

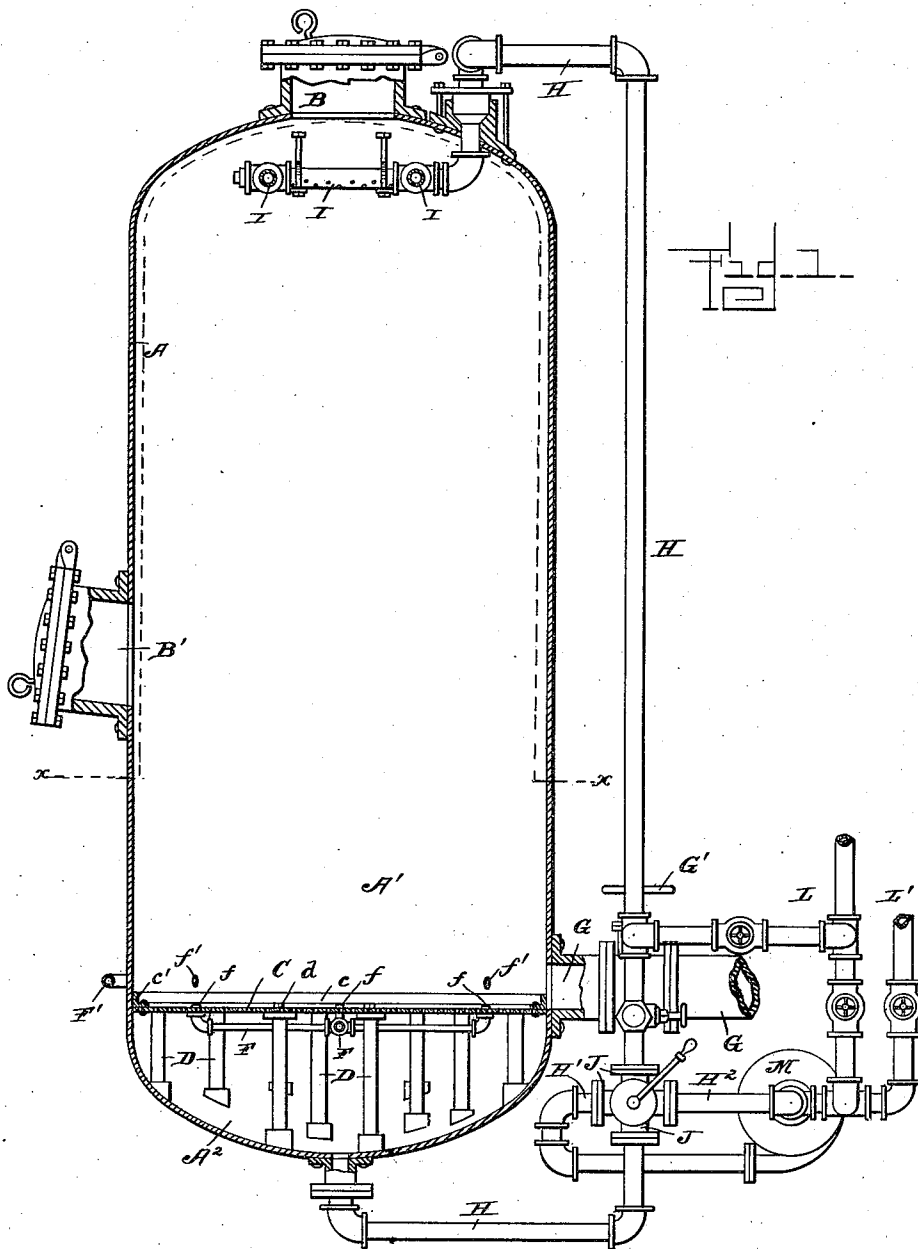
(No Model.)

2 Sheets—Sheet 1.

O. S. JACOBS.
DIGESTER.

No. 495,342.

Patented Apr. 11, 1893.



Witnesses =
L. E. Squire,
J. A. Lay Jr.

Inventor =
Oliver S. Jacobs,
By A. M. Smith & Son,
Attorneys.

