March 13, 1934.

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SCUTCHING AND CLEANING MACHINE

Original Filed Oct. 11, 1929 7 Sheets-Sheet 2

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This invention relates more particularly to plant decorticating apparatus designed and adapted for efficiently and economically acting upon fibre containing plants, such as flax, ramie, hemp, etc., for the purpose of cleaning the fibre, as by scutching.

Because of the inability of plant decorticating mechanism, proposed prior to my entrance into the field, to meet the widely varying conditions of the materials to be scutched, such, for example, as those due to different degrees of moisture content, atmospheric changes and different influences of the structure of the plants or plant stems; the only mechanism in general use to-day for such purposes is the old fashioned scutching wheel which has not been changed materially in the last one hundred years. Its continued existence is due to the fact that it gives a regular number of beating strokes per minute and the actual amount of beating necessary for the material being scutched is regulated and gauged by a skilled operator who, by varying the time during which it is subjected to the scutching operation, can give it more or less working in accordance with the requirements of the situation. The labor required is very severe, considerable skill is required, and the output is quite small.

One difficulty experienced in the past in raising plants having bast fibres and extracting the fibres therefrom resulted from the fact that the plants had to be pulled by hand thus adding materially to the expense particularly in localities where labor costs are high.

This difficulty has been obviated largely by the use of devices for mechanically pulling the plants. Furthermore, it has been necessary to ret the flax before scutching it and such retting involves work, delay and expense. The process of retting is not only expensive but also exceedingly obnoxious and it appears that profitable raising of flax or hemp is almost impossible without apparatus which will clean the fibre without retting and therefore relieve the farmers from the necessity of carrying out this process.

According to the present invention it is proposed to provide apparatus to scotch the material, such as flax and hemp, without previously retting the same. Also the present invention avoids the production of tow by the whipping action which is involved in substantially all other methods and decreases the yield of straight fibre. For example, according to the present invention the yield of fibre in good condition is from 28% to 30% of the weight of the de-seeded straw as compared with a maximum of from 12% to 18% of good fibre produced by other forms of apparatus. It is also proposed to provide such apparatus which will be capable of scutching retted as well as unretted material and in an improved manner. The material can then be scutched and threshed on the farm in a single operation and the fibre can be shipped to a collection point, preferably centrally located, and there treated as required, for example, by water retting or chemical retting. This practice would relieve the farmer of many difficulties heretofore encountered and would render it possible to raise such bast fibre plants and separate the fibre therefrom in suitable condition for shipping substantially without any requirements for employment of skilled labor. In fact, the handling of fibre plants of the class referred to would be simplified to such an extent as to involve in general no greater difficulties than the handling of the ordinary grain crops.

Inasmuch as bast fibre plants, such as flax, can be raised in nearly every state of the United States, it is obviously a matter of very great importance to make it feasible for farmers in this country to raise the plants referred to and to prepare the fibre for shipping.

It is therefore an important object of the invention to provide improved scutching mechanism which will meet the requirements specified. Another important object of the invention is to provide means of the class specified which is inexpensive to manufacture, easy and economical to operate, and adapted for ready transportation and quick installation in readiness for operation.

Other objects of the invention are to provide novel plant treating means adapted for varying the treatment to correspond with the nature and condition of the plants to be treated; plant decorticating means effective to clean either retted or unretted material; plant decorticating means adapted to clean butts of plants (jute butts, for example) and recover fibre which was lost heretofore; means for de-seeding and decorticating fibre producing plants in a single operation; and means for decorticating such fibre producing plants rapidly and substantially without waste or destruction of fibre.

Further objects will be apparent upon consideration of the following description and the drawings, in which:

Fig. 1 is a left end elevation of a machine embodying one form of the invention, part of the structure being broken away to show details of construction;
Fig. 2 is a front elevation;
Fig. 3 is a top plan view with parts omitted;
Fig. 3a is an end elevation of a modified form of a part of the beater portion of the machine;
Fig. 3b is a diagrammatic view on a larger scale illustrating the described spacing of the blades from right to left;
Fig. 4 is a section taken along the line 4-4 of Fig. 3;
Fig. 5 is a view in elevation of a part of the right end of the machine;
Fig. 6 is a section taken along the line 6–6 of Fig. 5.

Fig. 7 is a section taken along the line 7–7 of Fig. 5.

