J. M. WORTH.

MACHINE FOR TREATING FIBROUS MATERIAL.

APPLICATION FILED JULY 13, 1905.

1,010,006.

Patented Nov. 28, 1911.

6 SHEETS—SHEET 1.

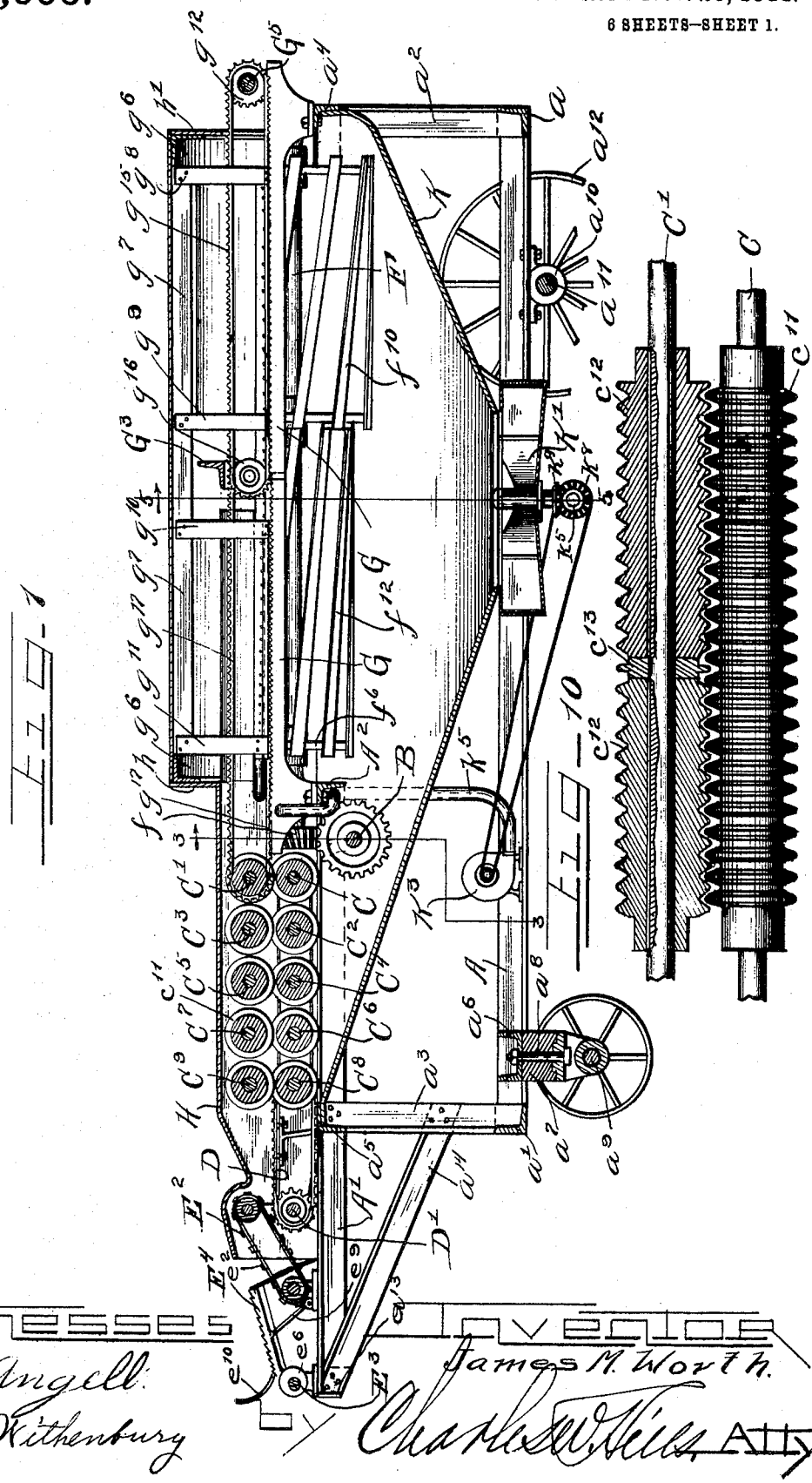

FIG. 1

FIG. 10

Witnesses

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6 SHEETS—SHEET 2.

