

A. S. Lyman.
Paper Making.
N^o 40,696. Patented Nov. 24, 1863.

Fig. I.

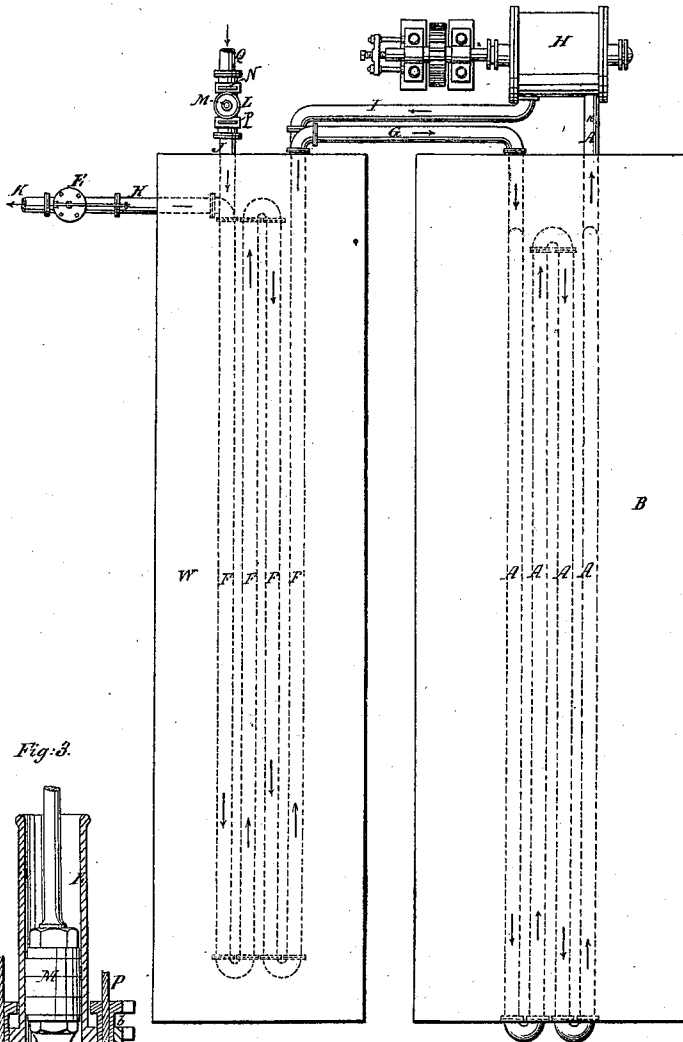


Fig. 3.

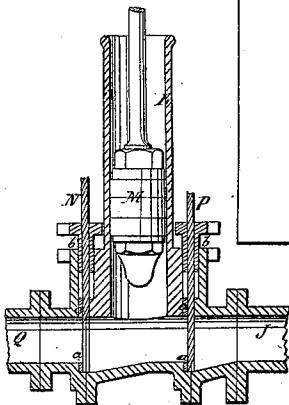
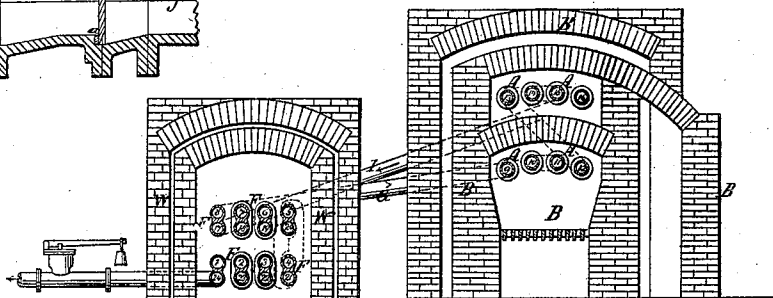


Fig. II.



Witnesses.
Thos. H. Doubler
Geo. W. Reed

Inventor.
Azel S. Lyman

UNITED STATES PATENT OFFICE

AZEL S. LYMAN, OF NEW YORK, N. Y.

IMPROVEMENT IN SEPARATING FIBERS OF STRAW,

Specification forming part of Letters Patent No. 40,696, dated November 24, 1865

To all whom it may concern:

Be it known that I, AZEL S. LYMAN, of the city, county, and State of New York, have invented certain new and useful improvements in the separation of the fibers of straw, wood, and other vegetable substances, and extracting the gummy and coloring matters therefrom to render them fit for paper-stock and for other purposes; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to the separation of the fibers of vegetable substances and the extraction of their gummy and coloring matters by subjecting them to the action of water brought to a temperature at which it boils under a pressure greater than that of the atmosphere, either with or without the use of alkalis or of rubbing, grinding, or beating devices as an aid to maceration. In such method of separation, as heretofore practiced, the boiler or macerating apparatus has been charged while at a temperature below 212° Fahrenheit, and after closing it the charge has been heated to a temperature of from 300° to 350° Fahrenheit, at which it has been kept for a sufficient time to effect complete maceration, and then the apparatus has been completely discharged and recharged for a new operation. The process conducted in this way involves the loss of all the time occupied in discharging and recharging, and in heating up again from below 212° Fahrenheit to the much higher temperature required, and the waste of all the heat contained in the matter at the time of its discharge, which takes place at the high temperature above mentioned.

