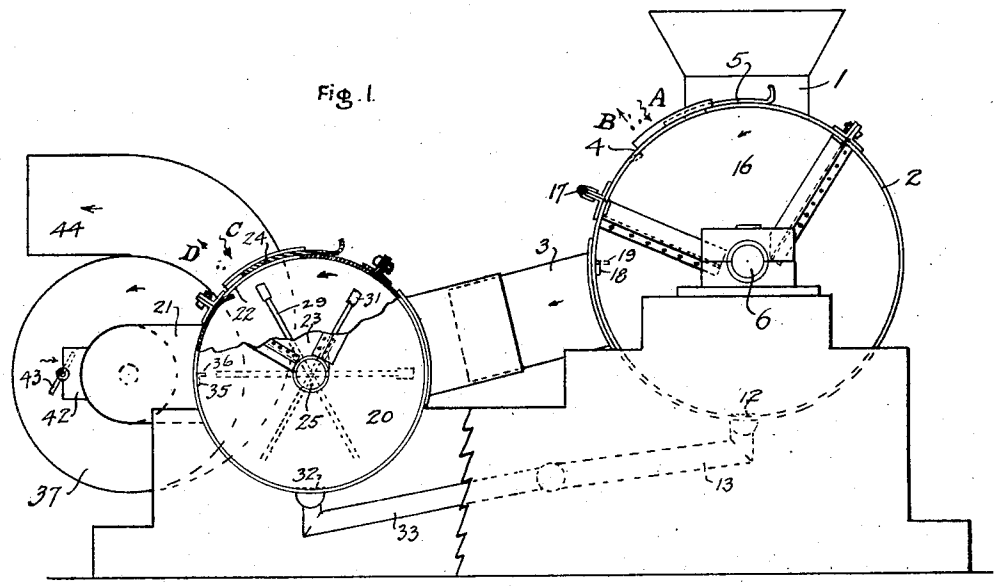
May 10, 1927. 1,627,706

P. E. KRONLUND

FLUFFING MACHINE

Filed July 13. 1926 2 Sheets-Sheet 1

Fig. 1.



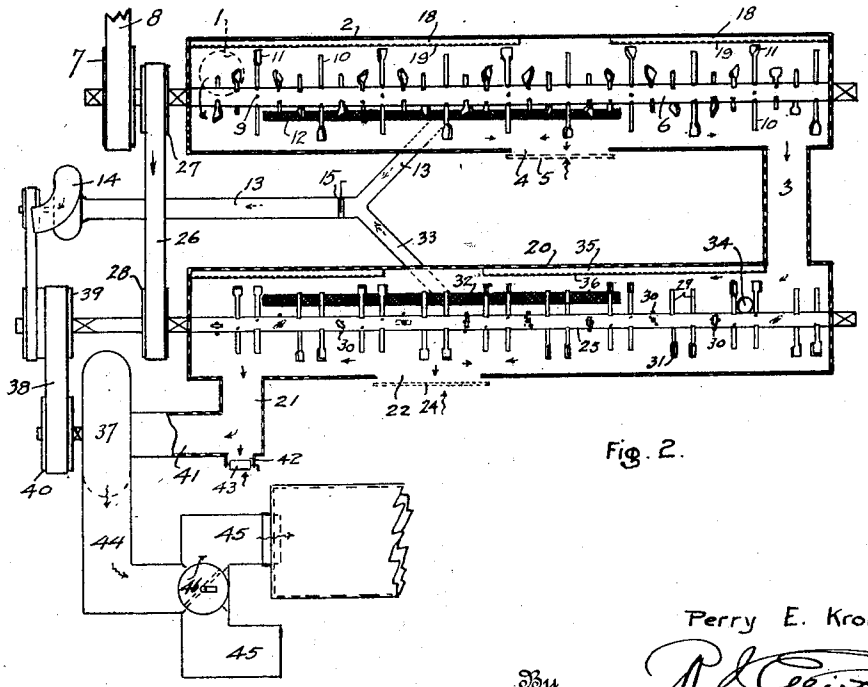


Fig. 2.