Fig. 2

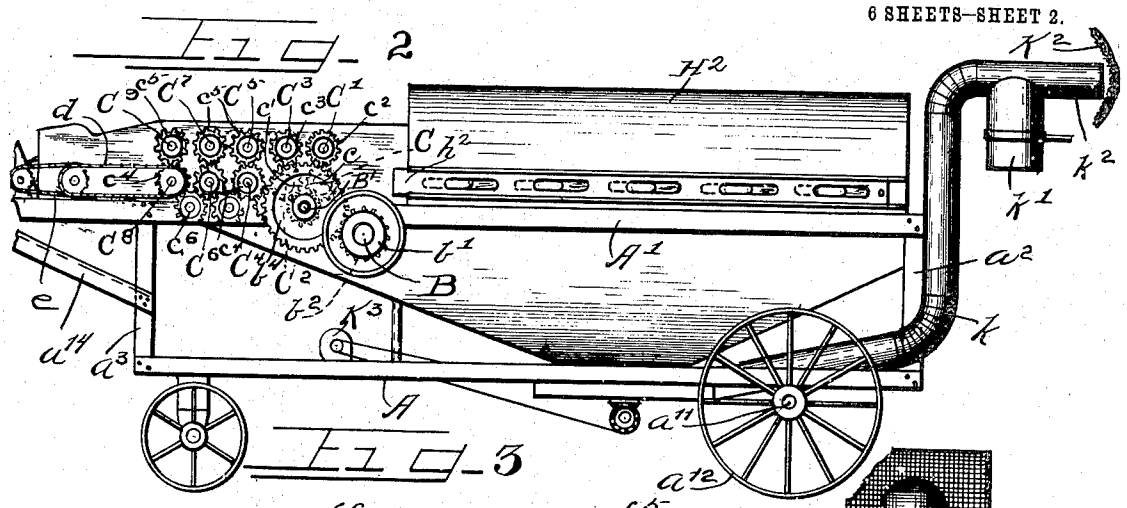

Fig. 3

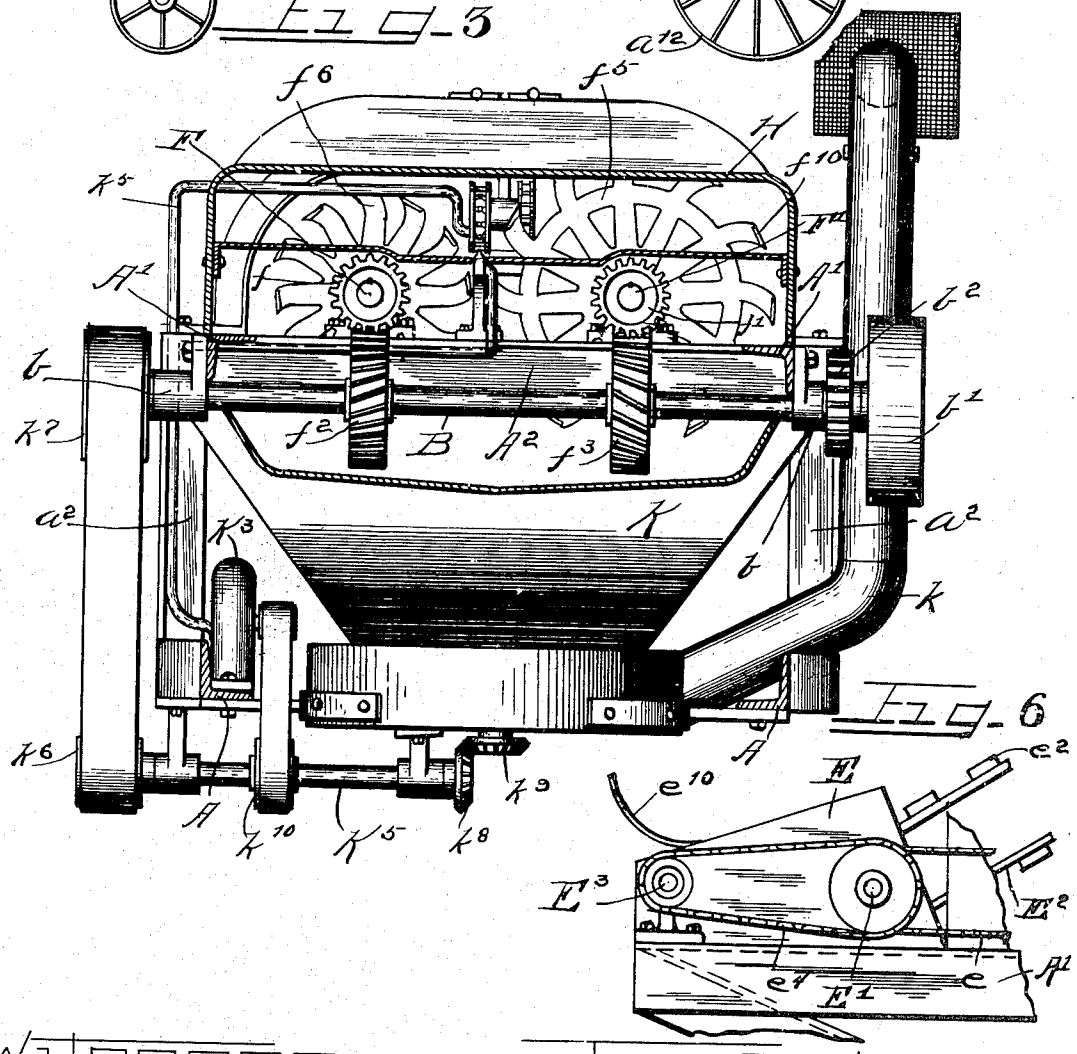

Fig. 6

Witnesses

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6 SHEETS—SHEET 3.

