No. 655,121. Patented July 31, 1900.

H. SCHAFFSTÄDT.

GRADUATOR.

(Application filed Apr. 17, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

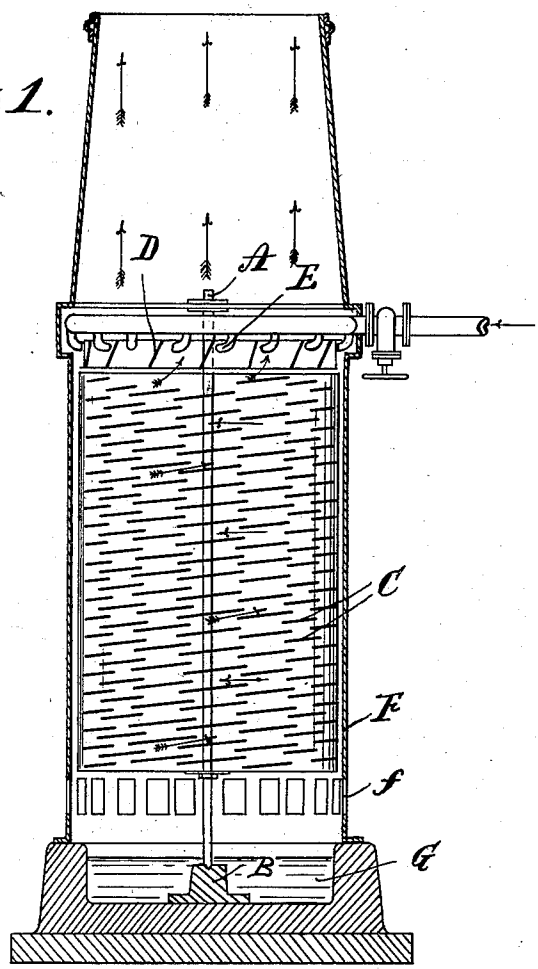
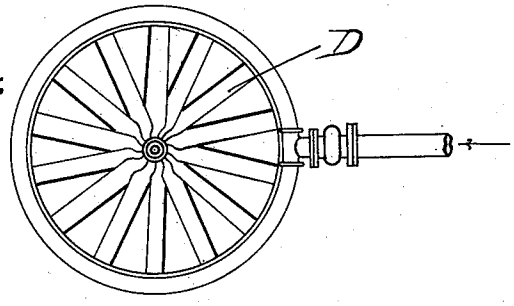


Fig. 2.



Witnesses
H. C. Etheridge
Charles G. Smith

Inventor
Heinrich Schaffstädt
By Briesen & Knauth
his Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