Fig. 8 is a fragmentary top plan view illustrating details of feed roll reversing means; Fig. 9 is a fragmentary end view showing the movable blades of the preferred form in substantially their lowest positions with reference to the stationary blades.

Fig. 10 is a view similar to that of Fig. 9 but with the movable blades substantially in mid-position;

Fig. 11 is an end view illustrating the machine as equipped with a suction casing forming part of means for withdrawing dust and waste, the casing being broken away to show underlying structure;

Fig. 12 is a detail view on a larger scale illustrating means for indicating the setting of the two groups of normally stationary blades with reference to the distances between the inner edges of corresponding blades of the two groups.

Fig. 13 is a view in elevation of the structure shown in Fig. 12 and as viewed from the right in such figure;

Fig. 14 is a detail view illustrating the relation between the fluted surfaces of two cooperating rolls;

Fig. 15 is a fragmentary view illustrating driving connections between upper and lower feed rolls, as seen at the left side of the machine; and

Fig. 16 is a view similar to Fig. 15 but at the opposite side of the machine and showing parts of the driving means for the lower feed rolls.

In carrying out the invention, the material to be decorticated may be inserted between feed rolls and fed thereby to the mechanism by which the principal decorticating action is effected as by beating the material (as it passes through slots or openings between the blades or blade sections of two groups of stationary blades or blade sections) by means of reciprocating blades also arranged in two groups with corresponding blades of the two groups spaced apart to provide slots or openings through which the material to be decorticated passes. The blades of each group of stationary blades are spaced apart along the direction of feed of the material at distance substantially greater than the thickness of the movable blades, and corresponding blades of the two sets of stationary blades are substantially in the same plane.

The arrangement of the reciprocating blades is similar to that described for the stationary blades; but the reciprocating blades are of substantially less thickness than the width of the spaces between adjacent stationary blades in the same group so that the action on the plant material to be treated tends to be more in the nature of a beating action than of a scraping action and injury to the fibre is avoided, and the width of the openings or slots between the reciprocating blades of the two groups and the length of stroke of these blades are such that the effective edges of these blades are projected only a short distance between the effective edges of the oppositely arranged stationary blades, thereby tending to avoid injury to the fibre.

The material fed to the beating blades is more bulky as it reaches the first set of blades than when it reaches the last set, due to the removal of some of the woody material by each set of blades as the material is fed past the same. It is therefore desirable to arrange the blades so that the space or slot between any two corresponding blades of opposed upper and lower sets is less than the next preceding space between two corresponding blades.

These spaces between blades of successive pairs are also adjusted to adapt the machine for use in cleaning or scutching different kinds of fibrous plants. For example, flax being finer than hemp requires smaller spaces than hemp and hemp being finer than jute requires smaller spaces than jute. Also to prevent too harsh treatment of the fibre, the action of the scutching blades may be cushioned as, for example, by providing spring support for certain of the blades so that they will yield when the pressure becomes too great.

The beating of the plant stalks between the stationary and the reciprocating blades tends to spread or fan out the forward ends of stalks fed thereto by means holding them in position at their rear ends and it is, therefore, sufficient for all practical purposes to introduce the stalks between the feed rolls in bunches and depend upon such fanning action to give the proper spread thereto as they pass through the stationary and reciprocating blades.

Of the nearest set of feed rolls from the beating blades affects to some extent this fanning or spreading action, and for this and other reasons it is desirable to provide for varying this distance to meet the requirements of the situation. It is also desirable to use fluted feed rolls in which the grooves are wider in proportion than the teeth or ribs, thereby avoiding undue pinching of the fibre between the teeth of one of two cooperating rolls and the side walls of the corresponding grooves at the surface of the companion roll.

It is also desirable to provide means for varying or regulating the proportional relation between the speeds of the reciprocating blades and the feed rolls, means for varying pressure between two cooperating feed rolls, and means for reversing the feed rolls. Such regulation of the feed speeds may best be effected by minutely varying the speed of the feed rolls and consequently varying the speed of movement of the fibre material through the slots between the beater blades or blade sections. As a result of such regulation the beating of the material may be so adjusted as to remove the woody portion of the material without injury to the fibre. Such regulation is particularly necessary in scutching unretted straw or stalks in that such unretted material is more brittle than the same material after retting.

Inasmuch as the reciprocating blades normally reciprocate at the same speed, the slower the fibre material is fed therethrough the greater will be the amount of beating received thereby.