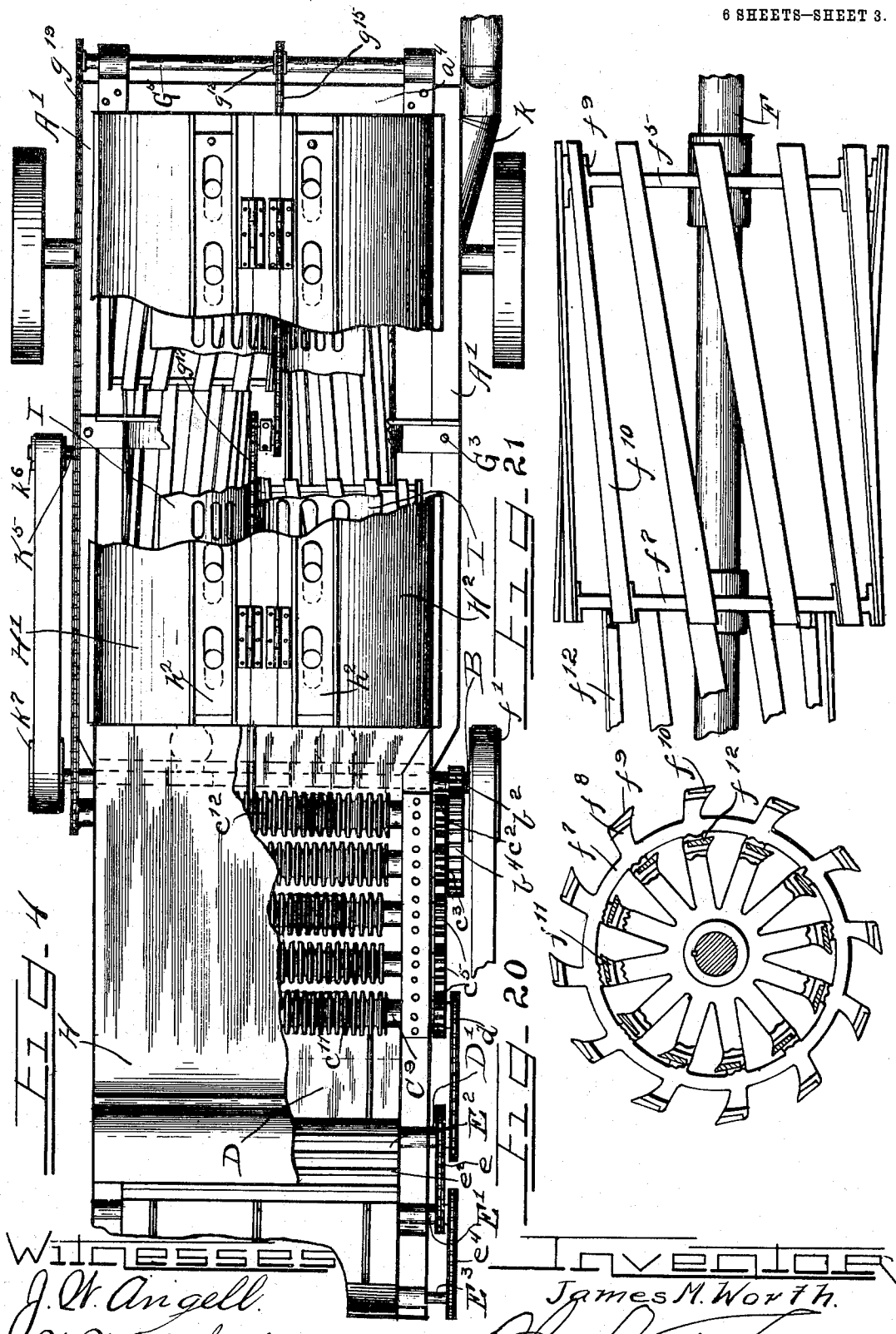

FIG. 4

FIG. 20

FIG. 21

Witnesses

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6 SHEETS—SHEET 4.

