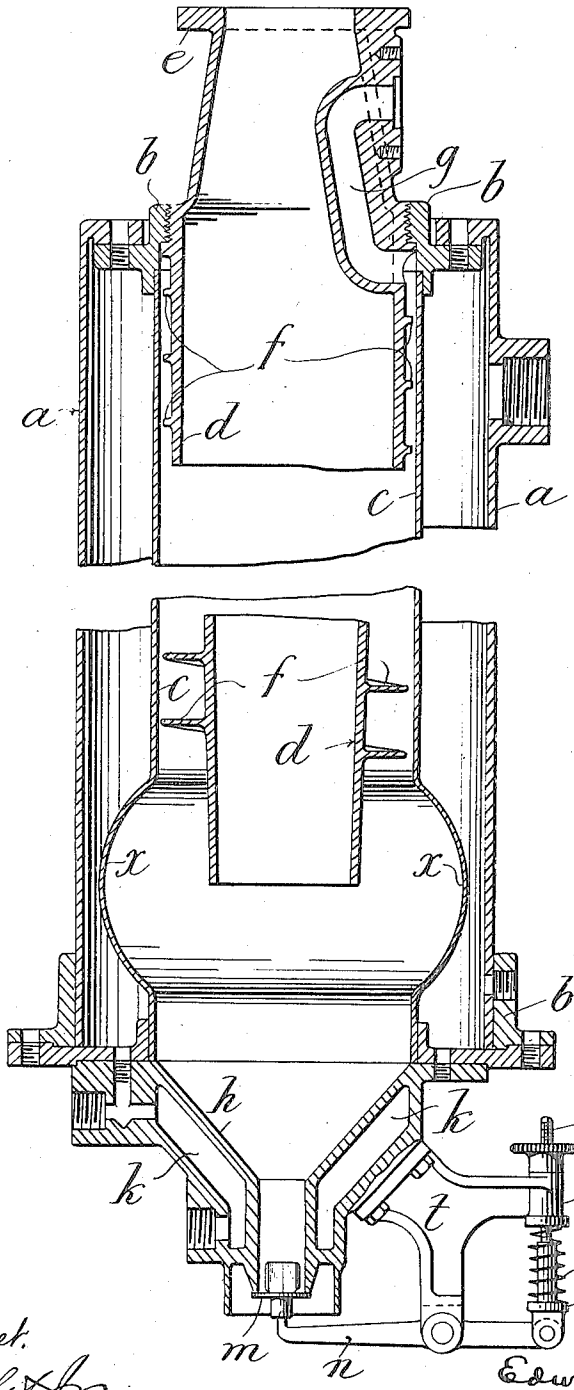
E. SHAW.

APPARATUS FOR EVAPORATING OR CONCENTRATING LIQUIDS.

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1,164,413. Patented Dec. 14, 1915.



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APPARATUS FOR EVAPORATING OR CONCENTRATING LIQUIDS.

1,164,413. Specification of Letters Patent. Patented Dec. 14, 1915.

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To all whom it may concern:

Be it known that I, EDWARD SHAW, a subject of the King of Great Britain and Ireland, residing in London, England, have invented Improvements in Apparatus for Evaporating or Concentrating Liquids, of which the following is a specification.

This invention has reference to the evaporation or concentration of liquids, particularly solutions such for example as sugar syrups.

According to the invention the syrup or other liquid to be treated is heated by forcing it through a spiral passage of gradually increasing area formed by a spiral plate interposed between two tubes the outer of which is steam jacketed and the inner of which serves as the outlet for the steam from the end of the spiral passage; preferably the inner tube is constituted by a cone and the outer tube by a cylinder, the cone being inverted so that the passage increases in area toward the lower end. The liquid is forced in regulated quantity into the said passage at the top and a slight space is left for the passage of some syrup between the edge of the spiral plate and the surrounding tube for the purpose of allowing a portion of the liquid as it is whirled through the spiral passage to pass and thus prevent any portion of the heated wall becoming uncovered and causing the syrup, if syrup is the liquid undergoing treatment, to caramelize, the space being sufficiently large to prevent any syrup being retained between the edge of the spiral plate and the heated wall which would result in discoloration. Below the spiral passage the syrup continues to flow down along the wall of the outer tube which at this part as well as at the part surrounding the passage is steam jacketed so that throughout its whole course and until it leaves the apparatus the syrup is in contact with walls at a higher temperature than that of the syrup and is uniformly heated and escape of vapor and steam facilitated.

