H. A. VALLEZ.

PULP DRIER.

APPLICATION FILED DEC. 16, 1907.

905,252. Patented Dec. 1, 1908.

2 SHEETS—SHEET 1.

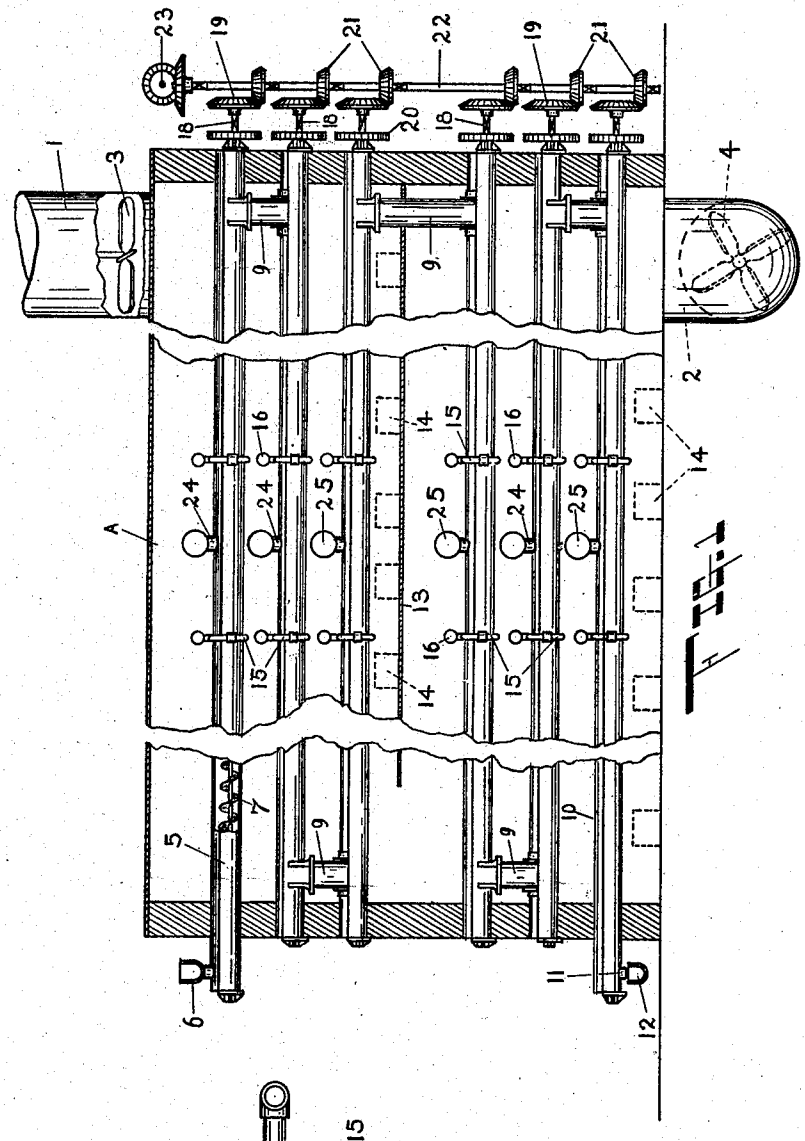


FIG. 1.

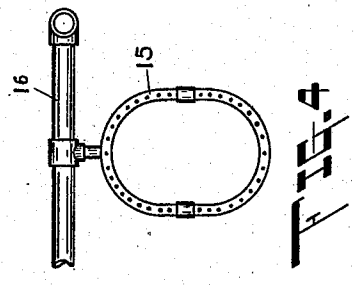


FIG. 4.

