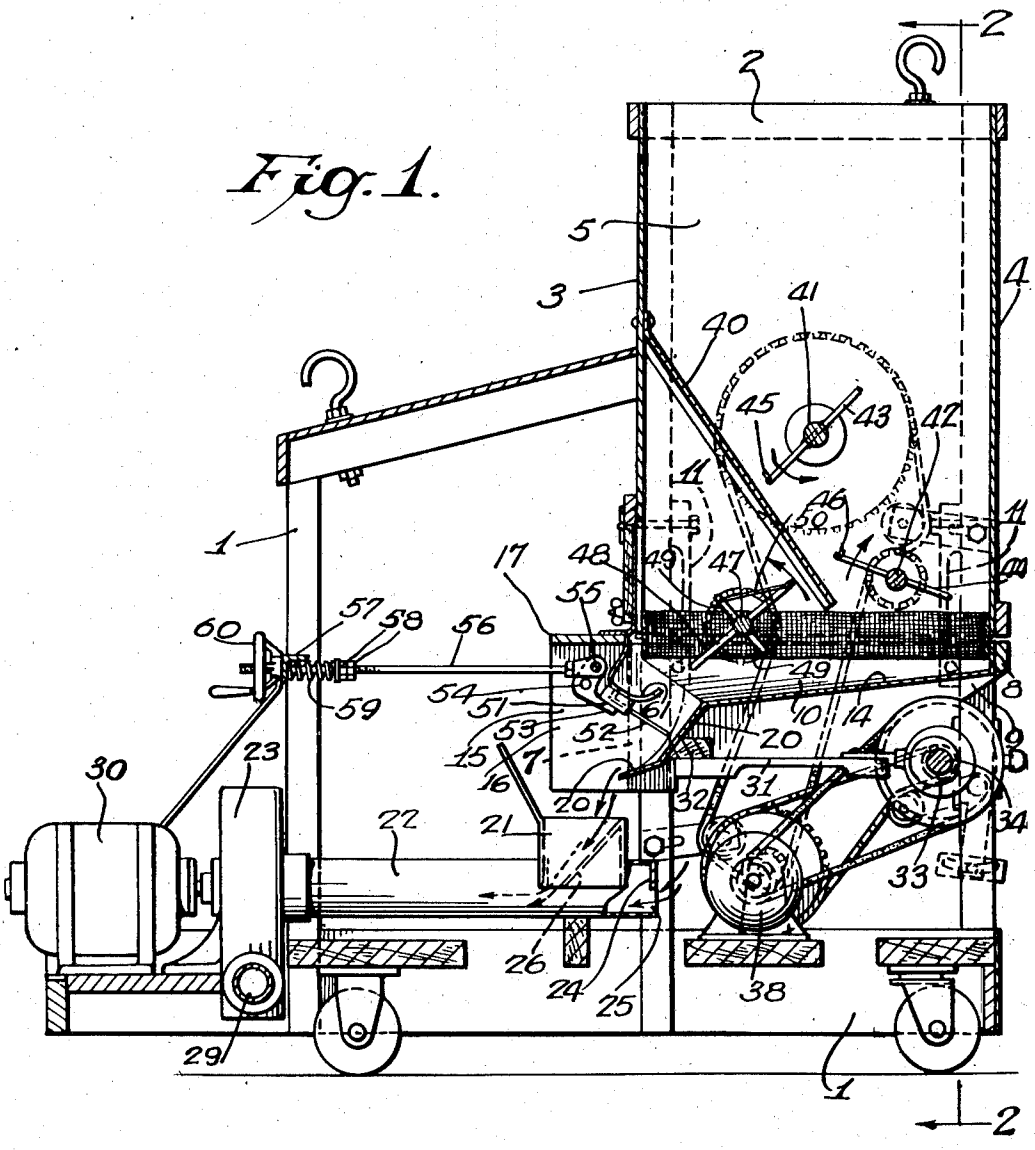
April 6, 1948. G. W. LUHRMANN 2,439,014

APPARATUS FOR PREPARING FINELY DIVIDED FIBRE STOCK FOR FLUID CONVEYANCE

Filed Dec. 23, 1944 2 Sheets-Sheet 1

Fig. 1.



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Fig. 3.

