the filter, and thereby to dispense with the manual labor heretofore necessary for removing the salt, the following construction is adopted: The filtering medium—for example, a perforated plate covered with a layer of porous material, such as cloth—is secured within the bottom part of the filter, and this part is so mounted and arranged in relation to the top part that it can be quickly moved from below the top part containing the salt, which can thus be allowed to fall into a suitable receptacle placed below to receive it. For this purpose a convenient arrangement is to hinge the bottom part of the filter to the top part, so that the bottom can swing downward, a screw-bolt or other suitable catch being provided, whereby the bottom can be quickly secured or released, as required. To admit of the opening and closing of the bottom part of the filter without breaking its connection with the upper end of the boiler above it, the communication is formed partly by a flexible pipe or hose.

In order that the present improvements may be clearly understood, reference is made to the accompanying drawings, in which—

Figure 1 is a vertical section, partly in elevation, of an apparatus embodying all the improvements hereinbefore referred to. It also shows in elevation a truck on rails to receive the salt or other matter deposited. Fig. 2 is a section on the line $x x$, Fig. 1. Fig. 3 is an enlarged detailed view showing more especially the construction of the frusto-conical pipes of the heating-chamber.

1 is the upper part of the boiler; 2, the lower

part; 3, the tubular heating-chamber; 4, the valve-casing for a sluice-valve or other suitable arrangement serving the same purposes. 5 is the top part of the vacuum-filter, and 6 is its bottom part. As will be seen, all these parts are made separate from one another, but so that they can be readily connected in the order shown, and are easily accessible for inspection and repair. The upper part 1 of the boiler is shown as made of greater diameter than the heating-chamber 3 in order to reduce the height or pressure of the brine or other solution treated, and consequently to facilitate its rapid evaporation. The part 1 is provided with a pipe 7, with valve 8, by which its interior can be placed in communication with a condenser (or with the heating-chamber of the next apparatus, if two or more are used together) for the purpose of producing a vacuum in the boiler to assist evaporation of liquor therein.

9 is a vacuum-gage.

The heating-chamber consists of a cylindrical shell within which are secured two flanged tube plates 10 10, in which are fixed tubes 11 that serve to place the upper and lower parts of the boiler in communication. These tubes are according to this invention made of gradually-increasing cross-sectional area as they proceed downward, being in the example of frusto-conical form.

12 is an inlet-pipe with valve for admitting steam to the interior of the heating-chamber to surround the tubes 11.

13 is a connection for a steam-trap, and 14 is a pressure-gage. The lower part 2 of the boiler, which in the example shown supports the other parts of the apparatus and is of suitable material, is carried by a suitable frame-work or support 15 and is in the form of an inverted truncated cone. To it is attached an inlet-pipe 16, with valve for admitting the liquor to be treated—for example, brine in the manufacture of salt, for which this apparatus is specially adapted.

The sluice-valve and its case 4 may be of any suitable construction adapted to provide a free passage when the valve is opened between the top part 5 of the filter and the lower part 2 of the boiler. The top part 5 of the filter is formed with two lateral openings 17 and 18, respectively, establishing communication between its interior, when required, with the atmosphere by a pipe 19 and with a water-supply by a pipe 20.

21 is a man-hole normally closed.

21^a 21^a are sight panes of glass.

22 is a perforated plate upon which the filtering material is placed. For the more economical working of the apparatus this perforated plate 22, with filtering material, is secured in the bottom part 6 of the filter.

6^a is a projecting ledge within the part 6 of the filter, which part is formed with a projection 6^b or lugs, by which it is hinged or jointed at 6^c to a similar projection or lugs on the top part 5.

23 is a counterbalance-weight secured to a rod carried by the projection 6^b.

24 are screw-bolts (one only of which can be seen in the drawings) jointed to the bottom part 6 and capable of turning upward, so as to pass through slots 25 25^a in the flanges of the bottom and top parts 6 and 5, respectively, when these parts are brought together. On each bolt 24 is a nut 26, whereby the two parts of the filter can be firmly held together, but nevertheless in such a manner as to admit of readily releasing the bottom part.

