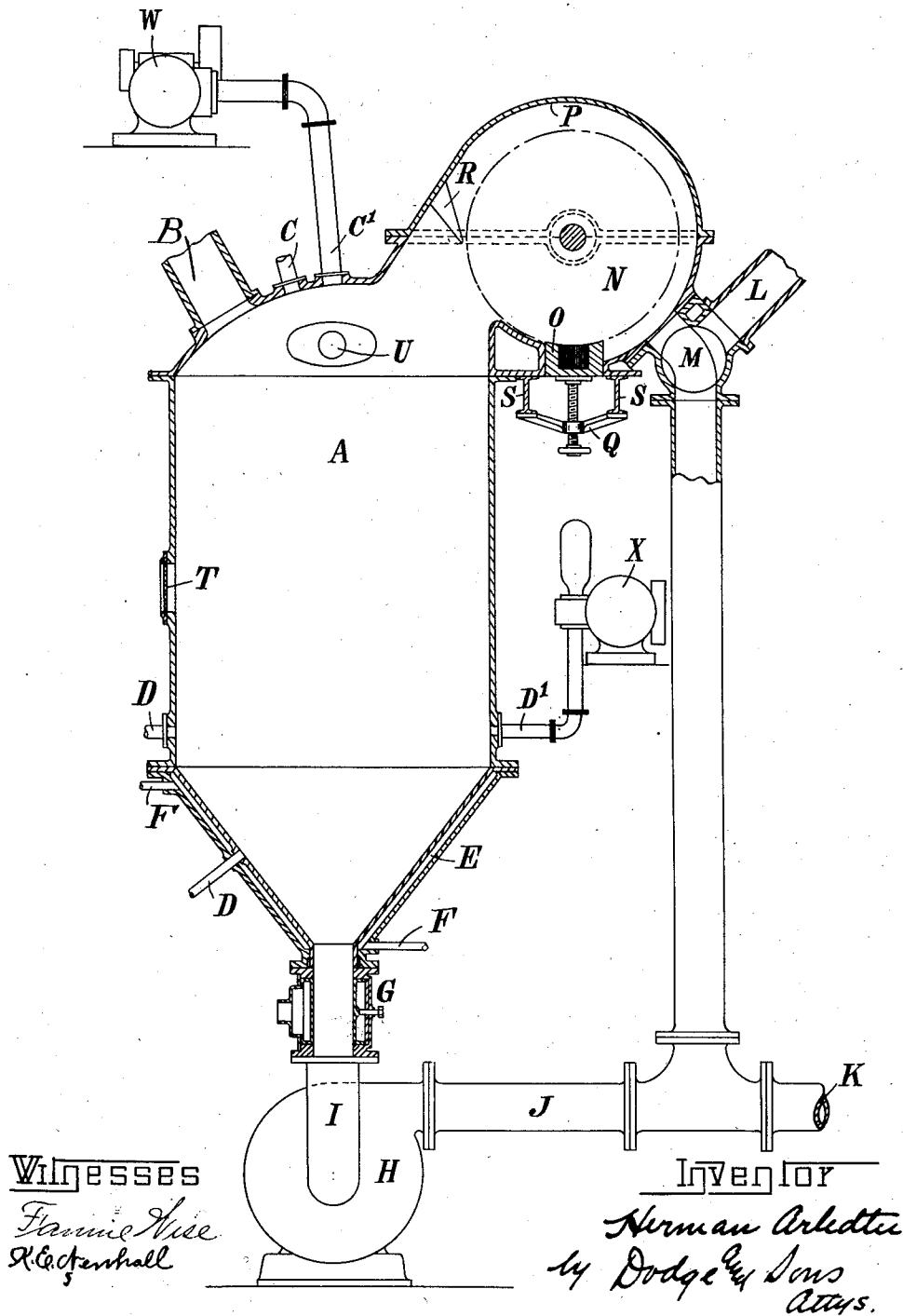


H. ARLEDTER.
 APPARATUS FOR USE IN THE MANUFACTURE OR TREATMENT OF PULP FOR MAKING PAPER
 AND LIKE MATERIALS.
 APPLICATION FILED JULY 25, 1910.

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Patented Dec. 24, 1912.



UNITED STATES PATENT OFFICE.

HERMAN ARLEDTER, OF FRODSHAM, ENGLAND.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HERMAN ARLEDTER, a subject of the Emperor of Austria-Hungary, residing in Frodsham, in the county of Chester, in the Kingdom of England, have invented certain new and useful Improvements in Apparatus for Use in the Manufacture or Treatment of Pulp for Making Paper and Like Materials, of which the following is a specification.

This invention relates to improvements in apparatus for the treatment of previously-manufactured pulp, such as mechanical pulp, chemical pulp, or the like, for paper-making, pasteboard-making and the like.

In my apparatus I effect the beating, disintegrating, washing, bleaching and mixing with chemicals of the pulp used in the manufacture of paper and the like, and where it is desired, dyeing, weighting and other processes, the whole being conducted in a hermetically sealed vessel under pressure or under vacuum in the following manner.