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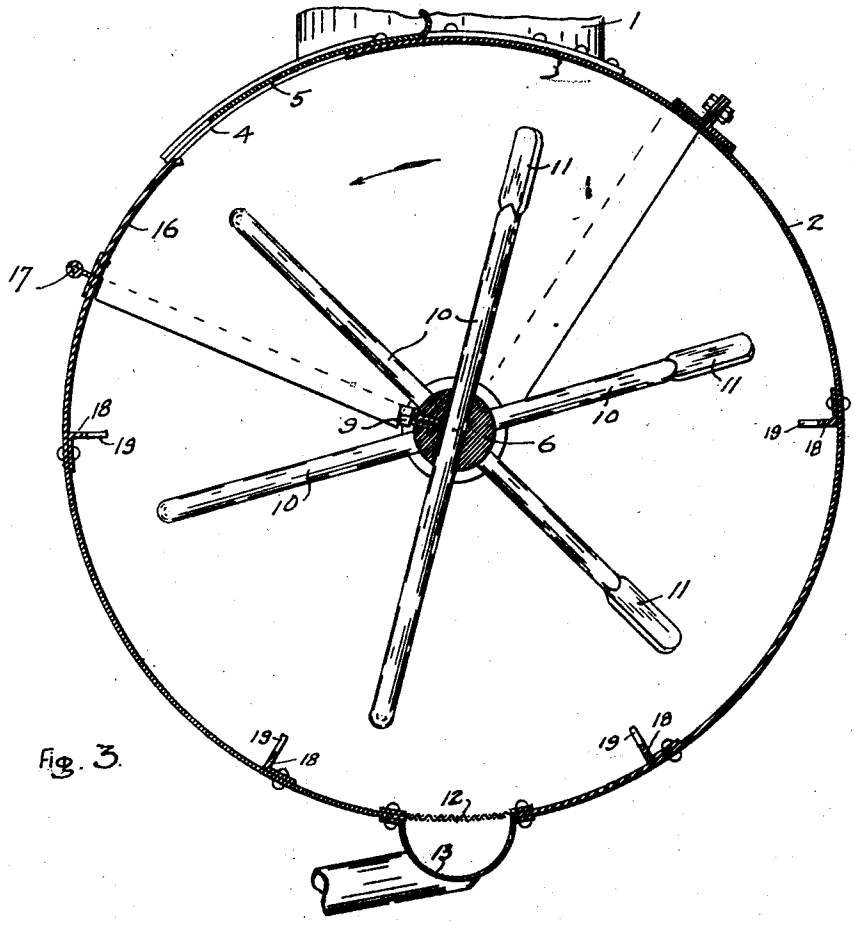


Fig. 3.

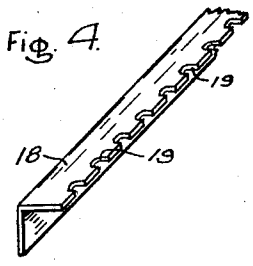


Fig. 4.

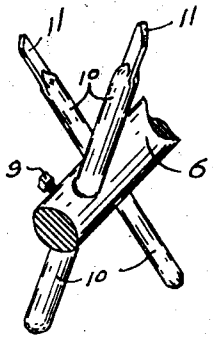


Fig. 5.

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UNITED STATES PATENT OFFICE.

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FLUFFING MACHINE.

Application filed July 13, 1926. Serial No. 122,105.

This invention relates to machines for preparing kapok floss, cotton, or other fibrous material for use in mattresses, or other cushions, and also to machines to be used in preparing cotton or other fiber for use in a Garnett or felt machine.

The objects of the invention are, first, to provide a machine which will thoroughly fluff the fibers apart without breaking them into short lengths; second, which will remove all foreign matter, such as sticks, seeds, stones, dirt, or nails; third, to feed the cleaned and fluffed floss or cotton fiber into a mattress or other container; fourth, to provide adjustable means whereby the action of the machine may be regulated to suit the particular fiber being worked on; fifth, to provide a machine which will eliminate fire hazard both by its construction and by its action of smothering any ignited matter therein, thereby reducing the high rates of insurance on factories using the machines at present on the market; and sixth, to provide a machine which is extremely simple in construction, cheap to make, easy to operate, and effective in use.

