

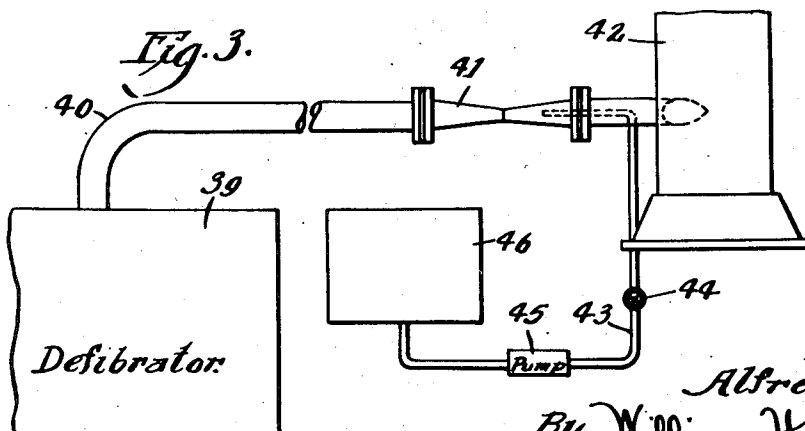
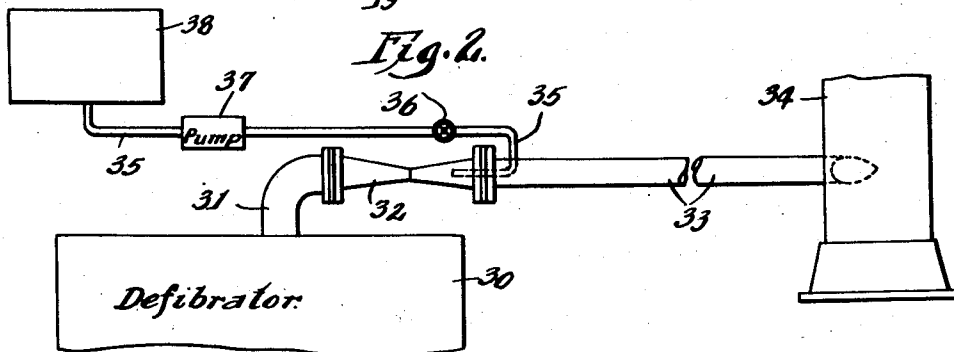
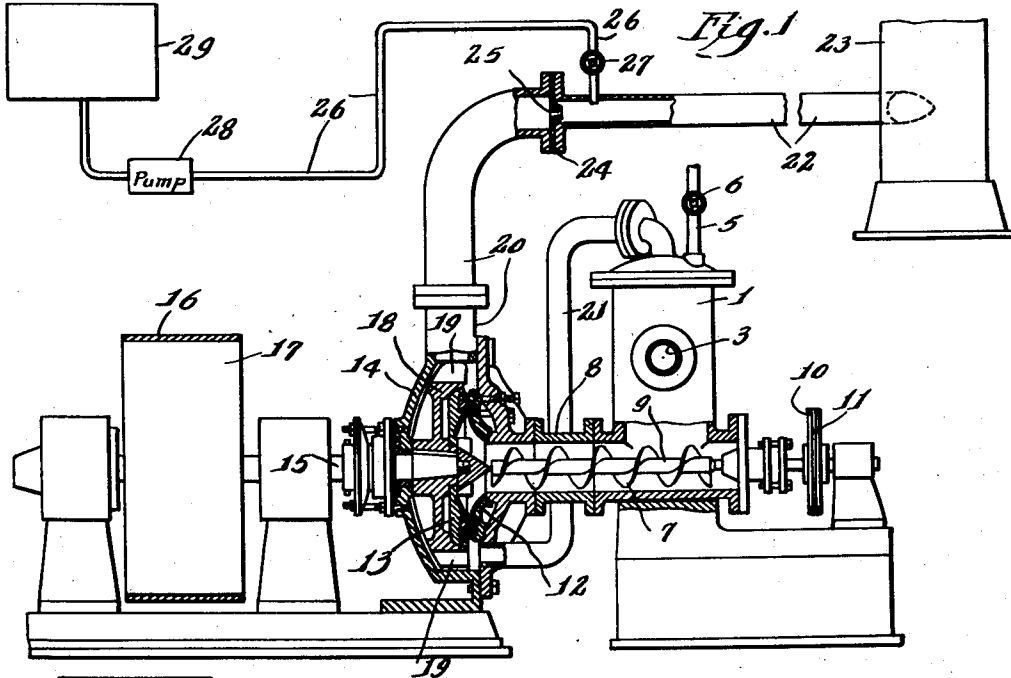
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DEFIBERING APPARATUS