My experimental apparatus is set forth in the accompanying drawings. In these A is a vessel somewhat egg shaped, made strong enough to stand the pressure or vacuum. It has an inlet pipe B and numerous smaller inlet pipes C C for chemicals and the like, also inlets for gases, steam, or the like D, supplied of course with suitable pipes. Connected with pipe C' is a vacuum pump W, whereby a high vacuum may be maintained in chamber A, while connected with pipe D' is a hydraulic pump X for pumping in water at a pressure of from 1000 to 2000 pounds to the square inch. The construction of these two pumps forms no part of my invention, and I have, therefore, shown them only diagrammatically. One or more vessels, not shown, above this, in any convenient position, are connected with pipes to the openings C at the top so as to supply chemicals. The lower part of A has a steam jacket E supplied by the steam pipes F.

G is a cock by which the entire chamber can be cut off when desired.

H is a hydraulic pump connected with the passage I from the converting chamber A, and also at its outlet with the passages J.

K is an outlet fitted with a plug tap. L

another outlet also fitted with a plug tap M, either of which could be used as desired, M being a three-way cock leading into the disintegrator N of the usual type, having a block of knives O at the bottom. As this disintegrator is hermetically closed by the cover P and therefore it is difficult to lift the disintegrator cylinder, I form the block of knives O to slide and have a screw device Q below so as to force it up gradually toward the disintegrator. The disintegrator drives the stuff back into the chamber A, a doctor or scraper R preventing the material from continuing on the surface of the disintegrator.

S S are two girders for holding up the disintegrator and to these girders the screw device Q is applied.

The mode of action of the apparatus is as follows:—The material, say softened pulp and water is supplied to chamber A, it is pumped by the pump H through the disintegrator. At first the adjustable bedplate is at some distance from the revolving knives, but as the material becomes finer and more homogeneous, the adjustable block of knives are brought nearer and nearer to the revolving ones till they almost touch. The chemicals, pressure and vacuum are applied in the manner hereafter stated by means of pumps X and W, respectively, and the process is watched through the sight-hole T, and also through another sight-hole in the man-hole U, and at sight-holes at other points if desired. Observation glasses can also be placed at any convenient point. When the work is accomplished, the required cocks are turned and the pump drives or blows all the material off to where it is further operated upon.

It will be obvious that in thus describing my apparatus the chamber A can be of any conceivable shape, so that it is strong enough. Almost any form of disintegrator at present known that can be closed in can be used, instead of N and O, and the positions of the pipes can be widely altered. There can also be more than one circulating pump, but one advantage of the herein described arrangement is that the outlet from the grinder or disintegrator being directly into the chamber A and the circulation pump being at the bottom, there is no place for lodgment, otherwise the pump could be placed at any other point. In some in-

stances the steam jacket is not required, in others I may have an additional coil to heat the vessel A. It will be observed in this description that I use a circulating pump H.

5 This is not absolutely necessary as many of the existing disintegrators also act as a pump, and where the disintegrator is designed to act as a circulating pump it is not necessary to use the pump H, but the passage can be continuous from the converting

10 chamber to the disintegrator; also where the pulp is already in such a state as not to require a disintegrator the disintegrator can be dispensed with, and a circulating pump

15 only used.

In carrying out my process, I usually mix the pulp in an ordinary beater or mixer, and suck it into the chamber A by means of the vacuum, the sizing and coloring matter being added as required by the pipes. As soon

20 as the chamber A is filled to its full capacity or nearly so it is closed, and the man-hole lid put on if not already in position. The disintegrator and propeller are now

25 started, and the mass is circulated at a very high speed without any chance of air being drawn into the mass as always happens with existing beating engines. In the meantime

30 as soon as the apparatus is filled, vacuum has been produced either by a pump W or other means, the gases being drawn off at the top. The immediate effect of such a vacuum within the mass is the abstraction

35 of the air and other gases, some of these latter being produced by chemical reactions from the interstices and pores of the pulp, but in these instances as before it gets saturated with water and chemicals and accelerates the hydration of the pulp to a very

40 considerable extent also intensifying the chemical action upon the fibers which in existing processes is much retarded through the presence of air and gases. Through the impossibility of air being drawn into the

45 mass by the disintegrator, the usual frothing seen on the paper machines is entirely avoided. Furthermore the air having been expelled previous to the drying, it enables the fibers of the pulp to knit together better

50 and the finished paper consequently is stronger and more pliable. The mass is alternately treated under vacuum and under pressure, the latter by means of pump X. The action of the pressure on the fibers is

55 most beneficial, the pressure combined with the rise of temperature tending to open out the fibers more readily. The constantly increasing pressure drives the sizes and colors into the pores and interstices of the fiber,

60 which have already been cleared of gases by being previously treated with vacuum and thus further increasing the physical and chemical actions and the result is a perfect sizing, coloring or weighing, the materials

65 being less likely to wash away after being

fixed and precipitated with alum. Other chemicals can be used in place of alum. If heat be required during the circulation of the mass, this is effected by means of the outer coil and jacket, or by direct steam