Referring to the drawings, the frame of the machine includes a base 18 and two ends 19, and all of the moving parts of the machine are driven from a shaft 20 journaled at opposite ends in the frame ends 19 and having keyed thereto a double sprocket wheel 21 driven by means of a suitable sprocket chain 22 connected with any suitable source of power. Power is transmitted on the shaft 20 to a gear 23 from which power is transmitted, by means of two successive double gears 24 and 25 arranged for successive steps of speed reduction, to a gear 26 fixed on a shaft 27 by which power is transmitted to a speed changer 28. Power is transmitted from the speed changer by means of a shaft 29 projecting from the speed changer and provided with a gear 30.
washing with an idle gear 51, which in turn meshes with a gear 52 fixed on a shaft 53.

1. The shaft 35 is provided with an idle gear 31, which in turn meshes with gear 32 fixed on a shaft 33. Also, the shaft 35 is provided with an idle gear 34, which in turn meshes with a gear 35 fixed on a shaft 37. The shafts 33, 34, and 35 are of the same size and shape and are made of the same material. The gears 31, 32, 34, and 35 are made of the same material and are of the same size and shape. The shafts 33, 34, and 35 are made of the same material and are of the same size and shape. The gears 31, 32, 34, and 35 are made of the same material and are of the same size and shape.

5. Connected with a gear 36 loosely mounted on a shaft 37 parallel with the shaft 33, and the gear 35 being connected indirectly, by means of an idle gear 36, with a gear 38 loosely mounted on said shaft 37, both of the gears 38 and 39 being, however, held against movement along the shaft 37. Obviously the gears 38 and 39 are rotated in opposite directions and the shaft 37 may be driven in either direction of rotation by coupling it to either of said gears loosely mounted thereon.

15. To fasten and to provide with a clutch member 40 slideable along the shaft 37 but held thereto to turn therewith, and this clutch member is provided at opposite sides thereof with teeth to cooperate with corresponding teeth at the inner sides of the gears 36 and 39. Control of the clutch member 40 may be effected by means of a shifter member 40a extending into an annular groove 41 extending around the periphery of the clutch member, a shifter member or bar 42 slideable longitudinally in a direction parallel to the shaft 37, and attached to said shifter member 40a to control the effective position thereof, and a controlling shaft 43 having fixed thereon a pinion 44 meshing with a rack 45 preferably formed as a part of the member 42. This controlling shaft extends to any convenient position at the front of the machine and, preferably, is provided with a handle 46 for turning the same.

25. Fixed on the shaft 37 is a sprocket wheel 47 which is connected by means of a suitable chain 48 with a sprocket wheel 49 fixed on a shaft 50 projecting axially from one end of a lower feed roller 51 which is securely fixed with an upper feed roller 52 in advancing the material to the washing zone. At the opposite end of the feed roller 51 there is a corresponding shaft 50 and these shafts or shaft sections, which may be parts of the same shaft or may be stub shafts secured to the cylinder at the ends from which they project, are journaled in bearing blocks 53 resting on the upper surface of parts of the frame 19 at the front of the machine. The upper roller 52 is provided with shafts 54 extending from opposite ends thereof and journaled in bearing blocks 55 positioned immediately above the corresponding blocks 53 and constructed so that they can move into and out of recesses in said blocks 53. The feed rolls are fluted and arranged to mesh with each other.

35. When the upper and lower rolls of a pair are suitably pressed together, the upper roll will be driven by the lower roll even when the plants to be decorticated are being fed therethrough. As here shown, however, the upper roll is positively driven with the lower roll by means of intermeshing gears 56 on the shafts 50 and 54 at the left side of the machine. Although the feeding of the material may be effected by the single pair of rolls referred to, it is preferred to use two or more pairs, the lower roller of the second pair being driven from the lower roller of the first pair by any suitable means such as a sprocket chain 57 passing around sprocket wheels 58 on the shafts 60 at the right side of the machine. Due to the positive driving connection between the upper and lower rolls of each pair of feed rolls, the teeth and the notches therebetween are shaped so as to avoid crushing of the seed and fibre. In Fig. 16, there are illustrated on a larger scale preferred forms of cooperating fluted feed rolls, 51 and 52, in which the rolls are substantially the same in cross section and the ribs or teeth 51a and 52a are made smaller than the grooves (51b and 52b) and to such extent as to avoid crushing of the seeds and injury to the fibre in the fibrous material passing therethrough to the washing mechanism.