The accompanying illustrative drawing shows in central vertical section one construction of apparatus suitable for the said treatment.

In the apparatus illustrated the upper and lower ends of a cylindrical steam jacket *a* have flanges *b* fixed to them in which the upper and lower ends of a steel or copper cylinder *c* are mounted. Depending within the cylinder *c* is a hollow vertical cone *d* which is fixed as by screwing into the upper flange *b* of the jacket and the lower end of which terminates a short distance above the lower end of the cylinder *c*. The upper end of the cone *d* extends above the cylinder *c* and jacket *a* and is flanged at *e* for connection to a steam escape pipe. The spiral passage is formed by a spiral web *f* on the exterior of the cone *d* the web projecting to such an extent as to leave a small space, as shown, between it and the adjacent wall of the cylinder *c* that surrounds it. Liquid is admitted to the spiral passage so formed through a conduit *g* within the cone *d*, the inlet end of such conduit being at the upper part of the cone at the exterior of the cylinder *c* and steam jacket *a*.

Secured to the lower end of the steam jacket *a* is a conical cover *h* which is also provided with a steam jacket *k* and into which the heated liquid falls from the spiral passage. The lower end of the conical cover may be furnished with a valve *m* that is supported by a lever *n* which is influenced by a spring *o* arranged between a flange or head *p*, on the lower end of a rod *r* pivoted to the outer end of the lever *n*, and a lug *s* on the bracket *t* which carries the lever *n*. In practice, however, it is found that the valve may be dispensed with, the steam passing away freely through the cone *d*, the valve being used when it is required to clean the apparatus by pumping water through it. The upper portion of the rod *r* is screw threaded and extends through the lug *s* above which it is fitted with a milled nut *w* whereby the tension of the spring *o* can be adjusted as desired.

Provision is made for differences in expansion of the parts, for example, by an expansion joint or the steel or copper cylinder *c* is bulged outwardly at *x*, near its lower end, to allow the cylinder to expand and contract without straining the flanged joints of the steam jacket *a*.

What I claim is:—

1. Apparatus for evaporating or concentrating liquid by forcing it through a spiral passage of gradually increasing area formed by a spiral plate interposed between two tubes within a steam jacket, wherein the inner of said tubes serves as the outlet for the vapor or steam from the lower end of the spiral passage, and the outer tube extends beyond the spiral passage so that the syrup

continues to flow along the wall of the outer tube, as set forth.

2. Apparatus for evaporating or concentrating liquid by forcing it through a spiral passage of gradually increasing area formed by a spiral plate interposed between two tubes within a steam jacket, wherein the inner of said tubes serves as the outlet for the vapor or steam from the lower end of the spiral passage, and the outer tube and the steam jacket extend beyond the spiral passage so that the syrup continues to flow along the heated wall of the outer tube, as set forth.

3. Apparatus for evaporating or concentrating liquids comprising a vertical cone surrounded by a cylinder contained within a steam jacket, a spiral plate interposed between the cone and the cylinder and forming therebetween a spiral passage of gradually increasing area, and an inlet for liquid to be treated at the top of the said passage, the bottom of the said passage being in free communication with the internal cone which serves as the outlet for vapor or steam, as set forth.

4. Apparatus for evaporating or concentrating liquids comprising a vertical cone surrounded by a cylinder contained within a steam jacket, a spiral plate interposed between the cone and the cylinder and forming therebetween a spiral passage of gradually increasing area, and an inlet for liquid to be treated at the top of the said passage, the bottom of the said passage being in free communication with the internal cone which serves as the outlet for vapor steam, and the surrounding cylinder and the steam jacket extending below the cone and forming a chamber into which the liquid from the spiral passage flows, as set forth.

5. Apparatus for evaporating or concentrating liquid by forcing it through a spiral passage of gradually increasing area formed by a spiral plate interposed between two tubes within a steam jacket, wherein a slight space is left between the edge of the spiral plate and the outer of said tubes, the inner of said tubes serves as the outlet for the vapor or steam from the lower end of the spiral passage, and the outer tube extends beyond the spiral passage so that the syrup continues to flow along the wall of the outer tube, as set forth.

Signed at London England this 16th day of February 1915.

EDWARD SHAW.

Witnesses:
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