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DEFIBERING APPARATUS

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1 Claim. (Cl. 92—7)

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This invention relates to defibering apparatus of a type in which wood chips or other fibrous growth material are fed into a compression chamber containing steam at or above a temperature of 212° F. so as to soften the incrusting substances by which the fibres are held together in the fibrous growth material, the fibrous materials being subjected to a mechanical fibre-loosening operation within the pressure chamber in the absence of water or other liquid in an amount sufficient for suspending the fibres, and being then discharged from the pressure chamber. Such mechanical defibering in a gaseous atmosphere is disclosed by Asplund Patent No. 2,008,892, dated July 23, 1935.

It is one of the objects of this invention to provide improved apparatus for defibering fibrous growth materials by the use of structure comprising an improved arrangement of means for withdrawing the fibres from the pressure chamber, and comprising preferably an elongated outlet conduit provided with pressure reducing means constructed and arranged so as to control to great advantage the escape of steam and fibres from the pressure chamber while at the same time limiting the flow of the steam and thus maintaining the desired steam pressure in the pressure chamber. For accomplishing this object, I have employed a construction comprising an elongated outlet conduit serving to provide an increased period for the beneficial action of the steam for modifying to the desired extent the condition of the incrusting substances carried by the fibres, and an increased period for the action of sodium hydroxide or other chemical agent introduced into the outlet conduit of such improved construction for enabling such chemical agent to act to advantage on the fibres and the incrusting substances carried by the fibres for making such fibres softer and more flexible.

The preferred form of means for controlling the withdrawal of the steam and fibres from the pressure chamber as disclosed by this application comprises a plate or other part having a restricted opening therethrough and positioned in the outlet conduit in full communication with the pressure chamber during substantially the whole of the period of operation of the apparatus, such plate or other part being adapted by itself to control the escape of steam and fibres from the pressure chamber, the restricted opening being of such size as to permit the steam to eject the loose fibres therethrough while at the same time limiting the escape of the steam so as to maintain the desired steam pressure in the chamber.

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The restricted opening as employed in this construction may be provided by the use of a Venturi tube forming a portion of the outlet conduit, or it may be provided by a plate positioned transversely across the conduit.

It is another object of this invention to improve devices of this type in sundry details hereinafter pointed out. This application is being filed as a continuation-in-part of my prior application Serial No. 364,039, filed November 2, 1940, now abandoned. The preferred means by which I have accomplished my several objects are illustrated in the accompanying drawing, in which:

Fig. 1 is a diagrammatic view of a preferred form of my improved apparatus; and

Figs. 2 and 3 are diagrammatic views of modified forms of apparatus.

In Fig. 1, I have shown one type of defibering apparatus suitable for carrying out my improved process, the major portion of such machine corresponding with the machine shown by said Asplund Patent No. 2,008,892. This apparatus comprises a steam chamber 1 having an opening at 3 through which the fibrous material which may be in the form of chips of wood is introduced by means not shown, against the pressure of steam delivered to the chamber 1 through a pipe 5 controlled by a valve 6. The steam is supplied at such pressure and the valve is to be controlled so that a pressure is maintained within the chamber 1 above atmospheric pressure and so as to maintain a temperature above 212° F.