I attain these and other objects by the devices, mechanisms, and arrangements illustrated in the accompanying drawings, in which:—

Fig. 1 is an end elevation of my improved machine, showing a part broken away to reveal the interior thereof; Fig. 2 is a diagrammatic plan view, in section, of the machine, showing particularly the setting of the paddles; Fig. 3 is a cross-section of one of the drums, on a larger scale; Fig. 4 is a perspective view of one of the notched baffle plates; and Fig. 5 is a perspective view of a portion of one of the shafts, showing some of the paddles mounted therein.

Similar numerals of reference refer to similar parts throughout the several views.

In general, the machine consists of two closed cylinders, connected together by a short pipe, in each of which is mounted a rapidly rotating shaft having a plurality of rods mounted thereon, each rod having a slightly flattened portion, at one end, thereby making it into a small paddle adapted to be set at any desired angle to drive the air and the floss or cotton in a certain spiral direction in the cylinder. Each rod in the said cylinders falls short of all obstructions in the cylinder, by a substantial margin. Each cylinder is provided with a central outlet, through which the refuse from the floss or cotton is thrown by the centrifugal action of the paddles and of the spirally rotating column of air in which the cotton or floss is floating, said refuse passing out through the opening against an inflowing stream of air. Each cylinder is also provided with one or more fixed notched baffle plates, adapted to coact with the rapidly rotating paddles to thoroughly pick and fluff the floss or cotton fibers apart, and to separate therefrom all foreign matter entangled therein. The second cylinder of the set is also provided with a supplemental air inlet hole at the bottom, whereby an additional supply of air is admitted, thereby preventing the fibers therein from becoming twisted together into strings.

Referring to the drawings, the floss or cotton mass is passed into the machine through the receiving pipe 1, which leads directly into the first and larger drum or cylinder 2. This drum or cylinder 2 is level, horizontally, and is closed except for the said receiving pipe 1, a discharge pipe 3, at the other end, and an adjustable opening 4, at a point near the longitudinal center between the pipes 1 and 3. The lower edge of the opening 4 is bent inward, as shown in Fig. 3. An adjustable slide or closure 5 is mounted outside of the drum 2 and is adapted to partially or wholly close the opening 4, as desired.

A shaft 6 is mounted in the central axis of the drum 2 and is rapidly rotated therein by means of the drive pulley 7 and the driven belt 8, or otherwise. The shaft 6 has a plurality of holes passing through it, said holes being arranged in regular order around and along said shaft and forming a spiral thereon. A set screw 9 is screwed into the shaft 6 opposite to each hole therein and enters the said hole at right-angles thereto. A round rod 10 is mounted in each said hole and is held in adjusted position therein by means of the said set screw 9. Each rod 10 is flattened at one end to form a small paddle 11. The rods 10 are arranged so that the said paddles 11 form a left-handed spiral around the shaft 6, looking in the direction of motion of the cotton or floss in the drum. The rods 10 are adjusted in the holes in the shaft so that the paddle ends 11 extend slightly nearer to the drum 2 than the round ends thereof, and the length of said rods is

substantially less than the inside diameter of the drum.

A narrow dust screen 12 is provided in the bottom of said drum 2, said screen covering the entrance to a short longitudinal dust pipe 13, which connects with a similar dust pipe from the second drum and with a suitable exhaust fan 14. One or more valves 15, in the pipe 13 controls the suction through the screen 12. The drum 2 is provided with a sector 16, hinged at 17, whereby the shaft 6 may be removed for repair or the rods 10 may be adjusted either by being shifted longitudinally in the holes (radially of the drum) or by turning them to adjust the angle that the flattened paddles 11 make with the plane of revolution.

