

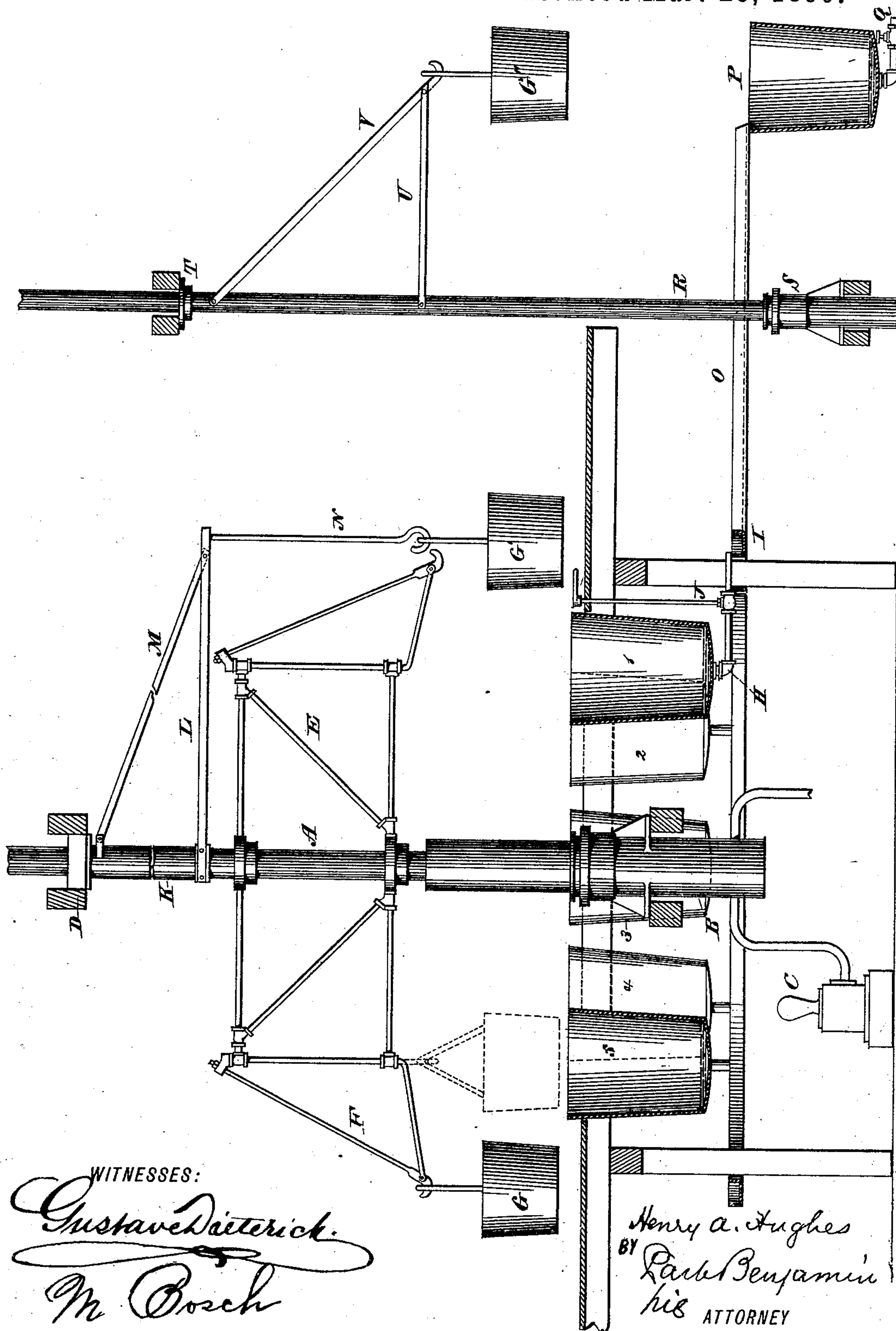
(No Model.)

H. A. HUGHES.

PROCESS OF DIFFUSION FOR SORGHUM CANE, &c.

No. 423,930.

Patented Mar. 25, 1890.





# UNITED STATES PATENT OFFICE.

HENRY ALBERT HUGHES, OF RIO GRANDE, NEW JERSEY.

