C. L. SCHALITZ.

EVAPORATOR.

APPLICATION FILED MAY 8, 1908.

909,028. Patented Jan. 5, 1909.

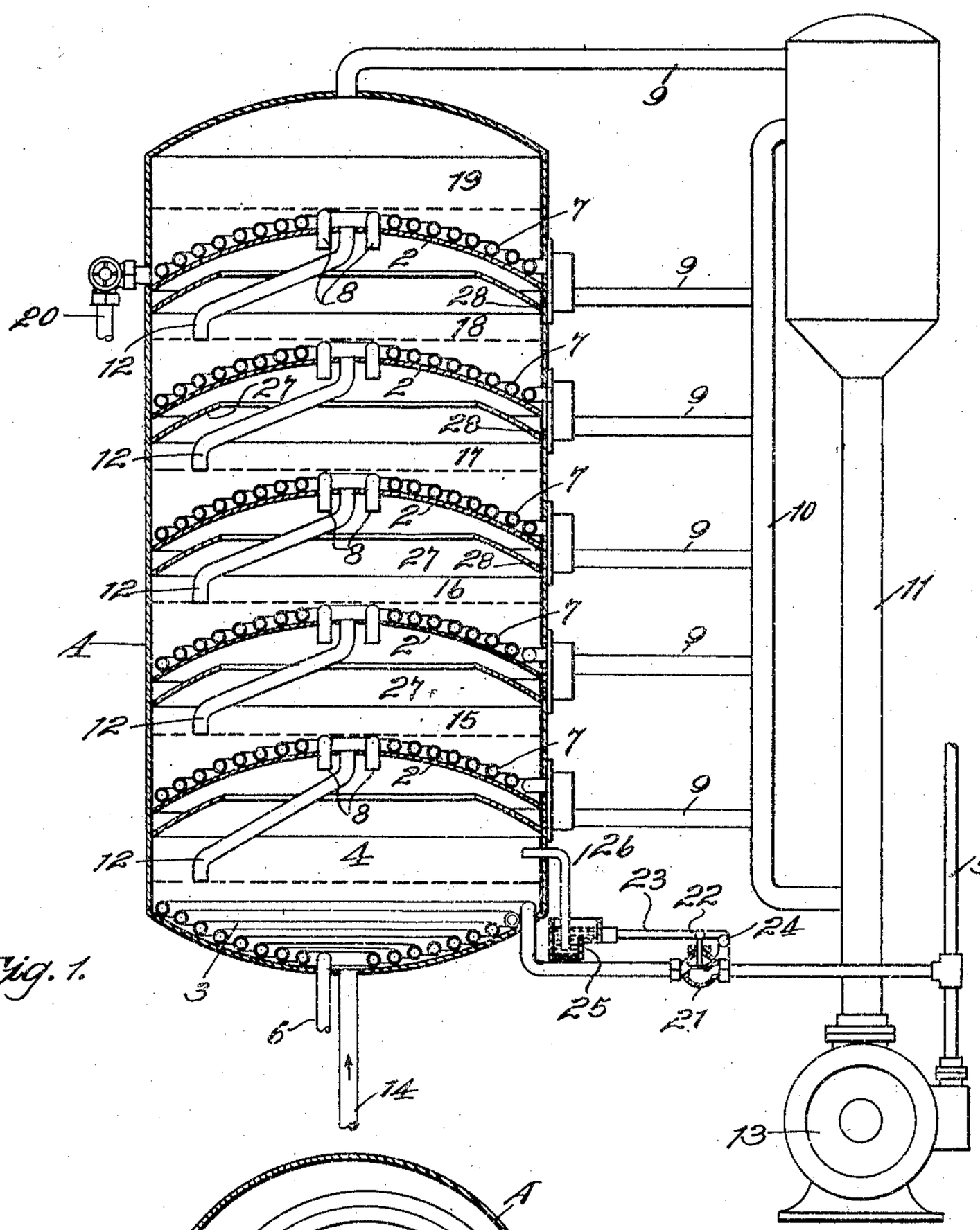

Fig. 1.