In order to control the fanning or spreading of the bunches of plant stalks passing from the feed rolls to the washing devices, it is advisable to have the feed rolls adjustable as a group to and from the washing devices. Such adjustability and also control of the pressure between the upper and lower rolls of each pair may be obtained in the following manner. The parts of the frame on which the bearing blocks 53 of the lower rolls 51 rest are provided at their upper surface with slots 59 each having a cross section in the form of an inverted V, the upright portion of the V being of suitable width to receive the shank of a bolt 60 and the undercut portion of the slot at the cross piece of the V being of suitable size to receive the head of the bolt. There is a bolt 60 for each pair of blocks 53 and 55 and the main portion of the shank passes upward through a bore at the forward side of the block 53. Near the top of the shank 60 there is an enlarged or countersunk portion 61 adapted to receive a nut 62 cooperating with a screw thread on the shank at this point. Obviously the blocks 53 may be clamped in any position along the corresponding slot 59 by tightening the nut 62. The main portion of the shank of the bolt 60 terminates below the level of the upper surface of the block 53 but a reduced portion 63 of the shank extends upwardly through a corresponding bore in the corresponding upper block 55 and above the top thereof. Each pair of bearing blocks 53 and 55 is secured in position securing the corresponding slot or in the same manner.

Preferably the two pairs of blocks at each side of the machine are kept close together irrespective of their position along the corresponding slot. As here disclosed, the two sets of blocks are kept together by means of a bar 64 having a proper distance apart, holes through which pass the threaded upper ends of the reduced portions 65 of the bolts, and this bar which is limited as to upward movement by nuts 65 screwed on the upper ends of said reduced portions, is also made lised in connection with the exertion of yielding pressure on the adjacent ends of the two upper rolls 52 to produce the desired pressure between the upper and lower feed rolls. Such pressure is imparted by means of suitable helical springs 66, of which the lower ends are seated in suitable sockets 67 in the tops of the bearing blocks 55 and the upper ends are in engagement with spring caps 68 mounted upon and held against upward movement by screws 69 having screw threaded engagement with means of a bar 64. The upper ends of the springs 66 may be held in engagement with the spring caps 68 in any suitable manner.

As will be brought out more clearly hereinafter it is desirable to provide a fine adjustment of the speed of the feed rolls, for example, by means of a speed changer 28 which may be set for a considerable number of different speeds. As here illustrated, this speed changer is of a standard commercial type and is capable of being set for twenty-four different speeds, three different settings being made by engaging the upper handle 28a and eight different connections being made by shifting the lower handle 28b while the upper handle is retained in any one of its three positions.
The plants to be decorticated are presented to the feed rolls over a substantially horizontal feeding platform or shelf 70 which may be provided with upright walls at its side edges, and under a pivoted flap 71 adjacent to the forward pair of feed rolls; and pass from the rearward feed rolls through openings or slots between upper and lower blades 72 which are normally stationary and are spaced apart in the direction of movement of the material being scotched, to receive therebetween vertically reciprocable blades 73 which are also arranged in upper and lower sets providing therebetween openings or slots through which the material is to be scotched or cleaned. The blades 72 of the lower set are arranged on edge with their ends resting on the tops of members 74 extending transversely of the blades and sladby mounted at their rear ends on strong posts or guides 75 which extend vertically from the main frame A. A will be described hereinafter, means for guiding and controlling the forward ends of the members 74 may also be provided.

These members 74 for the blades 72 of the lower set are provided with vertical projections 76 at their forward ends and with bolts 77 extending rearwardly therefrom through openings in the blades and adjacent to their lower edges; through openings in suitable spacers 78 which serve to maintain the blades at proper distances apart; and through blocks 79 sladby mounted in undercut groove in the members 74. When these blades and spacers are properly assembled they are clamped rigidly in position by nuts 80 screwed on the ends of the bolts 77 at the rear of said blocks 79. The blades 72 of the upper set are assembled in like manner with members 74 corresponding with the supporting members for the lower, but with the assembly in inverted position with respect to the assembly containing the lower blades, the corresponding blades of the upper and lower sets being in vertical alignment with respect to each other.