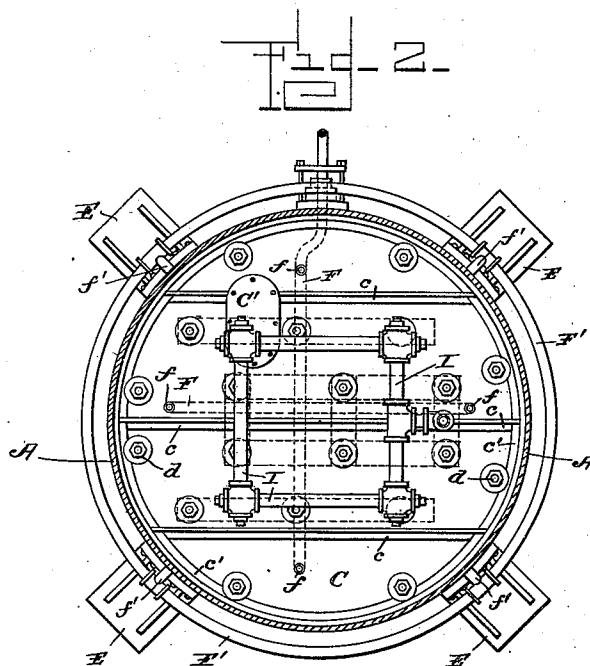
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UNITED STATES PATENT OFFICE.

OLIVER S. JACOBS, OF ST. MARY'S, OHIO.

DIGESTER.

SPECIFICATION forming part of Letters Patent No. 495,342, dated April 11, 1893.

Application filed May 11, 1892, Serial No. 432,654. (No model.)

To all whom it may concern:

Be it known that I, OLIVER S. JACOBS, a citizen of the United States, and a resident of St. Mary's, county of Auglaize, and State of Ohio, have invented a new and useful Improvement in Digesters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to the means or apparatus for making stock for paper or pulp board from wood, straw or other fibrous vegetable matter and more particularly to that part of the apparatus known as the digester and it consists in the means for applying steam to the digesting chamber for cooking or pulping the material and also for "blowing out" or discharging the digested material or pulp from said chamber, as herein-after described, and claimed.

In the accompanying drawings:—Figure 1 represents a vertical section through a digester, embracing my improvements, showing the circulating pipes, &c., in side elevation. Fig. 2 represents a horizontal section through the digester shell, on the line $x-x$, Fig. 1, but showing the spray pipe in plan view.

A indicates the shell of the digester, made, preferably, in the form of a strong, upright cylinder, of any desired capacity and provided in its upper end or head with a manhole at B, through which the cylinder is charged, and, preferably, also, with one B' in one side for facilitating access to the interior of the shell in the construction or for repairs or other purpose. Near its lower end or head the shell is provided with a perforated diaphragm C, which serves to form a liquid chamber A² in the lower end of the shell, separated from the pulp chamber A', proper, by said diaphragm through which the digesting liquid is strained and separated from the pulp material in the chamber A'. This diaphragm C is perforated throughout its entire extent and is formed or made up of strips or sections sufficiently narrow to pass through the manhole B, or B' and laid in the form of a flooring and supported upon shouldered tubes D, which at their lower ends rest on the lower end or head of the shell. The sections thus laid and forming a diaphragm fitting

snugly the cylindrical shell, have their joints covered by angle-iron bars c, c' , which are clamped down on the flooring strips or plates by bolts d , which pass through the horizontal flange of the angle iron and through the tubes D and lower end of the shell. The angle irons c' are curved to conform to the side walls of the shell and extend entirely around inside the latter covering the junction of the flooring sections therewith, and, may be riveted or otherwise secured to the flooring or shell or both as may be found expedient. The upright flanges of the angle iron bars serve to materially stiffen the flooring and permit the use of lighter metal therefor than would otherwise be practicable. The flooring is provided, at C', with a manhole through which access may be had to the liquid chamber for construction, repairs, &c. The shell thus constructed is supported on suitable mason work by strong, angular brackets E, E, the upright arms of which are securely riveted or bolted to the side walls of the shell.

F and F' represent branches of a steam pipe connecting with any conveniently arranged steam generator, the pipe F having branches provided with upturned ends or nozzles f, f , which penetrate or project up through the diaphragm and discharge into the digesting chamber, and the pipe F' extends around the shell and has branches or nozzles $f' f'$ which pass through the side walls of the shell immediately above the diaphragm, so that all steam admitted to the digesting chamber will enter at the lower end thereof, immediately above the perforated diaphragm. Further, by the arrangement of the several steam pipes, whereby they are made to enter the digesting chamber at its extreme lower end, beneath the contents of said chamber, but above the diaphragm separating it from the liquid chamber, as described, live or superheated steam can be introduced, in numerous jets, beneath the entire contents of the digesting chamber whenever this is found necessary, as it frequently is, for the proper cooking or digestion of the pulp material. Steam has heretofore been admitted near the bottom of the digesting chamber, in a single jet, for blowing out the contents, but never, so far as I am

aware, in numerous jets distributed to cover the bottom of said contents for causing the steam to penetrate the entire mass for cooking it.