The object of this invention is to obviate this loss of time and waste of heat.

The invention consists in effecting the macerating process without interruption by supplying and discharging the material and the water necessary to effect maceration in a continuous manner by means of a forced circulation through the boiler or macerating apparatus, effected by a pump or other equivalent forcing apparatus.

It also consists in saving the heat of the discharging pulp or macerated material by retaining it under pressure after it has left the boiler or macerating apparatus, and pass-

ing the incoming fibrous material in a contrary direction to the through a suitable system of passages properly arranged in contact relation to the discharge pipes or

It also consists in forcing the material through a mill or other grinding, or beating apparatus in connection with the boiler as an aid to the combined or simultaneous action of the pump or forcing apparatus, the forced circulation through the boiler produced, and of the pressure due to the steam or water in the boiler.

It also consists in the construction of a forcing-pump by which the forced circulation through the boiler or macerating apparatus is produced, with sharp-edged valves applied and operated as to cut and discharge other material which may be left in the passages when the valves close, to insure the perfect closing of the valves and prevent leakage.

It further consists in the employment of the purpose of transferring the heat from the discharging pulp or macerated material to the incoming material and water, of twin pipes, or, in other words, piping two passages through which the macerated material and the incoming material and water can flow side by side in opposite directions.

Figure 1 in the drawings is a plan view of the apparatus which embraces or illustrates several features of my invention. I have shown a transverse vertical section of the apparatus in the plane indicated by the line *x x* in Figure 3 is a central vertical section of the boiler or pump and its appendages, for effecting the producing a continuous circulation through the macerating apparatus.

Similar letters of reference indicate corresponding parts in the several figures.

The boiler represented is composed of a train of pipes, *A A*, arranged in two tiers, one above another, in a suitable furnace or so connected that there may be a continuous flow of material through the whole series, first through one of the lower tier, next through one of the upper tier, then through one of the lower tier, and so on. The pipe of the lower tier, which is the extreme left of the tier, and numbered 1, is connected by a pipe, *G*, with a

the train of twin or double pipes F F, in which the incoming fibrous material and water are heated by the outgoing pulp or macerated material before entering the boiler, and the last pipe of the upper tier, which is the one at the extreme right of the tier, and numbered 16 in Fig. 2, is connected with the mill H, Fig. 1, by which the fibrous substances, after having been boiled for a sufficient length of time, are ground, and from which they pass through a pipe, I, to the same end of the train of twin pipes F F with which the pipe G is connected, but G connects with the upper and I with the lower compartment of the pipe F, which forms this end of the train, as shown in Fig. 2. The other end of the train of twin or double pipes F F has connected with it the feed-pipe J and the discharge pipe K, the feed-pipe being connected with the upper and the discharge pipe with the lower compartment of the pipe F which forms that end of the train. The train of pipes F F is inclosed within a casing, W, of brick-work or other non-conducting material, to prevent loss of heat by radiation. The construction of these pipes is shown in Fig. 2, where it may be seen that each has two compartments or passages. The two compartments have no communication at all with each other, but the several lower compartments or passages are connected throughout the whole train, and so are the upper compartments or passages, the upper ones being for the passage of the incoming fibrous substances and water, and the lower ones for the discharging pulp. The upper passages are severally numbered in Fig. 2 from 1 to 8 in the order in which the material and water pass through them, that numbered 1 being connected with the feed-pipe, and that numbered 8 with the first pipe A of the boiler-train, which is numbered 9. The pipes of the boiler-train are severally numbered in Fig. 2 from 9 to 16, respectively, in the order in which the circulation through them takes place, the last pipe (numbered 16) being connected with the mill to deliver the boiled material thereinto. The lower passages of the twin pipes F F are numbered from 17 to 24 in the order in which the pulp or macerated material circulates through them on its way to the discharge-pipe K, the pipe I, coming from the mill, connecting with the passage numbered 17, and the discharge-pipe K connecting with the passage numbered 24.

L, Figs. 1 and 2, is the barrel of the force-pump for feeding the straw or other fibrous material and the necessary quantity of water to produce its circulation through the trains of pipes F F and A A. M is the piston of said pump. N and P are the induction and eduction valves, consisting of flat steel plates fitted to slide in suitable guides against steel-faced seats *a a*, and having their lower ends beveled to sharp edges to enable them to cut with a shears-like action against the lower edges of the openings in the valve-seats, and thus sever any pieces of straw or other fibrous

material that may be in their way as they move downward to close. These valves pass through suitable stuffing-boxes, *b b*, and are connected with eccentrics or other suitable devices which derive motion from the steam-engine or other motor by which the piston of the pump is worked.