75 passed in. As soon as the mass has been subjected sufficiently long to the treatment under vacuum, the pressure is produced within the mass, either by forcing more water in or by raising the temperature of the contents either directly or alternately by

80 steam or by allowing the contents to get warm through the friction of the disintegrator. The process of circulation and disintegrating both under vacuum and pressure is continued until a sample taken from the

85 test tap shows that the mass is in a proper condition. When if alum is required, the alum is passed in and when it has sufficiently acted upon the material the circulating pipe is closed and the whole mass is

90 forced or pumped out through the emptying pipe through the stuff chests from which it is removed for use. The action of the pressure on the pulp is to bring about an extremely intimate contact between the chemicals, colors, sizes and the fiber. It also when

95 weighting is required greatly assists the deposit of the weighting materials in the pores of the fiber, as the liquid is forced into these pores and the interstices or knotty particles which might have escaped the action of vacuum alone. By this means a far more

100 rapid disassociation is effected than a simple mechanical action could possibly bring about, while on account of the swelling up of the materials the knotted particles are less likely to escape the disintegrating

105 blades. In the case of incrustated fibers as in mechanical wood pulp these incrustations are rapidly broken down under the vacuum, and subsequent pressure laying bare the cellulose to mechanical and chemical actions so that mechanical wood pulp thus treated can

110 become practically equal to the best chemical pulp by passing through this process. The apparatus being closed and hermetically sealed, the entire operation of disintegrating, hydrating, dyeing, sizing and

115 weighting if required is very rapidly carried out, and far more efficiently than is possible in existing apparatus, while the application of easily volatile substances such as ammonia, carbonate of ammonia, chlorine, oxygen, carbonic acid, or other gases, alcohol,

120 ether, light oils, spirits, bisulfid of carbon, acetone, formaldehyde and the like, and their retention during the time of mixing and beating in the mass is made possible and consequently their physical or chemical

125 action is assured. All easily volatile substances or volatile parts of substances can be extracted from the apparatus during or after the treating process, and can be recovered by

130 condensation, absorption in water or other

solvents or by compression. The mechanical pulp can be changed into chemical pulp by extracting the resinous incrustations with ammonia or other alkali or alkaline salt.

5 This invention of mine if worked under a vacuum or pressure in pulp working machinery can be applied to nearly all existing beating machines.

Among the advantages that are expected to be derived from this invention are the following:—first saving in time of beating, second, cheapening of the sizing process, third, the possibility of using a larger percentage of filling materials without weakening the strength of the finished paper or board, fourth, the utilization of inferior qualities of pulp for better class papers, as for instance mechanical pulp where previously only chemical pulp had been used; fifth, larger quantities can be treated in one operation without material increase in the driving power; sixth, the improvement in the quality of the paper with a given class of material; seventh, absence of cloudiness and unevenness caused by air bubbles and untreated batches; eighth, less breakage and consequent waste on the paper machine, and ninth, the converting of mechanical pulp into chemical pulp or cellulose in the same apparatus and at the same time that the beating is effected.

I declare that what I claim is:—

1. An apparatus for treating wood pulp and converting it into a milky-like mass containing water, consisting of a closed chamber, means for heating this closed chamber, means for adding chemicals, means for varying the pressure in the closed chamber from above atmospheric pressure to a considerable vacuum, and means for carrying on a continuous forced circulation through the closed chamber.

2. An apparatus for treating wood pulp and converting it into a milky-like mass containing water, consisting of a closed chamber, means for heating this closed chamber, means for adding chemicals, means for varying the pressure in the closed chamber between a considerable pressure above

atmospheric pressure and a considerable vacuum, means for carrying on a continuous forced circulation through the closed chamber, a disintegrating device in connection with said closed chamber and means for carrying on a forced circulation through the disintegrator device and through the chamber back to the disintegrating device.

3. The improvement in apparatus for treating wood pulp and converting it into a milky-like mass containing water, which consists in a closed chamber, means for varying the pressure therein between a considerable pressure and a considerable vacuum, means for disintegrating in connection with said chamber, means for causing a circulation through the disintegrator and the chamber back again to the disintegrator and means for regulating the distance between the knives and the disintegrator from the outside while the parts are in operation, substantially as described.

4. The improvement in apparatus for treating pulp and converting it into a milky-like mass containing water, which consists in a closed chamber, means for varying the pressure therein between a considerable pressure and a considerable vacuum, means for disintegrating in connection with said chamber, means for causing a circulation through the disintegrator, and the chamber, back again to the disintegrator, means for regulating the distance between the knives in the disintegrator from the outside while the apparatus is in action, and means for heating or cooling the contents.

5. The combination of the chamber A, pump H, passage J, three-way cock M, and disintegrator N, with means for regulating the disintegrator substantially as and for the purpose described.

In witness whereof, I have hereunto signed my name this 16th day of July, 1910, in the presence of two subscribing witnesses.

HERMAN ARLEDTER.

Witnesses:

RICHARD WILLIS WILLIAMS,
H. WILLIAMS.