The paddles 11 of the shaft 6 are variously adjusted thereon; those leading from the feed pipe 1 to the opening 4 are adjusted to push the floss or cotton in a spiral direction, of slight pitch, from the feed pipe 1 towards the said opening 4; those positioned opposite the said opening 4 are adjusted to push slightly backward against the action of those in the first said section, and especially to throw outward; the paddles in the third section, extending from the opening 4 to the discharge pipe 3, are secured at a similar, but greater, angle to those in the said first section and are adapted to feed towards the said discharge pipe 3; while those in the fourth, and last, section of the drum 2, opposite to the said discharge pipe, are adjusted at an angle similar to those in the second section and are adapted to put a slight back pressure on the feed and to throw the floss or cotton out through the said discharge pipe. The paddles in the first section draw air into the machine through the receiving pipe 1 and the paddles in the third section draw air into the machine through the adjustable opening 4 as indicated by the wavy arrow "A" shown in Fig. 1. The paddles in the second section, opposite to the said opening 4, throw out all the heavier refuse so far separated from the floss or cotton, as indicated by the dots and straight arrow "B" shown in Fig. 1 through the said opening 4 and against the incoming current of air entering therethrough as indicated by said arrow "A." Though the paddles in the first and third sections feed the air, and floss or cotton mixed therewith, in the same direction they are not adjusted at the same angle to the planes of revolution, those in the first section being more nearly parallel to the plane than those in the third section and, therefore, the feed spiral in the said third section is of greater pitch than in the first section, with the result that the third set of paddles draw in more air through the opening 4 as indicated by the wavy arrow "A."

The drum 2 has one or more notched baffle plates secured on its inner side, each baffle plate comprising an angle-iron 18 with notches 19 punched or otherwise formed in the edge which projects inward from the drum wall.

The second drum 20 is of smaller diameter than the above described drum 2, and is connected at one end thereto by the discharge pipe 3 thereof. The drum 20 is also horizontal and is set at a lower level than the said drum 2. The connecting pipe 3 is therefore inclined downward from the drum 2 to the drum 20. This drum 20 is also provided with a discharge pipe 21 at the other end and with an adjustable opening 22 near its center.

The opening 22 is cut in the removable segment 23 of the drum 20, near its longitudinal center, and has its lower edge bent inward, as shown in Fig. 1. A slide plate 24 is mounted on the drum 20 and is adapted to partially or wholly close the said opening 22. A shaft 25 is mounted in the central axis of the drum 20 and is driven by a belt 26, running over the pulleys 27 and 28 on the shafts 6 and 25, respectively. The shaft 25 is provided with holes therethrough in similar arrangement with those in the shaft 6, as above described. A series of round rods 29, smaller in size than the rods 10, are mounted in the holes in the shaft 25, and are held in adjusted position therein by means of the set screws 30. Each rod 29 is slightly flattened at one end to form small paddles 31 similar to the above described paddles 11. A narrow dust screen 32 is positioned at the bottom of the drum 20 and covers a dust passage 33 leading to the above described dust exhaust pipe 13. A supplemental air inlet hole 34 is also positioned in the bottom of the drum 20, at a point slightly removed from the line of the connecting pipe 3, towards the line of the adjustable opening 22.

The paddles 31, in the drum 20, are secured at various angles in the different parts thereof. Those paddles opposite the connecting pipe 3 are set to drive the floss or cotton towards the other end of the machine; those from the supplemental inlet 34 to the adjustable opening 22 are adjusted at a slight reverse angle and tend to hold the floss or cotton back against the air suction at the other end of the machine; those opposite the opening 22 are adjusted to throw out all the remaining refuse, which, at this part of the action of the machine, has become entirely disentangled from the floss or cotton as indicated by the dots and the straight arrow "D," shown in Fig. 1; and those from the opening 22 to the discharge pipe 21 are adjusted to feed strongly towards the said discharge pipe; while those opposite the said discharge pipe 21 are adjusted to give a slight back pressure and to

throw the floss or cotton outward therethrough.

One or more notched baffle plates are secured in the drum 20, each baffle plate comprising an angle-iron 35, with notches 36 punched or otherwise cut in the edge which projects inward from the drum wall.

A suction-delivery fan 37 is mounted adjacent the machine and may be driven by a belt 38, running over the pulleys 39 and 40, mounted on the second shaft 25 and on the fan shaft, respectively. The intake side of the fan 37 is connected by a pipe 41 with the discharge pipe 21 of the drum 20, at an angle thereto. A vent 42 is formed in axial alinement with the pipe 21, at the junction of the pipes 21 and 41, and is controlled by a suitable valve 43 therein. The delivery side of the fan 37 is provided with a pipe 44 which leads to a plurality of delivery pipes 45, controlled by suitable valves, as at 46, whereby the cleaned and fluffed floss and cotton may be conducted to one or another mattress or to storage, as desired.