5 G indicates the discharge pipe, connecting with the digesting chamber A' through the side wall thereof, immediately above the perforated diaphragm and provided near the shell with a suitable valve, the hand wheel for controlling which is indicated at G' and 10 by means of which the discharge of the contents of the chamber is controlled at will. This arrangement of the steam pipes and discharge outlet is regarded as important. Here- 15 tofore the discharge has ordinarily been through the diaphragm and bottom of the shell and steam has been admitted to the liquid chamber, below the diaphragm, for blowing out the contents of the digesting chamber. 20 In this last named arrangement of the steam jets and discharge outlet the steam entered the liquid in the liquid chamber, and meeting the resistance and condensing action of the liquid therein and the further resistance due to the 25 perforations in the diaphragm being clogged and obstructed by the pulp drawn forcibly down thereon by the action of the circulation, the result was that the action of the steam tended to blow the liquid out of the liquid 30 chamber, into the circulating pipes and so around and into the top of the digesting chamber, until the pressure above and below was equalized and the blowing out, if effected at all, was very imperfect:—whereas, in my ar- 35 rangement, the steam being admitted immediately over the diaphragm, it can communicate with the circulating pipes only through the diaphragm, obstructed as described, or through the contents of the digesting chamber 40 itself, and then in a reverse direction, and the result, with the discharge pipe connecting with the side of said chamber above the diaphragm, as described, is an effectual and thorough blowing out of the contents of said 45 chamber or so much thereof as may be desired, controlled by suitable steam cocks and discharge outlet valve.

The circulating pipe H connects with the bottom of the liquid chamber A² and extends 50 thence to one side of and up to the top of the shell and through the latter where it has a spray pipe or pipes I, connected with it. We have shown the spray pipe made up into rectangular form, from straight pipe sections 55 united by corner or angle couplings, but any suitable form may be given to it. The sections of this pipe are perforated on their lower sides, the perforations being formed at different angles or inclinations so as to spray the 60 entire surface of the contents of the digesting chamber.

The circulating pipe H is provided intermediate its ends with a cross section or coupling J, in which is mounted a four-way valve 65 of any suitable construction. The lateral branches H' and H² from this cross-coupling

connect the upright circulating pipe with a pump at M, actuated in any suitable manner and which gives a forced circulation of the digesting fluid through the pipe H from the 70 liquid chamber A² to the spray pipe I in a manner well understood. The course of the liquid, in the ordinary operation as described, will be from the liquid chamber through the lower part of circulating pipe to the four way 75 valve in the cross coupling J, thence through the lateral pipe H' to the pump at M thence back through the lateral H² to the valve at J and thence up through the upper portion of the pipe H to the spray pipe. When, for any 80 purpose, it is desired to reverse the direction of the liquid through the circulating pipe, as, for example, when the diaphragm becomes choked the four way valve is suitably turned and the pump draws the liquid down through 85 the valve and lateral H' and forces it back through the lateral H² to the valve and thence through the lower portion of the pipe H into the liquid chamber and up through the perforated diaphragm, thereby removing the ob- 90 structing matter. Other pipes L, L', connect the pump M and pipe H with suitable liquid tanks for supplying fresh water or digesting liquid to the digester, as may be required. The spray pipe is regarded as important in 95 this fluid circulation, described, as it distributes the liquid evenly over the surface of the contents of the digesting chamber. Here- tofore the liquid has been brought by a single pipe and in a stream either directly into 100 said chamber or above a perforated diaphragm through which the water passed at the nearest point possible, but which, through its liability to become obstructed, failed to distribute the liquid evenly over the surface 105 of the mass of material in such manner as to secure the best results.

Heat may be applied to the digester, either through a furnace located under it or in any usual manner and the liquids employed may 110 be such as are usually employed for the purpose, whether alkaline or other solutions, for digesting the materials, or pure water for cleansing the pulp, &c.

Having now described my invention, what 115 I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for making stock for paper, straw board, &c. the digester provided with a perforated diaphragm near its lower 120 end, separating a liquid chamber from the digesting chamber, in combination with the series of steam pipes entering the digesting chamber and discharging immediately above the diaphragm and beneath the contents of 125 said digesting chamber, substantially as described.

2. In a machine for making stock for straw or pulp board, the digester having a perforated diaphragm near its lower end, separating a liquid chamber from the digesting chamber, in combination with a series of steam 130

5 pipes entering said digesting chamber through
said diaphragm and a series of pipes also en-
tering said chamber through the side walls,
immediately above said diaphragm and all
discharging at the bottom of said digesting
chamber, substantially as and for the purpose
described.

In testimony whereof I have hereunto set
my hand this 29th day of April, A. D. 1892.

OLIVER S. JACOBS.

Witnesses:

REXFORD M. SMITH,
R. H. TAYLOR.