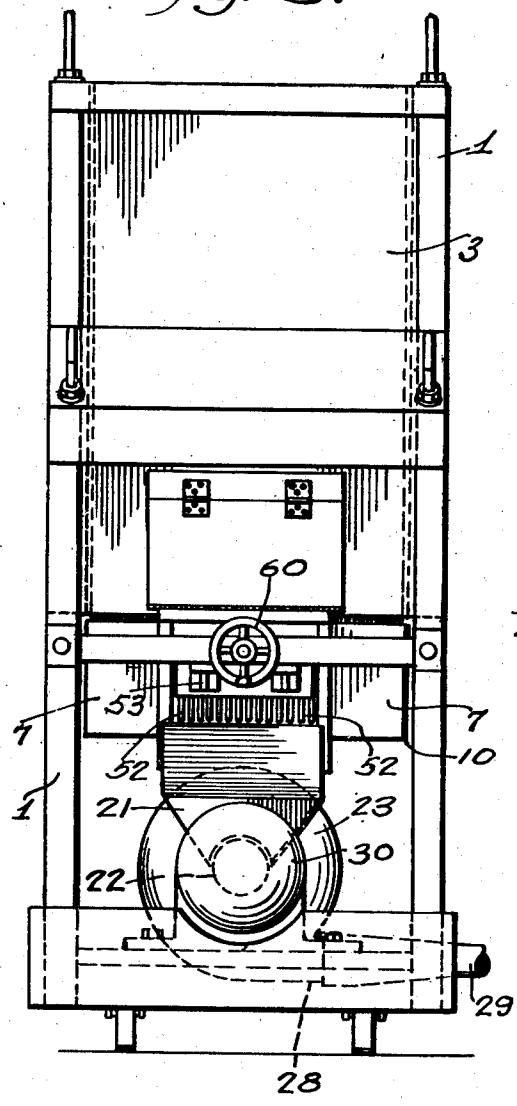
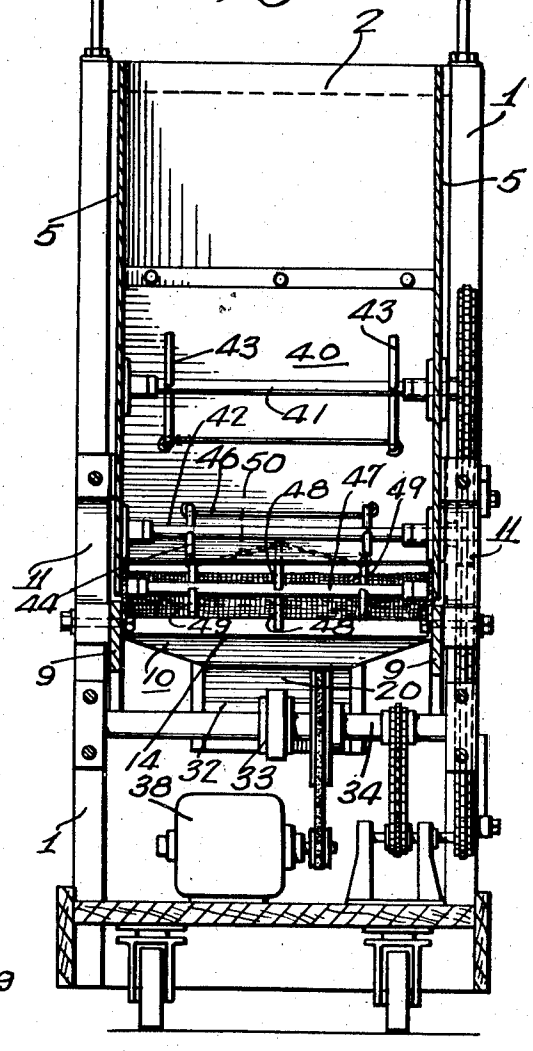


Fig. 2.



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APPARATUS FOR PREPARING FINELY DIVIDED FIBRE STOCK FOR FLUID CONVEYANCE

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Application December 23, 1944, Serial No. 569,515

8 Claims. (Cl. 241—98)

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This invention relates to a mobile apparatus for preparing fibrous material, such as shredded finely divided particles of asbestos, fiberglas, etc., to be pneumatically conveyed through a flexible conduit and to be discharged, together with a suitable dry agglutinant and an activating agent, from a nozzle or dispersing gun against a target surface to which the asbestos or other fibre is to be adhesively attached, for forming acoustical, heat, or other insulating or absorbent coatings on interior surfaces of walls, ceilings, etc., of buildings, ships or other structures.