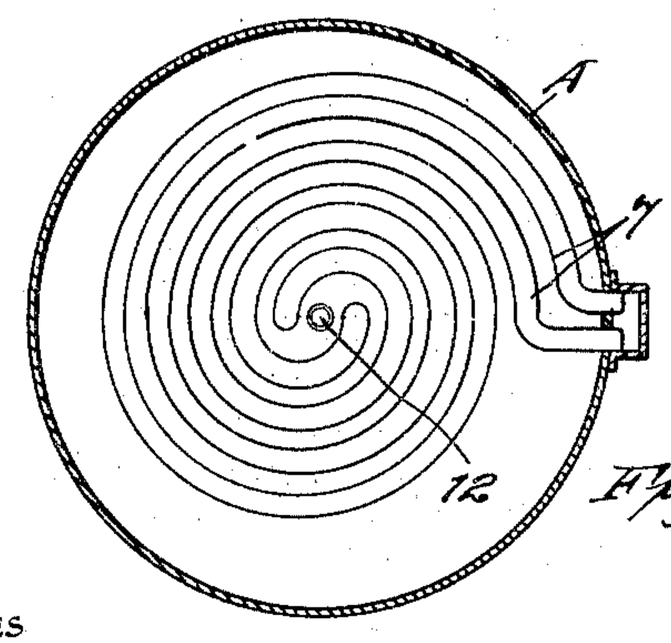

Fig. 2.

WITNESSES

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CARL L. SCHALITZ, OF SAN FRANCISCO, CALIFORNIA.

EVAPORATOR.

No. 909,028. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed May 8, 1908. Serial No. 431,689.

To all whom it may concern:

Be it known that I, CARL L. SCHALITZ, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Evaporators, of which the following is a specification.

My invention relates to evaporators, and especially to evaporating apparatus for use in sugar refining.

The object of this invention is to provide an upright multiple-effect evaporator, thereby economizing space and giving a maximum of heating surface; also to provide means for removing the condensed moisture from the evaporating chambers; and to provide means for maintaining a uniform heat in the evaporating chambers, and for regulating the heat consistently with the vacuum formed in the chambers.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the device. Fig. 2 is a transverse section.

A represents a casing of any suitable size, shape or material. It is preferably in the form of an upright cylinder, and its interior is divided off into a series of superposed hambers by suitable convex partitions 2. A steam coil 3 for heating purposes is arranged in the bottom of the initial or lowermost chamber 4, this coil connecting with a steam pipe 5 leading from any suitable source of steam supply. The exhaust steam from coil 3 passes out at 6. Each chamber in the evaporator is also provided with a steam coil, or a pair of coils, as here shown at 7; these coils having their ends 8 projecting down through the partition 2 into the chamber below, preferably centrally thereof. These coils 7 each discharge at their lower extremities proximate to the periphery of the evaporator into a drain pipe 9: these several drain pipes 9 leading into the drain trunk 10 which connects at each end to the condenser 11.

Each chamber in the evaporator above the lowermost chamber 4 is in communication with the chamber immediately beneath through a pipe 12 which extends from approximately the center of an upper chamber to a point adjacent to the periphery and near the bottom of the chamber immediately beneath.

The drain pipes 9—10 and condenser 11 are suitably connected with an exhauster or pump 13.

The operation of the apparatus is as follows: The material to be evaporated is first admitted into the lower chamber 4 through the inlet pipe 14. The steam is turned on into coil 3 and the pump set in operation. The steam in the coil 3 heats up the material in the lower chamber 4, and the exhaust created through the coils 7 and their inlets 8 in the several chambers produces a partial vacuum in each of the chambers. This results in causing the syrup or other liquid in the lower chamber to boil at a point somewhat less than 212° Fahrenheit. The steam rising from the boiling liquid in chamber 4 is drawn out through the outlets 8 of the coil 7 immediately above to the exhauster. Of course, the same suction is exerted through the several series of coils above. The material to be evaporated is continually fed in under suitable head through the inlet 14 and finally reaches the mouth of the pipe 12 in chamber 4. It is at this moment that the suction in chamber 15 immediately above begins to act and draws up a portion of the liquid in chamber 4 into chamber 15. This liquid spreads out over the floor of the chamber, and soon the heat from the steam rising from chamber 4 and circulating through the coils 7 sets this elevated material in chamber 15 to boiling; and the steam rising from chamber 15 is drawn out through the coil 7 in the bottom of chamber 16 above, just as in the first instance. The liquid in the chamber 15 gradually accumulates until it covers the mouth of the pipe 12 in that chamber, whereupon the vacuum created in chamber 16 draws up the liquid into chamber 16, and this spreads out and is heated and boiled again in the same way. Its steam is exhausted in a similar manner, and the chambers 17—18—19 above are gradually filled to the level of their respective pipes 12; the final evaporated product being drawn off through the outlet 20. The condensed moisture in the several series of coils 7 flows out through respective pipes 9 and downward through the pipe 10 to a suitable point where it is finally discharged from the exhauster, while the steam has an opportunity