The members 74 are provided with vertical slots extending from their rear ends to the bores through which the posts pass, and at the rear end of each member there is provided a suitable clamping device such as a screw 81 passing loosely through an opening in the branch at one side of the corresponding slot and screw threaded into the branch at the other side of the slot, thus enabling each member 74 to be clamped firmly in any position to which it is adjusted. Under many conditions, however, it may be desired to avoid too harsh action on the fibre material being treated, and this may be effected by releasing the clamps controlled by the screws 81 and supporting the members 74 in a manner to be described hereinafter. The blades of the upper and lower sets should be maintained in positions with the lower edges of the blades of the upper set and the upper edges of the blades of the lower set substantially the same distances on opposite sides of the generally horizontal plane of travel of the material through the feed rolls and the beating or scutching means, and at the same time the two sets of blades should be adjustable to vary the widths of the slots between corresponding blades of the two sets.

As here disclosed, the two requirements just referred to are met by providing at opposite sides of the machine vertical shafts 82, each provided at suitable positions therealong with two oppositely arranged screw threads (right and left threads) cooperating respectively with internal screw threads associated with the members or brackets 74; holding these shafts against vertical movement; and providing a connection between the two shafts 82 so that the slots between the blades of the two sets will be varied in the same way at both ends thereof.

The holding of each shaft 82 against vertical movement may be effected by providing it with a reduced lower end 83 extending downwardly through a portion of the frame, the shoulder at the upper end of the reduced lower end resting on the top of the frame; and by providing it with a reduced upper end 84 passing upwardly through a suitable bore in a horizontal block or member 85, the shoulder at the lower end of said reduced upper end of the shaft engaging a washer which in turn engages the lower side of said bar. Although such shoulders on the shafts 82 may be in direct engagement with the members with which they cooperate, it is desirable in many cases to insert wear resisting washers in such positions. The upper members 85 at opposite sides of the machine are preferably connected by suitable means including a tie rod 87. Each block or member 85 is provided at its rear end with another bore to receive the reduced upper end of the corresponding post 75 and is held against the upward thrust of the shaft 82, associated therewith, by means of a nut 86 screwed on said reduced end of the post.

Connection between the two shafts 82 at opposite sides of the machine may be effected by means of bevel gears 91 on the reduced lower ends of the shafts, and a cross shaft 92 provided with bevel gears 93 in mesh with the bevel gears 91. To facilitate the turning of the shaft 92, a disk 94a with a suitable eccentrically positioned handle 94 is fixed thereon, and the widths of the slots between the corresponding blades of the upper and lower sets may be indicated by the positions, with reference to a fixed index or pointer on the graduations on a disk 95 fixed on the shaft 92.

Preferably the internal screw threads associated with the blade supporting members 74 are formed at the interior of sleeves 97, of suitable material and provided with a suitable pair of correspondingly threaded bores in the members 74. During adjustment of the members 74, the sleeve 97 must be held against turning in said members and this may be done by any suitable means such as set screws 97a. Each of the sleeves 97 has at one end an annular flange 98, the sleeve 97 in each lower member 74 being arranged with its flange at the upper side of such lower member and the sleeve 97 in each upper member 74 being arranged with its flange at the lower side of such members 74.

The herebefore mentioned guiding and controlling means for the forward ends of the members 74 will now be described. As shown in Fig. 4, each lower member 74 is provided with a downwardly extending guiding pin 99 attached at its upper end to such lower member 74 and slidable below such lower member 74 preferably in a wear resisting bushing 100 mounted in a fixed part of the machine and enclosing this guiding pin is a helical spring 101 interposed between such fixed part of the machine and such lower member to urge the same upwardly. Each upper member 74 is in like manner provided with an upwardly extending guiding pin 99 slidable preferably in a bushing 100 mounted in the forward end of the corresponding block or member 85.

Preferably the upper and lower guiding pins 105.
The reciprocable blades 73 are also arranged in upper and lower sets with openings or slots between corresponding upper and lower blades and these openings are of almost the same width as the openings between corresponding stationary blades. Preferably, as indicated in Figs. 9 and 10, the slots between corresponding reciprocating blades 73 are somewhat wider than those between corresponding stationary blades. Such wear which may occur in reciprocating blades 73 are of less thickness than the spaces between adjacent blades 72 of the upper set or of the lower set and the distance between the upper and lower edges of these blades is such that they may have a sufficient clamping or set screws 81 and 97a in loosened condition (as stated above).