The agglutinant, such as dry Portland cement, starch or other dormant adhesive, is preferably emitted from the nozzle concurrently with the fibre, in order that the two may be simultaneously impinged against the target surface by the air blast which conveys the fibre and the agglutinant through the flexible conduit to the nozzle.

The activating agent, such as water, or any other liquid capable of causing the dormant adhesive to become active, is preferably projected separately from the nozzle, also, under pressure, in the form of a spray to impinge upon the target surface in the area being bombarded by the relatively free particles of the fibre and the dry agglutinant, to moisten and thereby activate the adhesive and cause it to effect attachment of the fibres to the target surface.

The present invention relates particularly to a device for receiving and preparing matted preshredded asbestos fibre stock as it is taken from original shipping bales, etc., in a lumpy condition, with or without the dry agglutinant or other inactive cementitious substance admixed therewith.

The device is adapted to effect complete disintegration of the fibre clods into a fleecy cloud-like mass of loose particles capable of being entrained in and conveyed by a current of air flowing through the flexible conduit to the nozzle.

The conveying current of air is created by a suitable centrifugal blower, preferably included as a part of the device, to which one end of the flexible conduit is connected, while the opposite end of the flexible conduit is connected to the dispersing gun or nozzle by which the entrained fibre, etc., is directed against the surface to which the coating is to be applied.

One feature of the invention resides in the provision of agitating means within the main hopper, by which the clods are beaten, torn apart and broken down into relatively free falling particles, whereby packing, arching, or tunneling of the bulk of fibre in the main hopper is eliminated, and whereby the supply of disintegrated fibre is

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made constantly available at a substantially uniform rate.

Another feature of the invention resides in providing a vibrating feed for delivering the disintegrated fibre from the main receiving hopper of the device into a stationary funnel by which the fibre is delivered into a flowing stream of air created by the centrifugal blower.

Another feature of the invention resides in the provision of an oscillating rake and beater at the discharge end of the vibrating or reciprocating feeder; and the provision of means for readily adjusting the sweep of the rake and beater within the discharge chute of the feeder, from a convenient point externally of the machine, whereby the volume of disintegrated fibre discharged from the vibrating feeder for deposition in the air stream created by the blower may be quickly varied and minutely controlled.

Referring to the accompanying drawings:

Fig. 1 is a vertical longitudinal sectional elevation of the preferred form of apparatus constructed in accordance with the principles of the present invention;

Fig. 2 is a transverse sectional elevation taken on the line 2—2, Fig. 1; and

Fig. 3 is a left end elevation of the apparatus, as viewed in Fig. 1.

As shown in Fig. 1, the device comprises a suitable framework 1, in which is rigidly mounted a substantially rectangular box-like main hopper 2. The hopper 2 is open at its top and bottom and includes front and back end walls 3 and 4, and opposite side walls 5, 5.

Directly below the open bottom of the main hopper 2 is a horizontally vibrating feeder or shaker box 10, which includes opposite longitudinal side walls 9, 9 lying substantially in the planes of the side walls 5, 5 respectively of the stationary hopper 2. The vibrating feed box 10 also includes a back end wall 8, substantially in the plane of the back end wall 4 of the hopper 2, and a front end wall 7 substantially in the plane of the front end wall 3 of the hopper 2.

The vibrating feed box 10 is suspended below the open bottom of the stationary hopper 2 by means of resilient hanger links 11, 11 having their upper ends respectively secured to upright side members of the framework 1, and their lower ends pivotally connected to the longitudinal side walls 9, 9 of the shaker box 10.

The shaker box 10 is provided with an inclined bottom 14, which descends longitudinally (Fig. 1) and converges transversely (Fig. 2) toward a discharge box 15 located at the one end of the

shaker box 10, in the end wall 7 thereof. The open box-like discharge extension 15 of the shaker box 10 includes side walls 16, 16 which are respectively attached to opposite side portions of the front wall 7 of the shaker box 10. The side walls 16, 16 are connected by a top wall 17.