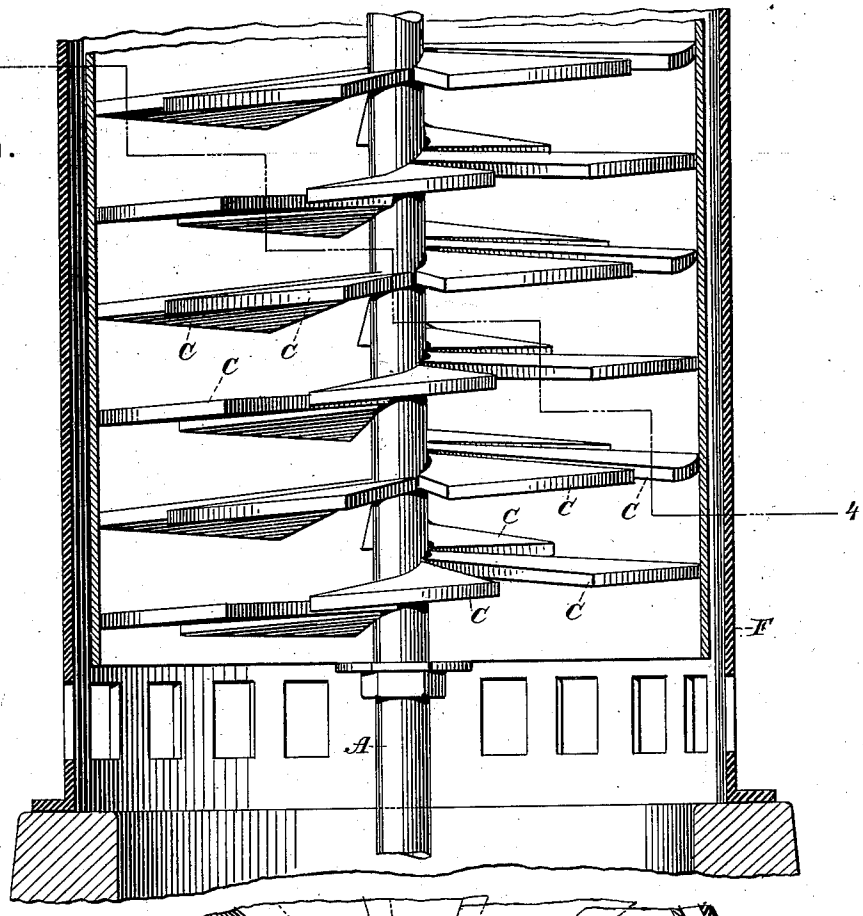
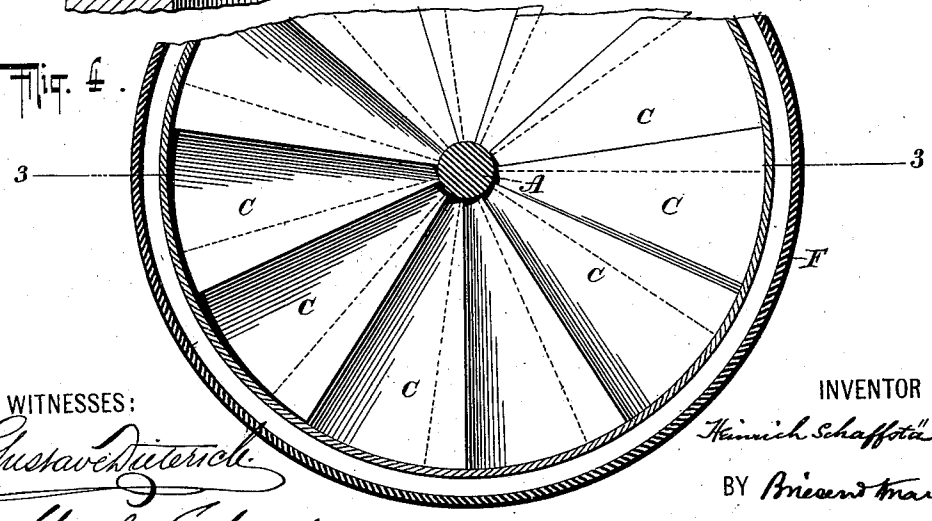


Fig. 4.



WITNESSES:

Gustave Dieterich.

Miles E. Smith

INVENTOR

Heinrich Schaffstädt

BY Brisen & Smith

ATTORNEYS

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HEINRICH SCHAFFSTÄDT, OF GIESSEN, GERMANY.

GRADUATOR.

SPECIFICATION forming part of Letters Patent No. 655,121, dated July 31, 1900.

Application filed April 17, 1900. Serial No. 13,205. (No model.)

To all whom it may concern:

Be it known that I, HEINRICH SCHAFFSTÄDT, manufacturer, residing at 12 Schanzenstrasse, Giessen, in the Grand Duchy of Hessen, German Empire, have invented new and useful Improvements in Graduators, (for which I have applied for Letters Patent in Germany, Sch. 14,474 I/17, dated February 16, 1899; additional application Sch. 15,740 I/17, dated March 8, 1900, and in England, No. 5,916, dated March 29, 1900,) of which the following is a specification.

This invention relates to improvements in graduators. Graduators as heretofore made and which are formed of fagots of thorns or the like and are used for cooling or concentrating condensed liquor possess the disadvantages that no systematic flow and distribution of the liquor or water to be cooled is effected, that no precautions can be taken to insure a suitable and powerful air circulation, and that the work which is consumed in raising the liquor to the top of the graduator is lost on the downflow or trickling through the graduator. Now this invention is designed to obviate all these disadvantages.