The induction pipe Q of the pump is connected with a mixing-chest, in which the straw or other fibrous material, cut into pieces of about one or two inches in length, is mixed as thoroughly as possible with water by means of suitable agitators. The feed pipe J is connected with the discharge-outlet of the pump.

The mill H may be composed of any suitable system of rubbing-surfaces. As the matter, when it arrives at the mill, has had the gums softened or dissolved, and is in a very different condition from rags, its fibers are easily rubbed apart, and it is desirable to avoid cutting them. Instead, therefore, of the blades or beaters used in the ordinary paper-engines for cutting, scraping, and drawing out the lint or pulp from the rags, I use simply corrugated surfaces having a rotary or other motion by which they are made to rub the fibers apart without cutting them and to rub and wash the softened gums off from the fibers after the latter have been separated.

The discharge-pipe K is fitted with a loaded valve, which may be substantially like an ordinary safety-valve, by which to regulate the discharge of the pulp, and at the same time to preserve the necessary pressure in the macerating apparatus. E represents a box containing such a valve.

To set the apparatus in operation, it is first filled with water only, and after the fire has been lighted the pump L M is worked very slowly, still pumping nothing but water until the temperature in the boiler is near 300°, when the suction-pipe is brought into communication with the mixing-chest, hereinbefore mentioned, to pump in the mixture of water and fibrous material, and its velocity increased to feed the mixture in a desirable quantity through the upper passages of the pipes F F to the boiler and produce a continuous and sufficiently rapid circulation through the latter and a continuous delivery to the mill. The pressure produced by the pump, and the pressure of the steam or hot water, due to the heat in the boiler, are both instrumental in forcing the material through the mill and from the mill through the lower passages of the several pipes F F to the discharge-pipe, and the macerating process is perfectly continuous. The fire should be so regulated as to keep the contents of the upper pipes A A at a temperature of about 330° Fahrenheit, and the circulation should be so regulated by the capacity and speed of the pump and by the area of the opening of the discharge-pipe and load on the valve in the box E, that the time occupied in passing from one end to the other of the train of pipes A A, constituting the boiler, will be sufficient to enable the perfect maceration to

be completed by the subsequent operation of the mill, or to be completed in the boiler itself, if for any material it should not be requisite to use a mill. The macerated material or pulp in its further transit through the lower passages of the pipes F F imparts its heat both through the partitions of the said pipes and through the external portions of the said pipes to the incoming material and water, which are passing in the opposite direction through the upper passages of the said pipes, and in this way becomes cooler and cooler as it approaches the discharge-pipe, while the incoming material and water become hotter and hotter. By this system of twin pipes the temperature of the discharging pulp may be reduced far below 212° Fahrenheit, and the temperature of the incoming material and water be raised before arriving at the boiler to a temperature not very far below that in the first pipe A of the train which constitutes the boiler. The discharging pulp may be further cooled and its heat further utilized by constructing the said pipe in the form of a coil and placing the said coil in a suitable vessel, through which the water for mixing with the straw before its advent to the suction pipe of the pump is allowed to circulate, and in that way the waste of heat may be obviated in the greatest practicable degree.

I do not confine myself to the particular form or construction of the boiler herein described or to the particular form and construction of any of the details of the apparatus, as such may be varied or modified without departing from the principle of my invention; but

What I claim is—

1. The mode of making the macerating process continuous by supplying and discharging the material and the water necessary to effect maceration by means of a continuous forced circulation through the boiler or macerating apparatus effected by a pump or its equivalent, substantially as herein specified.

2. Saving the heat of the discharging pulp or macerated material by retaining it under pressure after it has left the boiler or macerating apparatus, and passing the incoming fibrous material and water in a contrary direction to the discharge through a suitable system of pipes or passages properly arranged in relation to the discharge pipes or passages, substantially as herein described.

3. Forcing the boiled material from the boiler through a mill or other grinding or rubbing apparatus by the combined or simultaneous action of the pump or its equivalent, through which the circulation through the boiler is produced, and of the pressure due to the heat of the steam or water in the boiler, substantially as herein specified.

4. The employment, in the pump by which the circulation through the boiler is produced, of cutting-valves, operating substantially as and for the purpose herein set forth.

5. The employment, for transferring the heat from the discharging to the incoming material, of twin or double pipes F F, substantially as herein described.

AZEL S. LYMAN.

Witnesses:

THOS. L. J. DOUGLAS,
GEO. W. REED.