A discharge chute 20 is disposed in the open end extension 15 of the shaker box 10 and communicates with the lowermost end of the longitudinally inclined transversely converging bottom 14 of the shaker box 10. The chute 20 extends downwardly and forwardly between the side walls 16, 16 of the discharge box 15, in two intersecting planes disposed at an obtuse angle to each other, as shown in Fig. 1.

The lower forwardly projecting edge of the chute 20, as the vibrating feeder 10 reciprocates longitudinally, drops the disintegrated fibre into the open top of a rectangular stationary funnel 21 which is mounted on the upper side of a horizontal conduit 22 rigidly mounted on the framework 1.

The forward end of the conduit 22 is connected to the center or intake port of a centrifugal blower 23 and the rear end of the conduit, lying rearwardly of the funnel 21 is partly closed over the upper half of its cross-sectional area, by an end plate 24, leaving the lower half of its cross-sectional area open, as indicated at 25, to admit air into the conduit 22.

The funnel 21 is provided with a rear inclined wall 26 which extends down into the conduit 22 to a plane substantially coincident with the plane of the lower edge of the rear end plate 24, thus the stream of air flowing through the rear port 25 of the conduit 22 passes under the lower edge of the inclined wall 26 of the funnel 21, and the disintegrated fibre sliding down said inclined wall falls into and is conveyed by the underlying stream of air moving through the conduit 22 toward the blower 23.

The blower 23 discharges the disintegrated fibre and the conveying stream of air from a peripheral outlet port 28 into a flexible conduit 29, by which it is carried to the nozzle (not shown) which is remotely situated with respect to the machine. These nozzles or guns are well known in the art and further disclosure thereof is therefore deemed unnecessary.

Rotation of the rotor of the blower 23 is effected by an electric or other motor 30 carried by the framework 1. Vibration of the shaker box 10 horizontally, to effect feeding of the disintegrated fibre into the air stream created by the blower 23, is effected by a flexible link 31 having one end secured to a cross bar 32 of the shaker box 10, and its opposite end connected to an eccentric strap which encircles an eccentric 33 secured to a shaft 34. The shaft 34 is rotatably mounted in suitable bearings secured to the upright members located at the opposite sides of the framework 1. The shaft 34 is driven, through any suitable power transmitting means, from a motor 38, which effects rotation of the eccentric and produces horizontal vibration or reciprocation of the shaker box 10 independently of the rotation of the rotor of the blower 23 by its motor 30.

Within the hopper 2 is a steeply inclined plate or partition 40, which extends across the full width of the hopper between the side walls 5, 5 thereof, to which the opposite side edges of the inclined partition 40 are respectively secured. The upper end of the partition 40 is secured to the front wall 3 of the hopper and the lower

end terminates substantially midway between the front wall 3 and the rear wall 4 of the hopper, in a plane closely adjacent the plane of division between the lower edge of the hopper 2 and the upper edge of the shaker pan or box 10.

Mounted within the hopper 2 in a position approximately half way along the inclined length of the partition 40, and spaced perpendicularly from one face thereof, is a rotary shaft 41, and similarly spaced from said face of said partition, adjacent the lower edge thereof is a second rotary shaft 42.

The shafts 41 and 42 are rotatably mounted in bearings secured to the side walls 5, 5 of the hopper 2, and adjacent the inner ends of these bearings, each shaft is provided with arms 43, 43 and 44, 44 respectively.

The arms 43, 43 and 44, 44 extend radially in opposite directions to substantially equal extents from the axis of the shafts 41 and 42, and the tips of the two arms lying at one side of each shaft are connected by a wire, rod, etc., 45, 46, extending substantially parallel to the axes of the shafts 41 and 42 respectively.

The assemblage comprising the shaft 41, arms 43 and rod tip 45 constitutes a beater and agitator in the central portion of the hopper 2, between the inclined partition 40 and rear wall 4 of the hopper, which beats, agitates, and tears apart the clods in that region of the hopper, while the assemblage comprising the shaft 42, arms 44 and tip rod 46 forms a similar beater and agitator in the throat formed between the lower end of the inclined partition 40 and the rear wall 4 of the hopper.