At the lower end of the chamber 1, the feed screw 7 is provided for carrying chips from the chamber into and along a conduit 8 toward the left in said Fig. 1, such screw being supported by a shaft 9 rotatably mounted in the wall of the chamber and arranged to be driven by means of a chain 10 and sprocket 11. With the screw 7 rotating in the predetermined direction, chips falling into engagement with the screw are carried along the conduit 8 with a lignins or other incrusting and bonding substances of the wood holding the fibres in their original bundled form but with such incrusting substances substantially softened by the action of the steam.

At the outer end of the conduit 8, the chips are delivered to toothed defibering discs 12 and 13 within a suitable casing 14, the disc 12 being mounted rigidly in position and the disc 13 being rotatably mounted by means of a heavy shaft 15 driven by a belt 16 and pulley 17. In the arrangement shown, the rotatably mounted disc 13 is supported in position by means of a rotor body 18, which is provided on its periphery with a series

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of outwardly extending vanes 19. At its upper edge, the casing 14 communicates with an outlet conduit 20 through which the fibres escape from the casing 14. Stuffing boxes of any approved type are preferably provided in connection with the shafts 9 and 15.

In the normal use of the machine as above described, chips or other fibrous growth material are fed into the chamber 1 through the opening 3 against the pressure of steam in the chamber, such fibrous material dropping into engagement with the screw 7 by which it is carried at the desired speed of movement toward the defibering discs 12 and 13, with the incrusting substances of the chips being softened by the effects of the steam as the material moves along the conduit 8. At the end of the conduit 8, the chips are fed by the screw between the discs 12 and 13, by which the bundles of fibres making up the chips are quickly and easily torn apart so as to leave the fibres largely in individualized form while still carrying the softened incrusting substances thereon. As the fibres move outwardly from the discs 12 and 13, such fibres are engaged by the vanes 19 and forced into the outlet conduit 20, together with the steam which passes outwardly between the discs with the fibres. For insuring that the required amount of steam shall be present in the casing 14 and in the conduit 20, I have provided a steam pipe connection 21 leading from the upper end of the chamber 1 and opening into the lower part of the casing 14.

In the arrangement shown in Fig. 1, the outlet conduit 20 is of reduced size at the outer end portion 22 thereof to which a cyclone or condenser device 23 of any appropriate type is connected. Between the reduced size portion 22 of the conduit and the portion of the conduit adjacent to the casing 14, I have interposed a plate 24 having a continuously open restricted orifice 25 therethrough of such size as to permit the steam and fibres to escape therethrough under the influence of the pressure of the steam but so as to prevent too great reduction of the pressure of the steam within the casing 14 and the adjacent portion of the conduit 20 and thus maintain the desired steam pressure in the chamber.

With the pressure of steam maintained in the casing 14 above atmospheric pressure, the separated individual fibres are carried by the steam along the conduit and through the orifice 25, there being, of course, a substantial reduction in the pressure of the steam within the conduit portion 22 as compared with the pressure in the conduit portion adjacent to the casing 14. The conduit portion 22 may be of any desired length for insuring a continued action of the steam on the fibres, but it should normally be short enough to insure that the steam pressure will be sufficient for forcing the fibres from the conduit into the cyclone device.

In the arrangement shown in said Fig. 1, I have provided means for delivering sodium hydroxide or other suitable chemical into the reduced size portion 22 of the conduit by means of a pipe 26 opening into the conduit portion 22 adjacent to the restriction plate 24. In this arrangement, the chemicals are preferably forced in solution form through the pipe 26 under the control of a valve 27 and a pump 28 which takes the solution from a tank 29.

In the movement of the fibres through the outlet conduit 20, including the reduced size conduit portion 22, the fibres are subjected to the effects of the steam by which the incrusting substances

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on the fibres are substantially softened. In the movement of the fibres through the reduced size portion 22 of the outlet conduit, such incrusting substances are acted upon by the chemicals injected through the pipe 26, with the result that at least a portion of the incrusting substances are chemically changed so as to secure the desired degree of softness and flexibility of the fibres.