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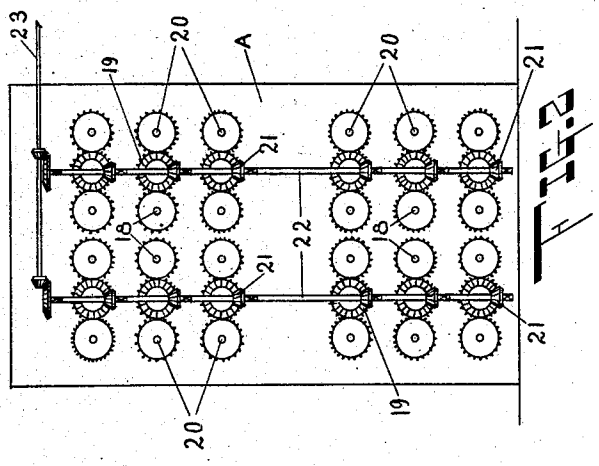


FIG. 2.

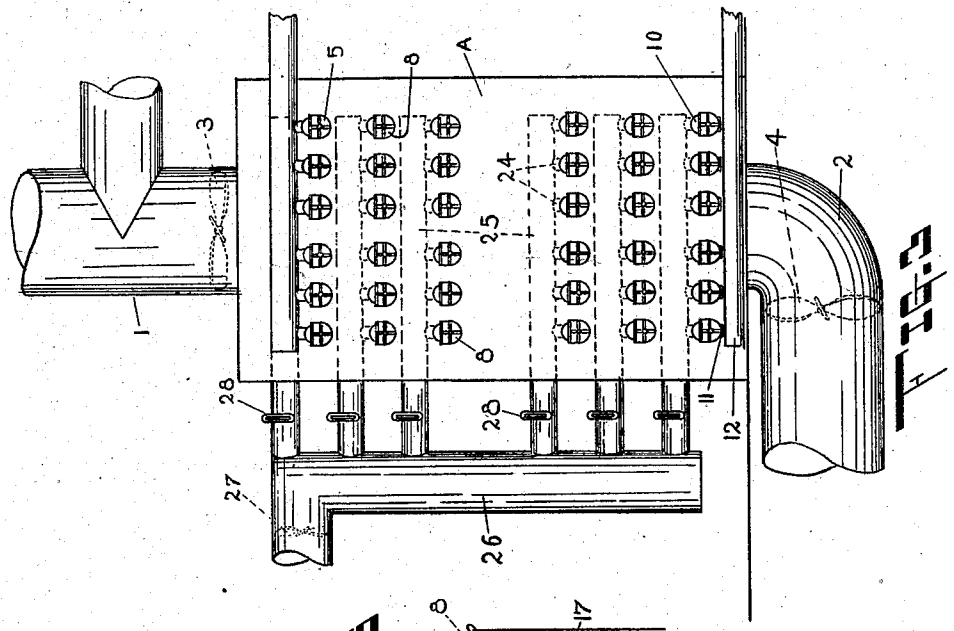


FIG. 1.

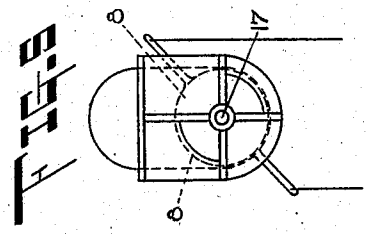


FIG. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY A. VALLEZ, OF BAY CITY, MICHIGAN.

PULP-DRIER.

No. 905,252. Specification of Letters Patent. Patented Dec. 1, 1908.

Application filed December 16, 1907. Serial No. 406,814.

To all whom it may concern:

Be it known that I, HENRY A. VALLEZ, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Pulp-Driers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in pulp driers, one object of which is to utilize the waste stack gases for drying the pulp without impeding the speed of travel of such gases.

Another object is to maintain the pulp white and clean during the drying operation.

A further object attained is the regulation of the temperature of the pulp as it is being dried.

Still another object attained is the release of steam from the pulp as it is being dried.

A still further object attained is a perfect circulation of the hot waste gases from the stack through the drier.

Another object attained is the removal of soot deposits from the drying tubes.

My invention also attains other objects and consists of novel features and combinations of parts, all of which will be more fully described hereinafter and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view longitudinally of the apparatus, parts being broken away; Figs. 2 and 3 are views of the opposite ends of the drying chamber; Fig. 4 is a detail view of one means for accomplishing the removal of soot or other deposits on the drying tubes; and Fig. 5 is a detail view of one of the adjustable vents.