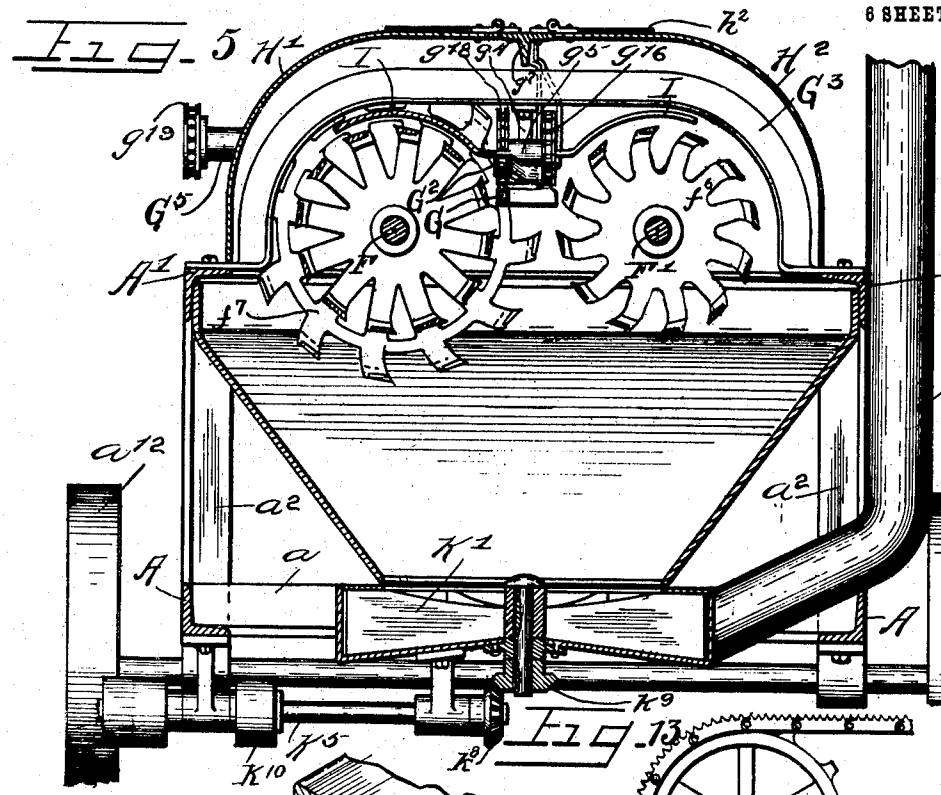

Fig. 5

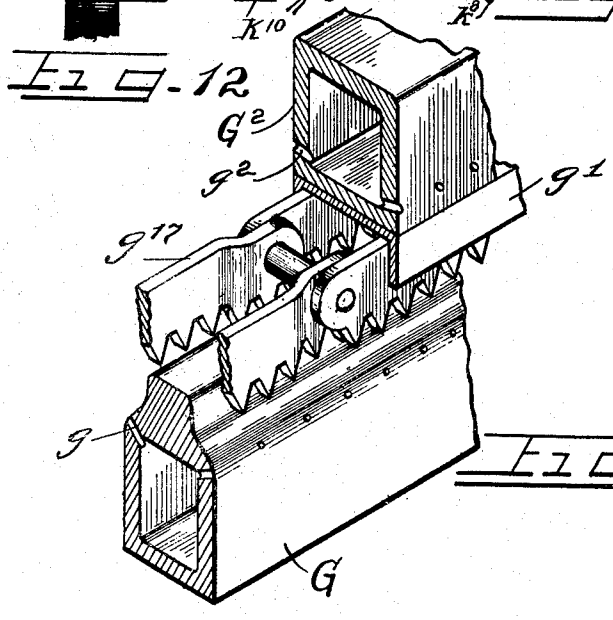

Fig. 12

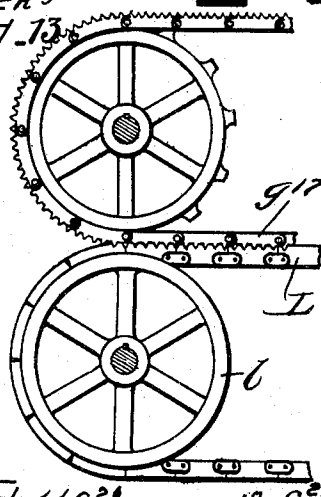

Fig. 13

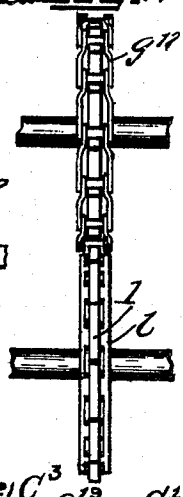

Fig. 14

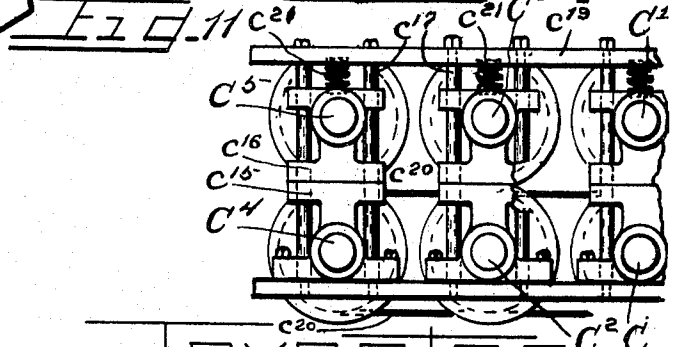

Fig. 11

Witnesses

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6 SHEETS—SHEET 6.

