

985,613.

Fig. 1.

Fig. 2.

Witnesses

Inventor
George H. Marshall

James F. Brown
E. M. Ricketts

Inventor
George H. Marshall
By Watson E. Coleman
Attorney

UNITED STATES PATENT OFFICE.

GEORGE H. MARSHALL, OF ROANOKE RAPIDS, NORTH CAROLINA.

APPARATUS FOR REDUCING FIBER-YIELDING MATERIALS.

985,613.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE H. MARSHALL, a citizen of the United States, residing at Roanoke Rapids, in the county of Halifax and State of North Carolina, have invented certain new and useful Improvements in Apparatus for Reducing Fiber-Yielding Materials, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to mechanism for carrying out my improved process for the treatment of fiber yielding materials of the cellulose variety such as sugar cane, bagasse, corn-stalks, sorghum, flax straw, etc., for which process I have made application for United States Letters Patent of even date herewith.

Large quantities of these materials are to be obtained as refuse matter in regions remote from centers where manufacturers might use them for various purposes, such as the manufacture of paper pulp and paper, as well as for textile uses. Owing to the remoteness of the origin of such materials, the matter of transportation makes their cost in many cases prohibitive for the manufacturer. These materials containing cellulose fibers are in many cases destroyed by fire or other methods, and are a source of expense and trouble to the producers, the plants being usually grown for other purposes, such for instance, as sugar cane which is grown for its sugar, and flax which is grown for its seed, so that the stalks, as refuse matter, are a total loss to the farmer. It is obvious that it is nearly always impracticable to manufacture the waste materials into commercial products at their points of origin owing to their remoteness from markets and the difficulty of securing skilled labor to utilize such waste materials. It will be quite apparent that if the useless contents of such materials can be removed by simple and cheap mechanism, and the waste materials reduced in weight, say fifty per cent., that it will be possible to make a large saving in freights and thereby place these materials at the disposal of many possible users, both producer and consumer being thus materially benefited and an economy in nature's products promoted. This will be particularly true in the paper and pulp industries, as at the present moment the greatest source of raw materials in these industries is wood of various kinds, the ob-

tion of which is leading to the rapid depletion of the forests.

It is the object of this invention to provide simple and cheap mechanism for the utilization of these products by carrying out said process, which process consists in treating such waste or raw materials to a high steam pressure in a closed vessel preferably of a rotating type, in the presence of water and some neutralizing material of an alkaline nature, whereby the sugars, gums and useless incrusting matters are disintegrated and dissolved and rendered possible of removal by blowing the liquor from the closed vessel and afterward subjecting the treated material to washing and drying.

My improved process may be carried out by machinery of various forms and in order that the process and mechanism may be readily understood by those skilled in the art, I have illustrated a preferred form of mechanism in the accompanying drawing in which—

Figure 1 is a diagrammatic illustration of the complete mechanism, the various parts being shown in their proper relative positions and the connecting and driving mechanisms, which may be of any ordinary or preferred type, shown in outline; and Fig. 2 is an elevation of the boiler, looking at the right hand side as shown in Fig. 1.

Referring specifically to the drawing, 1 indicates a closed vessel or boiler of a well known elongated rotary type, 2, 2 the trunnions upon which the boiler is mounted to rotate, and 3, 4, 5, 6 the gearing which transmits the necessary power for the rotation of the boiler. The boiler is provided at one end with a discharge spout 7 in which is located a valve 8 of any suitable form to permit of the blowing out of its liquid contents, a swing pipe 9 being connected with the end of the spout, through which the liquid contents, together with the steam used for blowing, and any accumulated gases, may be passed and conveyed to any desired point. Connected with one of the trunnions 2, which is itself hollow, is a steam inlet pipe 10, the entrance of steam into the boiler being controlled by a suitable valve 11 in said pipe. The boiler is provided at the end opposite the discharge spout 7 with a suitable cover 12, which may be hinged for convenience of operation, which cover is rendered hermetically tight by being screwed down by bolts 13 upon a

suitable gasket 14. Within the boiler 1, near the discharge end, is a transverse screen 15.

Above and slightly to one side of the boiler is a suitable tank 16 in which the solution to be used in the boiler is mixed, and leading from the bottom of said tank is a pipe 17 having a suitable valve 18, a swing pipe 19 being attached to the end of said pipe 17 in such position that when the pipe 19 is swung down, as shown in dotted lines, the contents of the tank 16 may be discharged into the boiler.