The two agitating and beating units are adapted to rotate in opposite directions to facilitate the breaking down of the clods more efficiently and more effectively before the beaten fibres drop through the said throat in the hopper into the shaker pan 10.

The two staggered agitating units operating as noted also prevent the mass of stock in the hopper from arching over the paths of rotation of the beaters, the uppermost unit kicking the fibres rearwardly in the hopper to fall into the path of the lowermost unit which kicks the fibres downwardly into the shaker pan.

As the beaten fibres pass down the inclined convergent floor 14 of the shaker pan they pass into the path of a third agitating unit which consists of a shaft 47 with long arms 48, 48 extending in opposite radial directions from the shaft 47, substantially in the center of the hopper 2, under the inclined partition 40.

The shaft 47, adjacent the side walls 5, 5 of the hopper 2, is provided with short arms 49, 49 disposed radially at 90° with respect to the long arms 48, 48.

One end of one of the short arms 49, at each end of the shaft 47, is connected by a tip rod 50 to the tip of one of the central long arms 48 and the opposite ends of the rod lie in a convergent angular relationship in a plane tangent to an arc swung from the axis of the shaft 47.

As this last mentioned beating and agitating unit rotates in the direction of the arrow thereon (Fig. 1) the tip rod dips down in the shaker pan 10 and engages the fibres passing down along the inclined bottom 14 thereof and tends to kick the fibres backwardly along said inclined bottom.

With the three units operating in opposed directions and at different relative speeds the fibres are given a thorough working which

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breaks up the clods and reduces them to a fleecy mass of relatively free loose independent particles gravitationally headed for the discharge box 15 at the forward end of the shaker pan 10.

Located in the discharge box 15, is a final agitator and beater which extends from one side wall 16 to the opposite side wall 16. This agitator also functions as a means for controlling the rate of discharge of the fibre from the shaker pan 10 into the funnel 21 by which the fibre is introduced into the air stream passing through the conduit 22.

The final agitator is in the form of a rake and comprises a back bar 51 from which projects a series of closely adjacent and parallel long pins or wires 52. The back bar 51 is carried by a pair of laterally spaced bell-crank levers 53 which are respectively pivoted to the side walls 16, 16 of the discharge box 15, at 54.

The back bar 51 is connected to one of the arms of each of the bell-crank levers and the second arms of these levers are connected by a bar 55, on which, between the levers 53, 53 is pivotally mounted one end of a reach rod 56.

The opposite end of the reach rod is threaded and slidably mounted in a cross bar 57 of the framework 1. The rod 56 is provided with a pair of abutment nuts or collars 58, between which and one side of the rigid frame bar 57, and encircling the rod 56, is a spring 59. At the opposite side of the bar 57, the rod 56 is threaded into a correspondingly threaded bore in the hub of a hand wheel 60.

Axial adjustment of the reach rod 56 controls the position of the angle of sweep of the tips of the rake pins or teeth 52 with respect to the chute 20, i. e., turning the hand wheel 60 in one direction causes the rake to operate in a region nearer the intersection of the chute 20 with the floor 14 of the shaker pan 10 and turning the wheel 60 in the opposite direction causes the rake 20 to operate in a region nearer the forward free end of the chute 20, the latter reduces the amount of fibre permitted to be discharged by the chute 20 into the funnel 21, while the former increases the amount of fibre permitted to be discharged by the chute 20 into the funnel 21.

Any tendency of the fibres to pack or build up in the forward end of the shaker box 10 adjacent the entrance to the discharge extension 15 thereof is discouraged by the rotation of the long and short arms of the final rotary agitator unit 47—50 in the forward end of the hopper 2, and an oscillatory movement of one or more upturned hooks 61 which are secured to the top of the rake bar 51, by which any fibres getting into the extension 15 above the rake bar 51 are kicked back into the path of the tip rod 50 of said unit and thereby returned to the shaker box 10.

As shown in Fig. 1 the agitator shafts 41, 42 and 47 are driven from the shaft 34, and the shaft 34 is driven from the motor 38, by any suitable chain and sprocket or pulley and belt arrangement desired, with any suitable means, such as adjustable idler pulleys or sprockets for taking up slack in the drive belts or chains.

