To all whom it may concern:

Be it known that I, Edward Shaw, a subject of the King of Great Britain, residing at Toronto, Ontario, Canada, have invented certain new and useful Improvements in Apparatus for Evaporating or Concentrating Liquids, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an improvement in an apparatus for evaporating or concentrating liquids, particularly solutions such, for example, as sugar syrups, and is a specific improvement upon my U. S. Patent Number 1,164,413, dated December 14th, 1915.

The apparatus disclosed in my said patent comprises a spiral passageway gradually increasing in area and formed by a spiral plate interposed between two tubes, the outer of which is steam jacketed and the inner of which serves as an outlet for the steam from the end of the spiral passage.

In this patent the inner tube is composed of a cone surrounded 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 at the top of this spiral passage and a slight space is left between the outer edge of the spiral plate or shelf and the surrounding cylinder for the passage of some syrup for the purpose of allowing a portion of the liquid to pass the edge of the spiral plate as it is whirled through the spiral passage.

My present improvement is to slope the spiral shelf or plate downward to an angle preferably of about 45°, but the angle may vary from 30° to 60° according to the nature of the solution being treated.

This improvement is found to have great practical value in a vertical apparatus, as here shown, because it keeps a better film on the hot surface of the steam heated tube and prevents the syrup from traveling along a relatively cold platform and relatively cold inner tube or cone.

The accompanying drawing is a central vertical sectional view of an apparatus embodying my present improvement.

This apparatus embodies an outer jacket a and an inner cylinder b which surrounds and incloses a conical tube c, which tapers downward. The upper end of the conical tube c is screwed or fitted to a flange d at the upper end of the jacket a, and the lower end of the conical tube c stops short of the lower end of the cylinder b. The lower end of the jacket a is provided with a flange e which receives the lower end f of the cylinder b. Secured to the lower end of the steam jacket a is a conical cover g which is also provided with a steam jacket h into which the heated liquid flows from the said spiral passage. The lower end of the cover g may be furnished with a valve i that is supported by a lever k, which is influenced by a spring o arranged between a flange p on the lower end of a rod r, pivoted to the outer end of the lever k and a lug s on the bracket t, which carries lever k. In practice, however, it is found that the valve may be dispensed with, the steam passing away freely through the cone c, 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 screwed threaded and extends through the lug s, above which is fitted 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 outwardly bulged expansion portion a on the lower end of the cylinder b, which allows the cylinder to expand and contract without straining the flanged joints of the steam jacket a.

A spiral plate, flange or shelf A is interposed between the cone c and the surrounding cylinder b, and projects close to but out of contact with the surrounding cylinder b to form a spiral space between the spiral flange and the surrounding cylinder, whereby the syrup is spread upon the inner surface of the steam heated cylinder b.

In this improvement the spiral flange a is declined or sloped downward which will prevent the syrup from running in contact with the relatively cold spiral flange and the inner cone c, which is a great practical improvement over the construction shown in my aforesaid patent, which patented construction permits the syrup to remain and travel on the flange thus having a disadvantageous cooling of the liquid being treated. The steam arising from the treatment of the liquid escapes through the cone c and out of the outer end into any suitable pipe (not shown) connected therewith.

In the practice of the apparatus shown in my hereinafore-mentioned patent, I have
found that it worked perfectly with certain solutions, and that it does not do so with certain other solutions. For instance, I found that in the practice of my patented construction that certain viscous liquids, or liquids which became viscous by concentration, preferred to travel along the horizontal platform, with the steam moving along the spiral passage at the top. For this reason my patented apparatus is not adapted to properly handle viscous liquids, or liquids which become viscous by concentration. My present improvement overcomes the above-mentioned weakness of my said patent, and the apparatus herein shown and described is adapted to properly and successfully handle the various kinds of liquids in evaporating or concentrating sugar syrup.

By inclining the flange or shelf A, as shown, I find that the liquid in its downward passage is caused to travel against the hot wall of the cylinder b, instead of upon the relatively cold shelf A and against the relatively cold tubular cone c.

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

1. An apparatus for evaporating or concentrating liquid by forcing it through a spiral passage of gradually increasing area formed by a downwardly inclined spiral flange interposed between two tubes within a steam jacket, whereby the liquid is caused to travel downward against the outer hot tube, and 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. An apparatus for evaporating or concentrating liquid by forcing it through a spiral passage of gradually increasing area formed by a downwardly inclined spiral flange interposed between two tubes within a steam jacket, the spiral flange of a width to leave a slight space between its edge and the outer of its tubes, whereby the liquid is caused to travel against the outer hot tube as it flows downward, the inner of said tubes serving 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.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EDWARD SHAW.

Witnesses:

J. H. Parkin,
W. Charles Colaw.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."