My improved fluffing machine depends almost entirely on the proper adjustment of the slides 5 and 24 and the valve 41, for its successful and efficient action on any particular grade of floss or cotton, and it also depends on the proper adjustment of the various paddles 11 and 31, in the several parts of the machine, for its success and efficiency for different grades of floss or cotton; therefore, in this description, it is not possible to specify accurately the angles of the paddles at various points in the shafts nor the degree of opening of the several slides and valves. It is important to bear in mind that both the cylinders, in which the floss or cotton is fluffed, are closed and are closely confined to the immediate sphere of action of the paddles and rods, in other words, there is no wide space surrounding the active part of the machine: and it must also be remembered that the paddles and rods are sufficiently far from the baffle plates 18 and 35 to prevent cutting or breaking the fibers into short lengths, a fault very common in machines for this purpose. This effect is due to the fact that the paddles 11 and 31 are very small being, in fact, not much larger than the round rods 10 and 29 of which they are made, and also because the other, or round, ends of the rods also project from the shafts and act as stirrers and tend to disentangle the fibres and to release therefrom the heavy foreign matter therein.

In order to understand the action of the machine it will be attempted to follow the floss or cotton through its various parts in consecutive order. The material, as received, is in a tangled and matted condition and carries with it a large amount of foreign matter, such as seeds, straw, sticks, dirt, nails, or stones, held in the mass by the condition of the floss or cotton. This mixture is inserted in the machine and it is desired both to separate out and eject all the foreign matter and to fluff the fiber therein by making, as far as possible, each individual fiber float separately in the air. The crude mixture is inserted into the receiving pipe 1 and is at once drawn into the drum 2 by the rapidly moving paddles 11, rotating immediately below the said pipe 1; these paddles 11, and those in the first section of the drum, all tend to draw air into the machine through the pipe 1, with a very light draft, and break up most of the entanglements by mixing the floss or cotton with the stirred air and by the mechanical action of both ends of the rods 10, one end of which alone is provided with paddles 11 as above described. As these rods 10 rotate on the axis of the drum 2 they pass near the baffle plates 18 and thus the floss or cotton is prevented from being carried around the inside of the drum without breaking away from the paddles, or wadding up on the paddles. During this part of the action of the machine a large amount of the foreign matter imprisoned in the floss or cotton becomes disentangled therefrom and the dust thereof is drawn through the screen 12 while the larger and heavier material is thrown outward against the wall of the drum. As the mass is thus fed spirally along the drum it finally reaches the opening 4 and most of the heavier material therein is thrown out therefrom as indicated by the dots and straight arrow "B", shown in Fig. 1. The floss or cotton, however, being very light in comparison to its air friction, is prevented from passing out through the hole 4 by the indraft of air entering the drum therethrough. As above stated, some of the paddles 11 opposite the opening 4, push backward on the advancing spirals of air and floss or cotton, thus tending to hold it in the first section of the machine and causing the rods to more thoroughly beat it up and more completely separate the undesirable particles therefrom. The paddles 11 in the section between the opening 4 and the discharge pipe 3, are set to a greater pitch than those in the first section, and therefore they demand more air and draw the required amount through the said opening 4, as above noted and as indicated by the above described wavy arrow "A", shown in Fig. 1. In this section of the machine the action of the first section of the drum 2 is repeated, except that the mass acted on by the paddles is lighter, being more completely fluffed and being relieved of the larger particles of foreign matter. When the floss or cotton reaches the discharge pipe it is thrown therethrough by the paddles 11 opposite thereto and is drawn by the current of air into the second drum. Some of the paddles

11, opposite to the discharge pipe 3, are set to feed backward and thus prevent the floss or cotton from wadding against the end wall of the drum.

It will be noted that in this drum 2 the floss or cottom passes along the spiral of the paddles, the rotation being right-handed and the spiral left-handed, when viewed in the direction of motion of the floss or cotton. This condition is reversed, however, in the second drum 20, in which the rotation is left-handed and the spiral is left-handed, when viewed in the direction of motion of the floss or cotton, and the floss or cotton therefore passes across the spiral of paddles.