Fig. 19

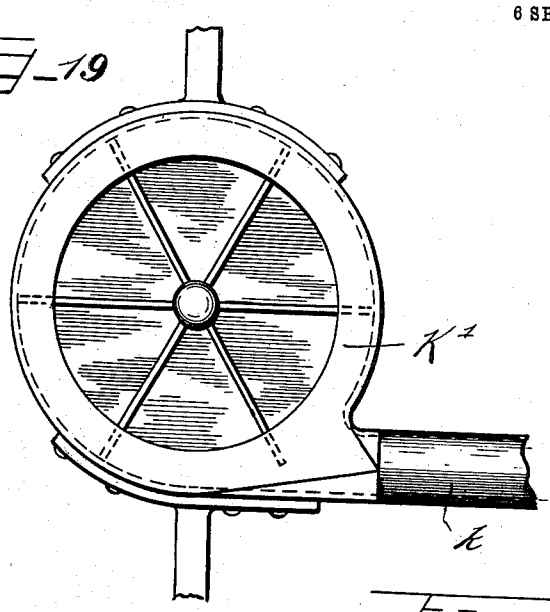


Fig. 17

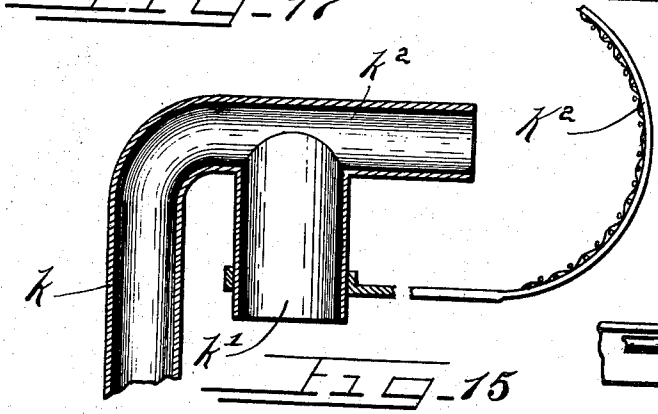


Fig. 15

Fig. 18

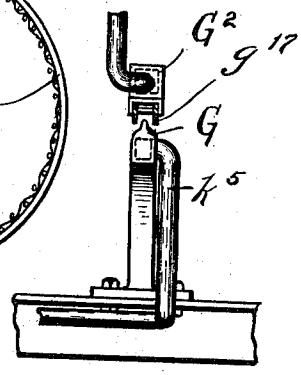
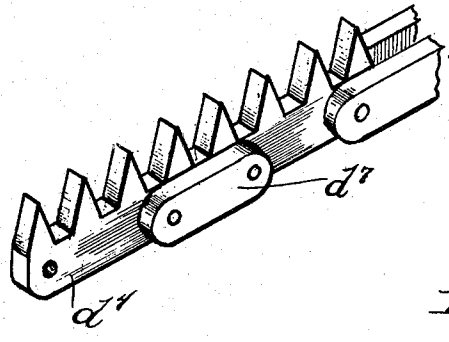
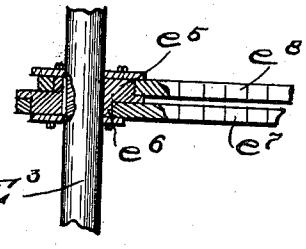