Hitherto the plan has been tried of utilizing flue gases to dry beet or other pulp, but it has been found necessary to maintain the same draft or speed of travel of the flue gases in the drier that obtains in the stack and such draft is strong enough to carry the light pulp with it. Furthermore, the contact of the gases with the pulp discolors the pulp and loads it with impurities. To obviate these and other manifest disadvantages, I provide a closed chamber (A) and connect the chamber (A) near its rear end with an inlet pipe (1) leading from the stack or other waste gas flue (not shown) into the chamber through the top thereof, and from the lower rear end of the chamber I lead the waste gases deprived of the greater portion of their heat back to the stack or to any other discharge through an outlet pipe (2). In order to maintain approximately the same speed of circulation of the gases in the drying chamber as is maintained in the stack I locate a blower fan (3) in the inlet pipe (1) and an exhaust fan (4) in the outlet pipe (2); I have shown these fans diagrammatically in the drawings. Extending from end to end of the drying chamber are a plurality of series of horizontal tubes, and while I have shown but six tubes in each horizontal series, it is obvious that a greater or lesser number might be employed.

The forward ends of the upper series of tubes (5) project beyond the front wall of the machine and are equipped with hoppers (6) (6) to receive the wet pulp, such pulp being conveyed from end to end of the tubes by means of screw conveyers (7). The horizontal series of tubes intermediate the upper and lower series have their opposite ends projecting through, but not beyond the end walls of the drying chamber, the ends being provided with dampers or adjustable vents (8) (8) for a purpose hereinafter set forth.

Each tube incloses a screw, the screws in the upper horizontal series adapted to convey the pulp to the rear of the chamber where the upper tubes communicate through down chutes (9) with the rear ends of the next lower series of tubes, the screws in which convey the material toward the front of the chamber until the down chutes (9) connecting the second series of tubes with the next lower series is reached and so on, the material being conveyed forward and backward through the drying chamber until the lowest series of tubes (10) is reached, it being remembered that the ends of such tubes project beyond one end of the chamber and are provided with delivery spouts (11) adapted to discharge the thoroughly-dried material into any suitable receptacle, as a conveyer (12).

The forward ends of the screws (7) terminate in trunnions (17) which are journaled in the ends of the tubes, the rear ends of the screws being provided with shafts (18) passing through the ends of the tubes and supported in suitable bearings, the shafts equipped with intermeshing gears

(20). Looking at Fig. 2, it will be seen that for convenience the gears are positively actuated in series of threes, the center shaft of each series having a bevel gear (19) thereon adapted to mesh with a beveled pinion (21) carried by a countershaft (22) driven by a power shaft (23) in the usual manner, the two countershafts extending vertically and equipped with pinions for each series of gears. The end gears of each series of gears rotate in the same direction, whereas the center gear rotates in a direction opposite thereto. The rotation of the screws will, of course, tumble and commingle the material, bringing every portion thereof against the heated sides of the tube, but not allowing it to remain in contact with the tube sufficiently long to burn.

It is obvious that the heat will evaporate the particles of liquid in the wet pulp and generate steam, and it is desirable to remove this steam to facilitate the drying operation, to which end I provide steam outlets (24) leading from each tube intermediate its ends and connected to steam-receiving pipes (25) extending to a steam chamber (26) equipped with an exhaust fan or other suitable device (27) adapted to create a partial vacuum or rarefaction in the pipes (25) and tubes to withdraw the steam therefrom.

It is also necessary to watch the pulp to prevent its burning and to provide some means for regulating the temperature in the tubes, to which end I provide the thermometers (28) on the steam pipes (25) and in the event that the temperature rises above a predetermined point I may open the vents or dampers, (8) (8), thereby admitting cold air to any one or more series of tubes, the air being drawn into the tubes because of the slight vacuum created by the exhauster (27), cooling the tubes and the material therein.