Flexible strips of any suitable character may also be provided to close the gap between the adjacent relatively movable edges of the shaker pan and hopper and between the rake and the top board of the discharge box, to reduce the loss of the loose fibres from the machine.

I claim:

1. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, a series of relatively staggered rotary beaters in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, and means at one end of said shaker pan for discharging the disintegrated fibre into said stream, one of said rotary beaters being located in the lower portion of said hopper adjacent the discharge end of said shaker pan and operable partly within said pan for working fibres therein.

2. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, a series of relatively staggered rotary beaters in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, and means at one end of said shaker pan for discharging the disintegrated fibre into said stream, one of said rotary beaters being located in the lower portion of said hopper adjacent the discharge end of said shaker pan and operable partly within said pan for working fibres therein, and a second of said beaters being located in the lower portion of said hopper and operable directly above the opposite end of said pan.

3. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, a series of relatively staggered rotary beaters in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, means at one end of said shaker pan for discharging the disintegrated fibre into said stream, one of said rotary beaters being located in the lower portion of said hopper adjacent the discharge end of said shaker pan and operable partly within said pan for working fibres therein, and a second of said beaters being located in the lower portion of said hopper and operable directly above the opposite end of said pan, and an inclined partition in said hopper disposed with its lower end adjacent said pan intermediate the beaters respectively operating adjacent the opposite ends of said pan.

4. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, a series of relatively staggered rotary beaters in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, means at one end of said shaker pan for discharging the disintegrated fibre into said stream, one of said rotary beaters being located in the lower portion of said hopper adjacent the discharge end of said shaker pan and operable partly within said pan for working fibres therein, and a second of said beaters being located in the lower portion of said hopper and operable directly above the opposite end of said pan, and an inclined partition in said hopper disposed with its lower end adjacent said pan intermediate the beaters respectively operating adjacent the opposite ends of said pan, and

a third of said beaters being operable in an upper portion of said hopper adjacent said partition above and in intermediate vertical relation to the first two said beaters.

5. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, means in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, a delivery box extending from the discharge end of said shaker pan, an inclined chute in said box and extending from the said end of the shaker pan to substantially beyond and below the same for discharging the disintegrated fibre from said pan into said stream, and an oscillating rake in said box and operable through a predetermined angle in a sweep arc substantially tangent to said chute for controlling the rate of discharge of prepared fibre from the chute into said stream.

6. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, means in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, a delivery box extending from the discharge end of said shaker pan, an inclined chute in said box and extending from the said end of the shaker pan to substantially beyond and below the same for discharging the disintegrated fibre from said pan into said stream, an oscillating rake in said box and operable through a predetermined angle in a sweep arc substantially tangent to said chute, and externally manually operable means for varying the position of the operating angle of oscillation of said rake relative to the opposite ends of said chute for controlling the rate of discharge of prepared fibre from the chute into said stream.

7. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, means in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, a delivery box extending from the discharge end of said shaker pan, a chute in said box and extending from the said one end of the shaker pan to substantially beyond and below the same for discharging the disintegrated fibre into said stream,

an oscillating rake in said box for controlling the rate of said discharging, a control rod pivotally connected at one end to said rake, a fixed bar slidably supporting the opposite end of said control rod, an abutment on said rod at one side of said bar, a hand wheel threaded on said rod at and bearing against the opposite side of said bar, and a spring encircling said rod and compressed between the first said side of said bar and said abutment.

8. An apparatus for preparing fibre stock for conveyance in and by a flowing stream of gaseous fluid, comprising a hopper for receiving the fibre stock for preparation, a horizontally reciprocable shaker pan underlying said hopper to receive fibre therefrom, a series of rotary beaters in said hopper for disintegrating clods of said stock into free fibre particles for reception by said shaker pan, means at one end of said shaker pan for discharging the disintegrated fibre into said stream each beater comprising a shaft, a pair of axially spaced radial arms carried by the shaft, and one of said beaters located adjacent the discharge end of said shaker pan including a radial arm intermediate the axially spaced arms thereof and at an angle thereto circumferentially of said one beater, and a tip rod spaced radially from said shaft and secured at and intermediate its opposite ends to the tips of said spaced intermediate arms respectively with opposite end portions of the tip rod disposed at an angle to each other and to the axis of the shaft of said one heater.

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