Fig. 16





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6 SHEETS—SHEET 5.

Fig. 7

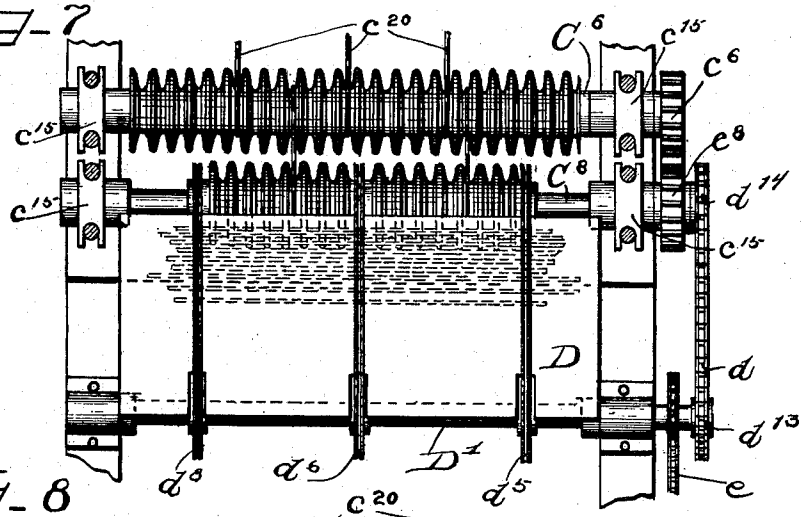


Fig. 8

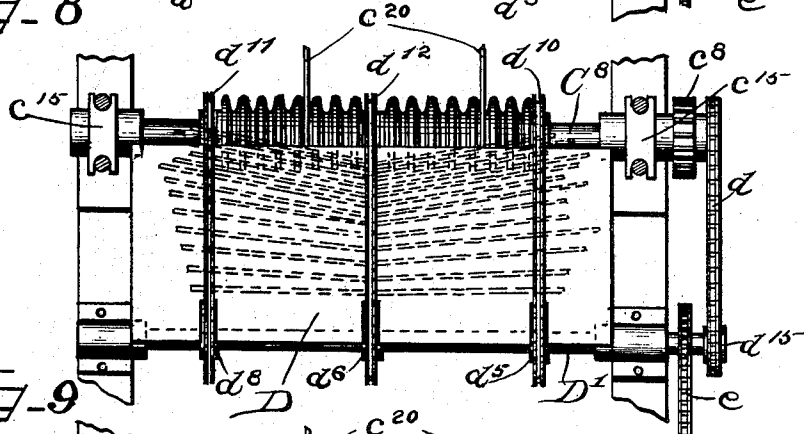
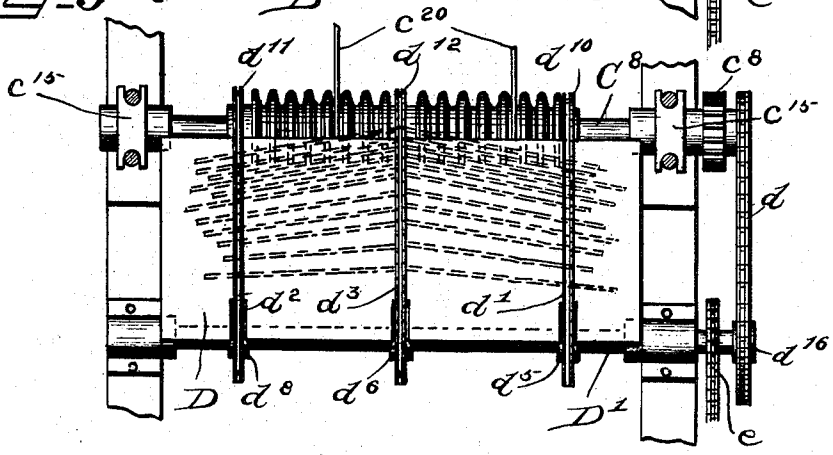