In order to permit reciprocation of the blades 73 without interference between the same and the stationary blades 72, the blades are of sufficient length to extend beyond the ends of the stationary blades and their ends are secured in yokes 102 by suitable means including bolts or studs 103 extending through the sides of the yokes 102 and held in position by engagement of their heads with the outer surface of one side of the blade and engagement of the outer surface of the other side of the yokes nuts 103a screwed on the other ends of the bolts.

As much as the blades 73 are supported entirely by the bolts 103, these bolts would be subjected to a great deal of wear if these blades were mounted directly thereon. Such wear may be avoided by use of wear resisting sleeves 104 fitting over the bolts and passing through suitable openings in the blades and in spacers 104a placed therebetweeen. The sleeves 104 are of suitable length to fit between the arms or sides of the yokes and each sleeve is provided at one end with an annular flange 105 and at the other end with an external screw thread to cooperate with a nut 105a by means of which the blades 73 and the spacers 104a are clamped in position.

A condition, a wide space may be left between the first and second blades of each set, a lesser space between the second and third blades of each set, and still less space between the third and fourth blades of each set. Different adjustments may be made for different fibrous materials, flax being finer than hemp and requiring smaller spaces between the blades, and hemp being finer than jute and requiring finer spaces between the blades than jute.

After such substantially permanent adjustments have been made, they will be retained and changes in conditions may be made by other adjustments which will now be discussed in connec.
tion with certain conditions which require them.

With damp straw and in damp weather it is particularly difficult to obtain the desired degree of cleanliness of the fibre. Satisfactory results can be obtained by varying the speed of the feeding rolls to obtain the proper reduction below normal speed and thereby subjecting the plants to the beating action for a longer period. This results, however, in cutting down production.

According to the preferred embodiment of the present invention, increased beating can, in many cases, be obtained without decreasing production, by varying the width of the slots between certain opposed blades of the same kind, preferably stationary blades 72 as here shown. When the screws 81 for clamping the holders 74 for the stationary blades to the post 76 are loose, the widths of the slots may be varied by turning the shaft 92. By this adjustment the degree of beating may, by narrowing the slots, be increased without decreasing production.

For instance, if the reciprocating blades 73 have a slot of one inch width, the slots or openings between corresponding stationary blades 72 are of three quarter inch width, and the reciprocating blades have a one inch movement, the edges of the slots in the movable blades will in each stroke pass the effective edges of the stationary blades at a speed of one inch; but unno-

the rolls at the other side of the machine being driven from shaft 20 by Separate connections of the same general nature including the gears 32, 36 and 38 (Fig. 1). In this arrangement there are separate controlling members 42 at opposite sides of the machine and they are operated by separated shafts 43 and handles 46. According to the arrangement just described the machine is operated essentially as two machines of half the width but in much more compact form than two separate machines.

It should be understood that various changes may be made in the construction and arrangement of the matter set forth in the claims, without departing from the true scope and spirit of the invention. Having thus described my invention, I claim:

1. In a decorticating machine, the combination of a member including a set of blades arranged in pairs in the direction of movement of the fibrous material to be decorticated, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the other, a third set of blades similarly arranged but positioned opposite to the spaces between the blades of the first set, means for effecting relative reciprocation between such sets of blades, and means for effecting yieldable support for the blades of at least one of said sets and thereby moderating the severity of the cleaning action.

2. In a decorticating machine, the combination of a set of substantially parallel blades arranged with the successive spaces therebetween decreasing in the direction of movement of the fibrous material to be cleaned, a second set of blades similar to the above but spaced apart to provide a slot for the passage of the fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the other, a third set of blades similarly arranged but positioned opposite to the spaces between the blades of the first set, means for effecting relative reciprocation between such sets of blades, and means for effecting yieldable support for the blades of at least one of said sets and thereby moderating the severity of the cleaning action.

3. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair facing each other but spaced apart to provide a slot for the passage of the fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the other, a third set of blades similarly arranged but positioned opposite to the spaces between the blades of the first set, means for effecting relative reciprocation between such sets of blades, and means for effecting yieldable support for the blades of at least one of said sets and thereby moderating the severity of the cleaning action.

4. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair fac-

ing each other but spaced apart to provide a slot for the passage of the fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the other, a third set of blades similarly arranged but positioned opposite to the spaces between the blades of the first set, means for effecting relative reciprocation between such sets of blades, and means for effecting yieldable support for the blades of at least one of said sets and thereby moderating the severity of the cleaning action.

5. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair spaced apart to provide a slot for the passage of the fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the other, a third set of blades similarly arranged but positioned opposite to the spaces between the blades of the first set, means for effecting relative reciprocation between such sets of blades, and means for effecting yieldable support for the blades of at least one of said sets and thereby moderating the severity of the cleaning action.
pairs arranged alternately with the pairs of the first set, means for effecting relative reciprocation between the two sets of blades, and means acting simultaneously at opposite ends of the blades, and feeding rolls adjustable toward and from said sets of blades to vary the spreading in said slots of fibrous material fed in bunches between said feed rolls to be advanced thereby into the slots.

6. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair spaced apart to provide a slot for the passage of fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the pairs of the first set, means for effecting relative reciprocation between the two sets of blades, springs acting on the blades of one of said sets to urge the blades of each pair of blades in such set in a direction to close the slot therebetween, and means for varying the minimum widths of such slots.

7. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair spaced apart to provide a slot for the passage of fibrous material to be cleaned, a second set of blades arranged in pairs in like manner but with such pairs arranged alternately with the pairs of the first set, means for effecting relative reciprocation between the two sets of blades, springs acting on the blades of one of said sets to urge the blades of each pair of blades in such set in a direction to close the slot therebetween, and means for varying such minimum limits to vary the width of said slots.

8. In a decorticating machine, the combination of a set of stationary blades arranged in pairs with the effective edges of the blades in each pair spaced apart to provide a slot for the passage of fibrous material to be cleaned, a set of reciprocable blades arranged in like manner but with such pairs arranged alternately with the pairs of the first set, means for yieldably supporting said stationary blades against movement due to the striking action of the reciprocable blades, means for adjusting the width of the slots between the stationary blades, and means for reciprocating said movable blades a distance slightly greater than the width of the slots between the stationary blades.

9. In a plant decorticating machine, the combination of two cooperating sets of breaker blades with the blades thereof arranged alternately, each set including pairs of substantially parallel blades spaced apart along the line of travel of the material to be actuated and the blades of each pair lying in the same plane with their opposed edges spaced apart to provide a slot for the passage of the material therethrough, means to effect relative reciprocation of the two sets of blades, and means for varying the width of the slots between the blades of each pair in such set.

11. In a plant decorticating machine, the combination of two cooperating sets of breaker blades with the blades thereof arranged alternately, each set including pairs of substantially parallel blades spaced apart along the line of travel of the material to be actuated and the blades of each pair lying in the same plane with their opposed edges spaced apart to provide a slot for the passage of the material therethrough, means to effect relative reciprocation of the two sets of blades, and means for varying the width of the slots between the blades of each pair in such set.

12. In a decorticating machine, the combination of a pair of substantially parallel blades, a blade positioned in the space between the blades of said pair, means for effecting a relative movement between the pair of blades and the other blade to clean and pass therethrough, and means for yieldingly supporting the blades of said pair against spreading movement.

13. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair facing each other but spaced apart to provide a slot for the passage of the fibrous material to be decorticated, a second set of blades including a pair of blades spaced to provide a slot therebetween and positioned between two pairs of blades of the other set, means to effect relative movement between the two sets of blades, means to vary the width of slot, in one set of blades by moving corresponding blades in opposite direction, and means for yieldably supporting the blades of one of said sets.

14. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair facing each other but spaced apart to provide a slot for the passage of the fibrous material to be decorticated, a second set of blades including a pair of blades spaced to provide a slot therebetween and positioned between two pairs of blades of the other set, means to effect relative movement between the two sets of blades, means to vary the width of slot, in one set of blades by moving corresponding blades in opposite direction, and feed rolls adjustable toward and from said sets of blades to vary the spreading of material fed to the slots.

15. In a decorticating machine, the combination of a set of blades arranged in pairs with the effective edges of the blades in each pair facing each other but spaced apart to provide a slot for the passage of the fibrous material to be decorticated, a second set of blades including a pair of blades spaced to provide a slot therebetween and positioned between two pairs of blades of the other set, means to effect relative movement between the two sets of blades, means for varying the width of slot, in one set of blades by moving corresponding blades in opposite directions, and feeding means adjustable to vary the spreading of material fed thereto from the slots.

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