Passing, now, to the second drum 20, it should first be noted that the diameter of this drum is less than that of the drum 2 and that, therefore, the normal speed of the air therein (disregarding the action of the paddles and of the air inlets) will be greater than in the first drum. The air received through the pipe 3, with the floss or cotton, will be the total amount which has been received through the feed pipe 1 and the opening 4. This air and partially fluffed floss or cotton, entering the smaller drum, would normally tend to pass swiftly through it, and therefore, after setting the first paddles 31 to feed away from the end wall of the drum, I set the next section of paddles, from the supplemental opening 34 to the adjustable opening 22, at a slight backward angle to react against the stream and to act as a brake thereon. However, it is found that if the floss or cotton passed directly through the machine without admitting additional air through the supplemental hole 34, the fibers thereof, though cleaned of foreign matter, tend to lose their fluffiness and become stringy, but by providing an extra supply of air at this point, through the supplemental hole 34, this tendency is overcome. The floss or cotton in this section is thus held back by the paddles and is more thoroughly and completely beaten up and fluffed, because it is constantly passing through the spiral of paddles, instead of along the said spiral as in the first drum, and it is constantly pressed back by the action of the paddles and drawn forward by the motion of the air. In this section, too, all the remaining foreign matter is completely separated from the floss or cotton and, when it reaches the opening 22, it is thrown out therefrom by the paddles 31 opposite thereto as indicated by the dots and arrow "D" shown in Fig. 1 and against the strong incoming draft of air entering therethrough as indicated by the wavy arrow "C", shown in Fig. 1. The paddles in the section between the opening 22 and the discharge pipe 21 are adjusted to feed strongly towards the said discharge pipe. The suction in this section is greater than the back pressure of the paddles in the last described section and therefore additional air is drawn into the machine through the supplementary opening 34 and through the adjusted opening 22.

The fan draws air from the pipe 21 and the opening 42, if the valve 43 is open. The completely fluffed floss or cotton is ejected from the drum 20 by the stream of air in the discharge pipe 21 and by the action of the last paddles 31 in the drum, and any foreign matter which has not already been thrown out passes out therefrom through the hole 42 when the air stream fails to draw it around the angle joining the pipes 21 and 41.

Thus it will be seen that the action of this machine is controlled by the flow of air therethrough and that this flow may be controlled by adjusting the valve 43 and the slides 5 and 24. The first half of the first drum is always fairly full of floss or cotton which is being loosened up and its tangles dissociated and the heavier dirt thrown therefrom; the second half of the first drum, the connecting pipe 3, and a short part of the second drum, are comparatively less full of fibrous material and are almost free of loose foreign matter, the fibrous material therein being fluffed as much as is possible so far as freed from bunches in the first section; then, from the supplemental hole 34 to the opening 22, it is again fairly full of cotton and is more completely beaten up and mixed with the new air and all the remaining foreign matter is freed from its entanglement and is ejected at the opening 22; and in the last half of the second drum this freed floss or cotton is finally again fluffed with the new air from the said opening 22.

One of the surprising effects of this machine is found in the fact that if a fire is started within it, it has been impossible to make the fire burn or even to permit the floss or cotton to smolder long enough to reach the fan 37. It has been repeatedly tried to cause the floss or cotton to burn therein by inserting matches by the handful with the floss or cotton as it is being fed into the machine through the pipe 1, but without success though there will be a slight flame in the first section of the first drum and the burned and extinguished matches will be ejected from the machine along with the other refuse therein.

Thus it will be seen that I have produced a machine of extreme mechanical simplicity and yet my experience therewith has been that, in spite of its apparent simplicity, it is absolutely necessary that all the parts be properly adjusted for the particular kind and grade of material being fluffed in order that the air and fiber flow therein be such as to cooperate with the mechanical action of the parts in order to produce the desired effect. One not familiar with the machine

would think that its action would not be materially affected by the adjustment of the paddles or of the air openings, and yet a slight disarrangement thereof makes a great difference in the results attained. The air pressure in the various parts of the machine is less than atmospheric and there is an internal difference of pressure at various parts. Also, in some parts, it seems likely that there is a cavitation, or at least an extreme agitation, of the air therein, the air being laden, as it is, with fluffy fibrous matter and not flowing as readily as it would if not so burdened.