Fig. 9



Witnesses

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UNITED STATES PATENT OFFICE

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MACHINE FOR TREATING FIBROUS MATERIAL.

1,010,006. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed July 13, 1905. Serial No. 269,441.

To all whom it may concern:

Be it known that I, JAMES M. WORTH, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Treating Fibrous Material; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in machines for treating fibrous material and more particularly to a machine adapted to break and scutch fibrous materials such as hemp, sisal grass, flax or other fiber producing materials. In some of the machines heretofore constructed for this purpose the breaking and the scutching mechanisms have been built and operated as separate machines. Some of the machines heretofore constructed have been designed to break and scutch the material from both ends of the stalks or leaves toward the middle, and in consequence the ends of the fibers at both ends of the stalk are subjected to the scutching operation much longer than the middle thereof and in consequence become much abraded, frayed and worn away to such an extent that the fiber is much shortened and a considerable part of the value is lost in a fine lint that is expelled from the machine with the boon or other cellular matter. As a rule the loss from injury to the ends of the fibers approximates twenty per cent. and the fibers at the middle of the stalks are usually not entirely cleaned of cellular matter though the ends are thus injured. In many such machines it is difficult if not impossible to insure a positive and a regulable feed for the material and owing to the character of the materials treated through the machine the fibers wind on all revolving elements soon stopping the machine and necessitating sometimes expensive repairs.

It is an object of this invention to afford a mechanism which feeds the stalks, leaves or materials to be treated uniformly into the machine by means of distributing feeders which deliver the same to a suitable feed mechanism whereby the material to be treated is delivered to the breaking mechanism while arranged to parallel therewith or with center or with the ends advanced as preferred.

A further object of the invention is to afford continuously operating coacting breaking rolls between which the material is thoroughly broken and from which the material is continuously delivered to the scutching mechanism.

It is a further object of this invention to afford means for positively engaging the stock or material to be treated at approximately the middle and transversely thereof and to carry the same continuously through the scutching mechanism and to afford means during the passage through the scutching mechanism for thoroughly scutching the material treated for its entire length excepting the part engaged in the carrying mechanism and to continuously subject the material to an air blast during the operation.

It is furthermore an object of the invention to shift the engagement of the carrier with the material from the point where first engaged during the passage through the scutching mechanism thus enabling all parts of the material to be scutched.

Furthermore it is an important object of the invention to provide means for saving the lint heretofore usually lost and representing from 5 to 10% of the fiber.

It is also an object of the invention to construct a strong simple and automatic machine of the class described in which the loss or destruction of fiber is reduced to a minimum while thoroughly cleaning the same and which delivers the fiber in a commercial condition preserving the full length of the fibers or harl.

The invention embraces many novel features and consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a central vertical section of a machine embodying my invention. Fig. 2 is a reduced side elevation of the same with a part of the feed mechanism broken away. Fig. 3 is a section taken on line 3—3 of Fig. 1. Fig. 4 is a fragmentary top plan view with the top casing and a part of the feed mechanism broken away. Fig. 5 is an enlarged section taken on line 5—5 of Fig. 1. Fig. 6 is an enlarged fragmentary side elevation of the front or feed end of the machine. Fig. 7 is an enlarged fragmentary top plan of a part of