## PROCESS OF DIFFUSION FOR SORGHUM-CANE, &c.

SPECIFICATION forming part of Letters Patent No. 423,930, dated March 25, 1890.

Application filed June 3, 1889. Serial No. 312,980. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY ALBERT HUGHES, of Rio Grande, Cape May county, New Jersey, have invented a new and useful  
5 Process of Diffusion for Sorghum-Cane, &c., of which the following is a specification.

In Letters Patent No. 402,083, granted to me on the 23d day of April, 1889, I have fully  
10 described my process of diffusion, which consists in subjecting successive masses of cane in the disintegrated or shredded condition to the action of stationary bodies of hot water contained in a series of successive independent non-communicating vessels by immers-  
15 ing each mass of cane successively in each vessel, and thereby bringing the liquor in each vessel to a predetermined density; and in said Letters Patent I have also shown and described an apparatus which has been prac-  
20 tically used by me for carrying the said process into effect, the said apparatus consisting substantially in a series of diffusion-cells disposed in a circle, at the center of which circle is arranged a vertically-movable and  
25 rotary shaft. Supported upon said shaft is a frame-work which carries swinging arms, and to these arms are hooked the baskets of cane, which are successively placed in the cell. This apparatus I have also fully de-  
30 scribed and claimed in Letters Patent No. 395,145, granted to me on the 25th day of December, 1888, and reference to the aforesaid two patents is hereby made.

My present invention relates to an improve-  
35 ment upon my aforesaid process; and it consists in placing the fresh baskets of cane, before their introduction into the battery-cells referred to in my preceding patents, in a separate and independent cell containing sugar-  
40 liquor. By this means the cane is prevented from absorbing the water in the battery-cells, so that the quantity of liquor in said cells may be kept uniform, and at the same time the liquor in the independent cell before men-  
45 tioned is rendered richer in sugar and is drawn off from time to time to be replaced by new liquor. I usually employ ten cells in my bat-  
50 tery, and therefore the independent cell I commonly designate as the "eleventh" cell, and I will for convenience refer to it by this name throughout the following specification.

The accompanying drawing is a vertical section through the apparatus by means of which I prefer to carry out my process.

A is a vertical shaft, which enters the hy- 55 draulic cylinder B, and is raised or lowered by water pumped into said cylinder from the pump C. Said shaft passes through a bearing D, supported from the beams of the building or any other independent support, and 60 supported upon said shaft is a frame-work E, upon which are several swinging brackets F, provided with hooks, upon which the cane-baskets, as G, are suspended.

The diffusion-cells 1, 2, 3, 4, and 5 are dis- 65 posed in a circle concentric with the shaft A, and each cell by a pipe, as H, communicates with an annular trough I. A valve J is provided in said pipe H, by means of which the liquid in the cell can be allowed to escape 70 therefrom at will. As the general arrangement and disposition of the cells and the mode of operating the shaft A, frame-work E, and brackets thereon is to be the same as is set forth in my prior patents aforesaid, fur- 75 ther description, therefore, is unnecessary.

Surrounding the shaft A and supported from the bearing D is a sleeve K, which sleeve K is rotary upon said shaft. The sleeve K carries the bracket-arm L and its supporting- 80 strut M, and depending from the arm L is a hooked rod N, upon which a cane-basket, as G', may be suspended. The annular trough I communicates by a conduit O with the eleventh cell P, and said cell P by pipe Q 85 communicates preferably with the evaporator for the juice. Arranged in convenient proximity to the cell P is a shaft R, which also is worked by a hydraulic cylinder S, and may be raised or lowered therein by the action of 90 a pump similar to pump C. The shaft R passes through an upper bearing T, and carries a crane-arm U and a support V therefor. The crane U V is provided with a hook to carry a cane-basket, as G''. 95