Also above and to one side of the boiler is a conveyer of any preferred form, being here shown as an endless belt 20 mounted on pulleys 21, the said conveyer leading to the boiler in order to convey the materials to be treated thereto.

Below the boiler is located a suitable conveyer, here shown as an endless belt 22, on pulleys 23, which serves to convey solid contents discharged from the boiler as hereinafter described, to squeeze rolls 24, and above said rolls, is a water pipe 25 suitably perforated, to discharge water on the matter entering between the rolls. Below the rolls 24 is another conveyer, shown as an endless belt 26 on pulleys 27, which lead to another set of squeeze rolls 28, below which is another conveyer belt 29 mounted on suitable pulleys, as at 30 and leading into a dry house or kiln 31, one of the pulleys supporting belt 29 being within the dry house, which may be heated in any suitable manner, and suitable idler rollers 32 being provided to support the conveyer belt 29 owing to its length.

The raw materials are brought to the rotating boiler by the conveyer 20, and discharged into the boiler, the boiler being in a vertical position, with the lid 12 at the top and open. The neutralizing solution being mixed in the tank 16, the swing pipe 19 is lowered into the opening of the boiler and the contents of the tank allowed to flow into the boiler. The neutralizing solution is composed of water with which may be mixed chalk, powdered limestone, lime, or any material of a weak alkaline nature. The materials under treatment, and the neutralizing solution, having been placed in the boiler the cover 12 is then put on and securely bolted to make a tight joint. Steam is then slowly admitted to the boiler through the pipe 10 and valve 11 and the boiler rotated on the trunnions by the gearing 3 at a speed of preferably one revolution in two minutes. The steam is allowed to flow into the boiler for say about fifteen minutes when it is cut off and the boiler stopped with the valve 8 at the top, being in a vertical position. The valve 8 is now opened sufficiently to allow the heated air to escape when it is again closed tightly,

the boiler again set in motion, and the steam again turned on, the pressure being allowed to rise slowly to about 150 pounds, where it is kept for from one to three hours according to the condition of the material under treatment, green material requiring a short time and old and dry material a much longer period. The loaded boiler having been kept rotating and under the steam pressure for from one to three hours, the material within it will have all the gums and useless matter softened sufficiently to permit of blowing down the pressure. The boiler therefore at this period, is stopped in a vertical position, with the valve 8 at the lower end and connection is made to the pipe 9. The valve 8 is now opened as quickly as possible and the resultant liquors in the boiler blown out through the screen 15 which prevents the passage of the material into the pipe 9. The blowing down of the pressure in as short a time as safety will permit, accomplishes a double purpose; first, the quick release of pressure tends to explode the piths or woody portions of the materials in the boiler, such as the pith in sugar cane and the woody boon or stalk in flax straw, and allows this disintegrated matter to pass out more or less with the quick rush of steam through the blow out valve 8. The resultant liquors having been blown out, and the steam pressure having been reduced to atmospheric pressure, the cover 12 is then removed and the boiler turned so that the contents will fall upon the conveyer 22 and be conducted to the squeeze rolls 24, where it receives a shower of water from pipe 25 which washes out the dirt and waste products which failed to pass off in the blow off operation. From the rolls 24 the material passes to another conveyer 26 and thence to a second set of squeeze rolls 28 which remove the surplus water and the material thence passes on the conveyer 29 through the dry house or kiln 31 which may be of any desired or suitable type.

The various pulleys and shafts may be actuated by a system of belting running from a main power shaft, or in any other desired manner.

If preferred, the finished product may be dried in the open air and then baled for shipment.

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

The combination of stationary bearings, a rotary digester of cylindrical shape, having trunnions rotatable in said bearings, one of said trunnions being hollow, said digester having at one end an inlet neck closed by a removable cover, and at its other end a reduced outlet neck covered by a transverse screen, and controlled by a valve, an elevated liquid tank, a right angular discharge

pipe having its vertical branch depending from the liquid tank, a cut-off valve in the horizontal branch of said discharge pipe, and a right angular rigid swing pipe connected to the end of the horizontal branch of said discharge pipe, and mounted for vertical swinging movement whereby it may be swung from an upright position, downwardly to a horizontal position to discharge into the inlet neck of the digester when the cover of the latter is removed and the digester is in an upright position. 10

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEO. H. MARSHALL.

Witnesses:

THOS. R. MURPHY,

J. T. CHASE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