27 is a length of flexible pipe or hose connecting the outlet branch 6^d of the bottom part with a pipe 27^a, that is provided with a valve. By these pipes 27 and 27^a liquor filtered from the salt can be conveyed from the bottom part of the filter to the upper part of the boiler (wherein a vacuum is maintained) by the pressure of the atmosphere admitted to the interior of the top part of the filter through the pipe 19. With this construction, after the salt deposited in the top part of the filter has been separated from the liquor with which it was mixed and such liquor has been forced through the pipes 27 and 27^a to the upper part 1 of the boiler, the bottom part 6 of the filter can be quickly unfastened and allowed to assume the open attitude indicated by dotted lines in Fig. 1, and the salt in the top part then allowed to fall by gravity into a suitable truck or receptacle 28 placed to receive it, the flexible hose permitting this movement of the lower part of the filter without breaking connection with the pipe 27^a.

As will be obvious, a single apparatus constructed as hereinbefore described can be used by itself, or a number of them may be connected together, as in the arrangement of apparatus described in the former specification hereinbefore referred to. In the latter case, supposing three or more apparatus to be used, the upper ends of the first and second boilers are connected with the heating-chamber of the second and third boilers, respectively, in order to utilize the heat of the steam generated in the first and second boilers for evaporating liquor in the second and third boilers, respectively, as in the original arrangement of apparatus.

Each apparatus is provided with a steam-trap, (not shown,) with gages, and with a pipe for leading non-condensable gases from its heating-chamber to an air-pump, as well understood.

When using two or more apparatus of the kind herein described for evaporating brine, it is advantageous to supply the brine to each apparatus separately and not to admit it to one vessel and cause it to flow therefrom to the next, as described in the said former specification.

What I claim is—

1. In a salt-liquor-evaporating apparatus, the combination, with a boiler having a heating and vacuum chamber, of a vacuum-filter

located below said chamber, a valve for controlling the communication between the lower part of said boiler and the upper part of said filter, said filter having a lower hinged or movable part, and a flexible pipe connection between said part and the boiler, substantially as described.

2. In a salt-liquor-evaporating apparatus, the combination, with a boiler having a heating and vacuum chamber, of a vacuum-filter, a valve controlling the communication between the lower part of said boiler and the upper part of said filter, said filter provided with an air-inlet pipe and having a lower hinged or movable part having a counterpoise at its hinged side and at its opposite side jointed screw-bolts engaging slots in flanges of the lower and upper parts of the filter, and a flexible pipe connection between the lower part of the filter and the boiler, substantially as described.

3. In apparatus for the purpose above specified, the combination of a boiler provided with a heating-chamber, a vacuum-filter consisting of a top part 5, with inlets for air and water, a bottom part 6, hinged or jointed to said top part 5 and provided with an outlet-pipe 6^d for liquor, a filtering medium carried by said bottom part 6, means, substantially as described, for engaging and disengaging said top and bottom parts, a pipe 27^a in communication at its upper end with the

upper part of the boiler, and a flexible pipe 27, connecting the lower part of said pipe 27^a with the outlet-pipe 6^d, substantially as herein described, for the purposes set forth.

4. An apparatus for the purpose above described, consisting of a boiler having an upper part with outlet-pipe 7 and a lower part 2, of inverted truncated conical form, a heating-chamber 3, with vertical tubes for placing the parts 1 and 2 in communication, said upper part 1 being of greater diameter than said heating-chamber, and said heating-chamber being external to said upper and lower parts of the boiler, but connected to both of them, a vacuum-filter arranged below said boiler and having a top fixed part 5 and a movable bottom part 6, a valve-casing 4, with valve arranged between the lower part 1 of the boiler and the top part of said filter and connected to both, a pipe 27^a, connected at its upper end to the upper end of said boiler, and a flexible pipe 27, connecting the lower end of said pipe 27^a with the bottom part of said filter, substantially as described, for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SIGISMUND PICK.

Witnesses:

WIKTOR GRYCHOWSKI,
EUGEN WOJUARSTE.