I carry out my process in the following manner: The diffusion-cells 1 to 10 are filled with hot water. A covered basket, as G or G', is then hung upon an arm of the crane E and immediately lowered into cell No. 1. Af- 100 ter a delay of about one minute the shaft A is raised and revolved so that basket No. 1



hangs over the cell No. 2. A second basket is then hung upon the arm over cell No. 1, and the shaft A is lowered. Whenever the shaft A is raised it is also revolved, and thus the bracket-arms F are successively brought over cell No. 1. A basket of fresh cane is always hung upon this arm and immersed in cell No. 1 when the shaft A is lowered. This process is repeated until a basket of cane hangs from each of the bracket-arms F, and when this point is reached the basket then on arm No. 1 will have been dipped into ten different cells full of hot water, by which time its contents will have been thoroughly leached. This operation is the same as has already been described by me in my prior patents aforesaid in greater detail. The contents of cells Nos. 1 and 2, which have received the baskets of cane in its freshest condition, will then be relatively strong sugar solutions. Valves J in the pipes leading from said cells are then opened and the liquor is allowed to run out by the pipe H into the annular trough I, whence it passes into the eleventh cell P, which cell now comes into use. The cells Nos. 1 and 2 now being emptied are refilled with hot water, so that the strongest sugar solution now in the battery is in cell No. 3, the next strongest in cell No. 4, and so on. The baskets of freshly-cut cane are now no longer put into the diffusion-cells, but go first into the eleventh cell—that is to say, the next basket of fresh-cut cane to be treated would go first into the eleventh cell P and then into cell No. 3. It would then come out of cell No. 3 and make the round of the remaining cells. The same thing would happen with the next basket. Then at the end of that time two baskets would have been immersed in the eleventh cell P, and cells 3 and 4 would each have received in turn baskets under the same conditions as cells Nos. 1 and 2 had already done. The contents of the eleventh cell P would then be drawn off and taken to the evaporator, while the contents of battery-cells 3 and 4 would now flow into the eleventh cell P, and cells 3 and 4 would in turn be filled with hot water. This operation would then go on continuously, the eleventh cell P being emptied always after two baskets have been immersed in it. The object of the shaft R, with its crane, is to raise the baskets out of and lower them into the eleventh cell P. When the shaft R is rotated on its axis, the basket may be transferred to the arm N, dependent from the crane-arm L, and thence it may be transferred to the bracket-arms F. The use of this apparatus, however, is of course not essential to my process.

The advantages gained by the employment of the eleventh cell are twofold. When fresh cane is introduced directly into the hot water, it at once absorbs water, and thus depletes the contents of the diffusion-cell, the result being that in the first cell, after a number of

successive baskets have been passed through it, the amount of liquor therein may be very greatly diminished, and as a consequence it is practically impossible to keep the contents of the cells uniform. I find by actual experiment that the increase in the net weight of the baskets of cane is seventeen and three-tenths per cent., the weight of the baskets of exhausted cane being to this extent in excess of the weight of the baskets of fresh cane. By immersing the fresh baskets directly in the liquor in the eleventh cell their absorbing capacity is wholly or in a great degree satisfied, and hence when they reach the diffusion-cells in the battery they no longer take up the water therein, and therefore I am enabled to maintain the uniformity in contents of the diffusion-cells. I also enrich the contents of the eleventh cell, and thus obtain a denser and stronger juice for the evaporator.

I claim—

1. The continuous process of cane diffusion, which consists in subjecting successive masses of cane in a shredded or disintegrated condition to the action of stationary bodies of hot water contained in a series of successive independent non-communicating vessels by immersing said mass of cane in each vessel successively, the number of masses of cane being equal to that of the stationary bodies of hot water; second, drawing off the contents of certain vessels of the series into a separate receptacle and replacing said contents with hot water, and, third, immersing succeeding masses of cane in the liquid contained in said separate receptacle prior to immersing them successively in the liquor contained in said first-named vessels, beginning with the vessel containing the strongest solution of sugar-liquor.

2. The continuous process of cane diffusion, which consists in subjecting succeeding masses of cane in shredded or disintegrated condition to the action of stationary bodies of hot water contained in a series of successive independent non-communicating vessels by immersing said mass of cane in each vessel successively, the number of masses of cane being equal to that of the stationary bodies of hot water; second, drawing off the contents of certain vessels of the series into a separate receptacle and replacing said contents with hot water; third, immersing succeeding masses of cane in the liquid contained in said separate receptacle prior to immersing them successively in the liquor contained in said first-named vessels, beginning with the vessel containing the strongest solution of sugar-liquor; fourth, drawing off the liquor contained in said separate receptacle when it shall have attained a predetermined density.

HENRY ALBERT HUGHES.

Witnesses:

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