In the accompanying drawings, Figure 1 is a diagrammatic sectional view of one form of apparatus embodying my invention. Fig. 2 is a top view of the same. Fig. 3 is a fragmentary enlarged vertical sectional view of the apparatus, taken on the line 3 3 of Fig. 4. Fig. 4 is a fragmentary transverse sectional view of the apparatus, taken on the line 4 4 of Fig. 3.

According to the invention, I utilize as the graduator apparatus which consists of separate bars, arms, or the like arranged spirally or screw-like upon a rotatable upright spindle. The arrangement is such that the arms overlap in vertical planes, so that the water flows onto the upper part of such arms, and thence drops onto the next arm beneath, so pursuing a regular path toward the lower end of the apparatus. This rotation operates in various ways to effect the complete and rapid cooling and evaporation of the water. First, by the rotation of the arms the air which is flowing upward is driven laterally through the spaces existing between each two superposed arms, and, secondly, by reason of the spiral arrangement of the arms the whole set thereof acts as a kind of ventilator, so that the velocity of the air-current upward is increased. The water is also advantageously itself used for rotating the graduator, and to this end the latter is provided at its upper part with suitably-shaped scoops or blades. The water on entering the apparatus at the upper part thereof encounters the scoop-wheel, which fulfils three functions. First, it serves as a horizontal water-wheel for driving the whole apparatus; secondly, it simultaneously distributes the water over the whole area by reason of the said water striking upon its scoops or arms, and, thirdly, the said scoops are so disposed with respect to the horizontal planes that they act as a fan upon the air-current. The drip-arms of the graduator, situated underneath the water, are made wide and are arranged in a spiral or screw-like manner, such that by their rotation they also exert a lifting action upon the air column—that is to say, they spread the air over the scoops or blades.

The nozzles for feeding the water into the apparatus are arranged at the upper end of the apparatus and incline inward, so as to distribute the water over the whole of the scoop or water-wheel. The air enters suitable inlets at the lower end of the apparatus, and the water collects in a suitable trough or the like at the bottom thereof.

I am aware that graduators are known wherein a series of wings disposed one above the other are employed; but these wings are not arranged in such a manner that they lie closely together, so that the water drops from the edge of each wing onto that lying next below it.

In order to enable anybody skilled in the art to carry out my invention, I have affixed drawings.

A is a spindle supported in a bearing B at its foot and guided at its top. Arms C are fixed on this spindle as to form a screw plane in which the arms overlap each other in vertical planes. D shows propeller-arms which are acted upon by the water-jets from the pipes E.

In Fig. 1 arrangement of the arms C is diagrammatically illustrated for the purpose of clearer illustration. In this view the arms are not shown in their entirety in order to avoid confusion. It will, however, be under-

stood, especially upon reference to Figs. 3 and 4 of the drawings, that each of the arms extends and is connected to the supporting-spindle A.

The arms D serve not only to impart rotation to the spindle A, but they distribute the water along the arms and promote the rising of the air. F is a mantle which surrounds the rotating device as closely as possible. *f* shows apertures in the mantle to allow the inlet of the air.

The water dripping from the arms C is collected in the basin G.

Now what I claim, and desire to secure by Letters Patent, is the following:

1. In a graduator the combination of a rotatable spindle with arms which overlap one another in vertical planes and which are fixed in spiral lines on the spindle, means to distribute water on the top series of arms and means for admitting air at the lower portion of the structure, substantially as described.

2. In a graduator the combination of a rotatable spindle with superposed arms which overlap one another in vertical planes and which are fixed in spiral lines on the spindle, means for distributing water on the top series of arms, means adapted to be acted upon by the water to turn the spindle and means for admitting air at the lower portion of the structure, substantially as described.

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

HEINRICH SCHAFFSTÄDT.

Witnesses:

JEAN GRUND,

RICHARD GUENTHER.