In the present instance, I have shown six series of horizontally-placed tubes, but it is obvious that I might use a smaller or larger number of series, and that they need not be horizontal. The drawings disclose a baffle-plate (13) interposed between the upper three series of tubes and the lower three series, the baffle plate extending forwardly from the rear of the chamber between the inlet and outlet pipes (1) and (2), thus diverting the incoming hot gases and causing them to travel toward the front of the chamber to envelop the series of tubes from end to end. In view of the fact that the tubes within the chamber are closed the heat is conducted to the material through the material of the tubes and the hot gases do not come into actual contact with the pulp. Also it will be observed that I lead the hot gases into the chamber at the point where the pulp is wettest, thus avoiding the danger of burning the pulp, as well as allowing the wettest pulp to pass through the greatest heat and thus facilitate the drying operation.

I may locate clean-out doors (14) on the sides of the chamber, adjacent the baffle-plate and also at the bottom of the chamber.

It is evident that soot and other dirt may be deposited upon the series of tubes and as one means for keeping the tubes clean, I preferably encircle the tubes at intervals throughout their lengths within the chamber with rings (15) perforated on opposite sides, the rings being hollow and connected at some point in their peripheries to a steam-supply-pipe (16) extending outside the chamber and controlled by a valve or cock (not shown). The perforations, facing both ways, will emit steam in opposite directions to remove the deposit from the tubes.

I may use an auxiliary heating furnace, the heat from which is conveyed into the closed chamber (A) through the induction pipe (1) and mingles with the fuel or stack gases, or I may employ the auxiliary furnace alone without reference to the flue gases.

It is obvious that the advantages hereinbefore mentioned are attained by this invention, and that changes might be made in the form and arrangement of the several parts described without departing from the spirit and scope of my invention.

Having thus fully disclosed my invention, what I claim as new is—

1. A drier comprising a chamber, conduits for admitting waste gases to the chamber and for permitting their escape, a tube conveyer closed within the chamber to the entrance of hot gases, and means for removing deposits from the exteriors of the conveyer.

2. A drier comprising a chamber, conduits for admitting waste gases to the chamber and for permitting their escape, a tube conveyer closed within the chamber to the entrance of hot gases, hollow perforated rings encircling the conveyer at intervals, and a steam connection communicating with the rings.

3. The combination in a drier comprising a closed chamber, stationary tubes extending across the chamber, the tubes at one end projecting through the wall of the chamber, chutes within the chamber connecting each two adjacent tubes, screw conveyers within the respective tubes, means for rotating the screw conveyers, a waste gas conduit leading to the chamber, means for forcing the waste gases into the chamber, an exhaust conduit leading from the chamber, means in the exhaust conduit for withdrawing the gases from the chamber, the inlet and exhaust conduits communicating with the chamber at the same end, a baffle plate extending between the inlet and exhaust conduits, the tubes being closed to the entrance of hot

gases within the chamber, means for permitting the escape of vapor from each tube and means for admitting air to the respective tubes, and controlling the amount of air so admitted.

4. In a drier, the combination of a chamber, stationary tubes arranged in banks and extending across the chamber, the tubes at one end passing through the walls of the chamber, chutes within the chamber connecting adjacent tubes, screw conveyers in the tubes, means for rotating the screw conveyers, means for admitting hot gases to and removing them from the chamber, steam outlets located intermediate the ends of each tube, a steam receiving pipe connecting the steam outlets in each bank of tubes, a steam chamber to which the steam pipes lead, means for creating a partial vacuum in the steam chamber, and means for admitting air to the respective tubes and controlling the amount of air so admitted.

5. In a drier, the combination of a chamber, stationary tubes arranged in banks and extending across the chamber, the tubes at one end passing through the walls of the chamber, chutes within the chamber connecting adjacent tubes, screw conveyers in the tubes, means for rotating the screw conveyers, means for admitting hot gases to and removing them from the chamber, means for permitting the escape of vapor from the respective tubes, the ends of the tubes passing through the wall of the chamber being provided with openings to admit air to the respective tubes and adjustable plates adapted to cover and uncover the openings to regulate the amount of air admitted to the tubes.

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

HENRY A. VALLEZ.

Witnesses:
GEO. B. WILLCOX,
RALPH S. WARFIELD.