In the arrangement shown in Fig. 2, a defibrator 30 is shown diagrammatically, being of the same type as is shown in Fig. 1, with an outlet conduit 31 leading therefrom corresponding to the outlet conduit 20 of the Fig. 1 structure. In this modified form of apparatus, a Venturi tube 32 is interposed in the outlet conduit at a point adjacent to the defibrator, with the conduit portion 33 leading to the cyclone device 34 of reduced size as compared with the size of the portion of the conduit adjacent to the defibrator. Means is provided in this construction for feeding chemicals into the Venturi tube adjacent to the throat of the tube, such means comprising a pipe 35 having a control valve 36 therein and connected with a pump 37 which draws a suitable chemical reagent from a tank 38. The operation of the apparatus of Fig. 2 is substantially like that of Fig. 1, the Venturi tube 32 having substantially the same effect as that of the orifice plate 25 of the arrangement of Fig. 1.

In the arrangement shown in Fig. 3, the construction is substantially like that of Fig. 2 except for a change in the location of the Venturi tube. In the Fig. 3 structure, a defibrator 39 has an outlet conduit 40 opening therefrom, with a Venturi tube 41 interposed in the conduit adjacent to a cyclone device 42 with which the outlet conduit is connected. Means for feeding chemicals into the outlet conduit 40 comprises a pipe 43 with a control valve 44 interposed therein and connected with a pump 45 taking a suitable chemical solution from a tank 46.

The arrangement of Fig. 3 operates in substantially the same manner as that above described in connection with Fig. 2, in that the throat of the Venturi tube is continuously open for permitting the steam and fibres to move along the conduit but is of such restricted size as to limit the escape of the steam so as to enable the steam in the defibrator to be kept up to the desired pressure for effective operation.

In all three of the arrangements shown herein, the escape of the steam and the fibres is controlled adequately without the necessity of providing any means therefor other than the restricted openings through the plate 24 and the Venturi tubes 32 and 41. These restricted openings serve effectively for limiting the escape of the steam so as to maintain the desired pressure in the defibrator while at the same time permitting the movement of a steady stream of steam and fibres from the defibrator to the cyclone device by which the fibres are received.

I claim:

A defibering apparatus comprising in combination, a pressure chamber; fibre-feeding means operatively connected with said pressure chamber for supplying fibrous growth material to said chamber; a steam feeding conduit in communication with said chamber for introducing steam into said chamber; mechanically operating defibering apparatus disposed in said chamber for separating from each other the fibres fed into said chamber; a discharge conduit in communication with said chamber, said discharge conduit being comprised of two portions of substantially

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different diameters and having an apertured plate disposed between said portions at the juncture thereof, the conduit of larger diameter being disposed between said apertured plate and said chamber, the aperture in said plate being in full communication with both portions of said conduit and having a diameter which is substantially smaller than the diameter of either of said portions of said conduit but of sufficient diameter that the separated fibres discharged from said chamber under the pressure of the steam introduced therein pass through said aperture; and an injector for introducing a chemical treating medium into said conduit, said injector being disposed substantially adjacent said apertured plate and in direct communication with the portion of said conduit having the smaller diameter.

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REFERENCES CITED

The following references are of record in the file of this patent:

6

UNITED STATES PATENTS

	Number	Name	Date
	Re. 19,288	Bacchus	Aug. 28, 1934
	1,367,895	Schouten	Feb. 8, 1921
5	1,824,221	Mason	Sept. 22, 1931
	1,923,313	Mason	Aug. 15, 1933
	2,007,348	Scharmann	July 9, 1935
	2,008,892	Asplund	July 23, 1935
	2,045,818	Adams	June 30, 1936
10	2,145,851	Asplund	Feb. 7, 1939
	2,265,622	Basler	Dec. 9, 1941
	2,300,184	Turner	Oct. 27, 1942
	2,323,194	Beveridge	June 29, 1943
15	2,405,213	Heritage	Aug. 6, 1946

FOREIGN PATENTS

	Number	Country	Date
	473,708	Great Britain	Oct. 19, 1937
	99,120	Sweden	Apr. 11, 1940

OTHER REFERENCES

Der Papier Fabrikant Wochenblatt fur Papier Fabrikation Heft 2, May 1943, pages 57 to 60.