to rise upwards through the pipe 10 and be condensed in the enlarged part of the condenser 11. As the mouth of each of the pipes 12 in the several chambers 4—15—16, etc., becomes sealed by the rising liquid in these chambers, the vacuum in the chamber above becomes correspondingly increased; and consequently the boiling point in the chambers is correspondingly reduced. Thus, for example, there may be five inches of vacuum in chamber 4 and the liquid will boil at 200° Fahrenheit. In chamber 15 there will be ten inches of vacuum and the liquid will boil at 180° Fahrenheit. In chamber 16 there might be fifteen inches of vacuum and the liquid will boil at 160° Fahrenheit; and so on, until in chamber 19 there might be twenty-seven inches of vacuum and the liquid would boil at 100° Fahrenheit.

In order to suitably regulate the admission of the steam to the initial steam coil 3 and control the heat by the amount of vacuum, I have shown the pipe leading to the steam coil 3 as provided with a valve 21 which may be opened by the pressure of the steam flowing from pipe 5. This valve is provided with a stem 22 which pivots to a lever 23, the latter being fulcrumed at one end to 24, and carrying a mercury cup 25 at the opposite end. A small pipe 26, which may be ten or twelve inches in length, has one end entering chamber 4 and the other end dipping into the mercury in the cup 25. There is a sufficient quantity of mercury in the cup 25 to hold the valve 21 closed until say five inches of vacuum is created in chamber 4, which will result in drawing say five inches of mercury up into the pipe 26. This will reduce the amount of mercury in the cup 25 so as to allow the steam pressure on the under side of valve 21 to force open the valve and admit steam into the coil 3. Thus, by increasing or decreasing the quantity of mercury in the cup 25, the amount of vacuum in the several evaporating chambers may be regulated accordingly, and the heat in the several chambers maintained uniform.

The partitions 2 are preferably made arched, as shown, so that any moisture condensing on the under side of these partitions will drain towards the periphery of the shell A and there be caught by the annular shelves or shields 27; the moisture so collected passing out through small outlets 28 into the drain pipes 9. It is understood that these outlets 28 are not large enough to interfere with the proper suction and circulation through the coil 7.

Evaporators built according to these specifications are in use at the present time, and are operating successfully.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In an evaporator having an evaporator chamber, a steam coil therein, means for creating a vacuum effect in said evaporator chamber, and means including an automatically operating valve in the inlet to the steam coil for regulating the admission of steam to the steam coil by the vacuum in said chamber.

2. An evaporator having an evaporating chamber, a steam coil in said chamber, means for creating a vacuum effect in said chamber, said steam coil having an inlet and an outlet, a valve in the inlet, and means controlled by the vacuum in the chamber for operating said valve.

3. An evaporator having an evaporating chamber, a steam coil in the chamber, means for creating a vacuum effect in the chamber, a valve controlling the admission of steam to said coil, said valve having a stem, a lever to which the stem is connected, said lever carrying a mercury cup and weighted with mercury normally to hold the valve closed, and a pipe entering the evaporating chamber and dipping into the mercury in said cup.

4. An evaporator having a plurality of superposed evaporating chambers, said chambers divided one from the other by arched partitions, a coil resting on the top of each partition and having one end extending into the chamber below and the other end connected with a suitable exhaust apparatus, an exhaust apparatus therefor, a steam coil for heating the initial chamber, said coil having an inlet and an outlet, a valve in the inlet and automatically controlled by the vacuum in the chamber, and pipes for the flow of the liquid to be evaporated leading from respective chambers above and opening into the chambers below.

5. An evaporator having multiple evaporating chambers arranged one above the other, means for simultaneously creating a vacuum effect in the several chambers, a steam coil for heating the lowermost chamber, a valve in said inlet, and means controlled by the vacuum for operating the valves, and suitable connections between the chambers whereby on the production of a vacuum effect in said chambers the material to be evaporated is lifted successively through the several chambers.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CARL L. SCHALITZ.

Witnesses:
CHARLES EDELMAN,
C. C. COOK.