Having therefore described my invention, what I claim is:—

1. In a fluffing machine, the combination of a horizontal drum, having a receiving opening at one end, adapted to admit air and a supply of fibrous material to be cleaned and fluffed, a discharge opening at the other end, and an intermediate opening, formed in the shell thereof; a notched baffle plate secured within the drum and extending inward therein; a rapidly rotating shaft axially mounted in said drum; a plurality of radial rods mounted thereon and extending therethrough, whereby the fibrous material is beaten and disentangled and the refuse matter separated therefrom; and an adjustable slide mounted on said drum and adapted to partially close said intermediate opening, whereby the supply of air therethrough is controlled.

2. A fluffing machine as set forth in claim 1, wherein the rods are flattened at one end to form small paddles, thereby affecting the axial motion of the air in the drum by said paddles, and stirring it by the opposite ends of said rods.

3. In a fluffing machine, the combination of a horizontal drum having a receiving opening at one end, adapted to admit air and a supply of fibrous material to be cleaned and fluffed, a discharge opening at the other end, and an intermediate opening, formed in the shell thereof; a notched baffle plate secured within the drum and extending inward therein; a rapidly rotating shaft axially mounted in said drum; a plurality of radial rods mounted on and extending through said shaft and revolving in said drum, but removed from said baffle plate by a substantial space, said rods being flattened at one end to form small paddles; means for securing each of said rods in place on the shaft, whereby each may be separately axially and angularly adjusted to set the paddles at predetermined angles in the several parts of the drum; and an adjustable slide mounted on said drum and adapted to partially close said intermediate opening, whereby the supply of air therethrough is controlled.

4. In a fluffing machine, the combination with a drum divided into two parts by an opening in its shell intermediate of its ends, and provided with a receiving opening at one end, adapted to admit air and a supply of fibrous material into the drum, and a discharge opening at the other end; a notched baffle plate secured within the drum and extending inward therein; a rapidly rotating shaft axially mounted in said drum; a plurality of radial rods extending through said shaft and revolving in said drum, said rods being flattened at one end to form small paddles, each said rod being adjustably secured to said shaft whereby the angle of the several paddles to the plane of rotation may each be severally and independently set, the rods in the first part of the drum being set to feed lightly from the receiving opening towards the intermediate opening, whereby the fibrous material therein is fed slowly therethrough and becomes disentangled and the refuse matter is separated therefrom, the rods in the second part being set to feed more strongly from the intermediate opening towards the discharge opening, whereby additional air is drawn into the machine through the intermediate opening and the fibrous material therein is fluffed, and the rods opposite said intermediate opening being set to create a back pressure on the feed in the first part of the drum and to throw the refuse matter out through said intermediate opening against the stream of inflowing air therethrough; means for securing each of said rods in position; and an adjustable slide mounted on said drum and adapted to partially close said intermediate opening, whereby the supply of air in said second part of the drum is controlled.

5. In a fluffing machine, the combination of a pair of horizontal drums, connected together to form a continuous passage therethrough, both said drums being divided into two parts by means of an opening in its shell intermediate of its ends, the first drum being provided with a receiving opening at the end opposite to its connection with the second drum and adapted to admit air and a supply of fibrous material to be cleaned and fluffed, and the second drum being provided with a discharge passage at the end opposite to its connection with the first drum; an exhaust fan connected to said discharge passage on the second drum and adapted to draw air from said drums; adjustable slides mounted on both said drums and adapted to partially close the respective intermediate openings therein, whereby the supply of air entering the several openings may be controlled; rotating means within the drums and adapted to act on the air and material therein whereby the feed of the fibrous material in the second parts of both said drums is greater than in the first parts thereof and whereby the fibrous material is

first beaten and disentangled and the larger particles of refuse matter are separated therefrom, said refuse matter passing out of the intermediate opening of the first drum under the action of the centrifugal force thereon and against the action of the incoming air therethrough, then said fibrous material is fluffed by said rotating means and by a new supply of air entering therein, then the fluffed fibrous material is again retarded in the second drum and the remaining refuse matter separated therefrom and the disentanglement thereof completed, said refuse matter passing out of the intermediate opening of said second drum under the action of centrifugal force thereon and against the action of the incoming air therethrough, then said cleaned fibrous material is again fluffed in the second part of the second drum and is discharged therefrom.

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