the feed to the breaking rolls showing the parallel adjustment of the same. Fig. 8 is a similar view showing the adjustment to deliver the ends of the stock to the breaking rolls in advance of the center. Fig. 9 is a similar view showing the adjustment to deliver the center in advance of the ends of the stock. Fig. 10 is an enlarged side elevation and longitudinal section respectively of a lower and an upper breaking roll. Fig. 11 is an enlarged side elevation of a part of the bearing for the breaking rolls. Fig. 12 is an enlarged perspective view partly in section and partly broken of the carrier through the scutching mechanism. Fig. 13 is a view in side elevation of a modified carrier. Fig. 14 is an end view of the same. Fig. 15 is an enlarged fragmentary perspective view of one of the feed chains for delivering the material to the rolls. Fig. 16 is an enlarged fragmentary plan view partly in section of one set of the feeders for delivering material to the feed table and the feed chains. Fig. 17 is a fragmentary longitudinal section of the pneumatic spout through which the boon or other cellular matter and the lint is delivered and illustrates the means for catching and retaining the lint. Fig. 18 is an enlarged fragmentary detail illustrating the connection of the air pipes with the central tubular rib or support of the carrier. Fig. 19 is an enlarged top plan view of the exhaust fan. Fig. 20 is a transverse section of one of the scutching cylinders. Fig. 21 is a fragmentary enlarged top plan view of the same.

As shown in the drawings: A rigid frame is provided for said machine comprising as shown angle bar or other suitable side sills A, and end sills a—a' affording a rectangular frame on which at the corners are engaged posts or uprights a^2—a^3 and such other intermediate posts, uprights or braces as may be necessary but which for convenience of illustration are not shown in the drawings. Supported on the post a^2—a^3 are upper side sills A′ and upper transverse sills, A^2, a^4 and a^5. A channel bar a^6 is secured transversely between and near the front ends of the sills A and secured thereto is a transverse bolster a^7 extending beneath the frame and beneath which and secured by means of a king bolt a^8 thereto is a front axle a^9 on which are wheels supporting the front end of the machine. At the rear end of the machine a boxing a^{10} is secured upon each of the side sills A in which is journaled the axle a^{11} for the rear wheels a^{12} which support the rear end of the machine.

The upper sills A′ extend forwardly beyond the upright a^3 and are connected at their outer end by transverse angle bars a^{13} and are rigidly secured to the main frame by brace bars a^{14} which are rigidly engaged to the extremities of the sills A′ and extend downwardly and are bolted, riveted, or otherwise firmly secured, to the uprights a^3 at the front corners of the main frame. Supported upon said forward extension of the main frame is a feeder acting to separate the material to be treated and to deliver the same uniformly to the feed table, and from which the same is delivered to the breaking rolls journaled transversely of the machine, and through which the material is delivered to the scutching mechanism comprising in part a series of cylinders journaled longitudinally of the machine. Beneath the scutching rolls is an exhaust fan which delivers the boon or other cellular matter and the lint from the machine.

Journaled upon suitable bearings b and extended below the top sills A′ is a driving shaft B provided at one end with a driving pulley b' and at the same end and outside the frame with a pinion b^2. Journaled on a stud shaft B′ on the side of the machine, adjacent the shaft B is a gear b^4 which meshes with the pinion b^2 and is provided on its side adjacent the machine with a pinion or gear shown in dotted lines in Fig. 2 and which meshes respectively with gears c and c' also shown in dotted lines in Fig. 2 and on the lower breaking roll shaft C and C^2 which respectively intermesh with the gears c^2 and c^3 on the upper breaking roll shafts C′ and C^3. As shown journaled to intermesh are gears c^4 and c^5 on the lower and upper roll shafts C^4 and C^5, C^6, C^7, C^8 and C^9, and journaled between each pair of lower gears is a transmitting gear or idler, c^6 which meshes with each pair of lower gears.

Secured on each roll shaft is a longitudinally corrugated roll c^{11} of steel or other suitable material affording rounded peripheral ridges each of which intermeshes in a complemental groove in the corresponding upper or lower roll and between which the material or stock is passed in breaking. As shown the upper rear breaking roll shaft C′ is provided with a roll c^{12} on each end of the shaft and between the inner ends of which and rotatably engaged on the shaft, is a sprocket wheel c^{13} for the scutching feed mechanism. The bearings for said roll shafts comprise each a cast boxing c^{15} and c^{16} provided with arms above and below directed longitudinally with the machine and which are drilled in alinement as shown in Fig. 11 and through which extend rods c^{17} the lower ends of which are engaged to the sill A′ through the flanges of the lower boxes which are rigidly bolted to said sills, and the upper ends of which extend through a bar c^{19} between which and the top of the upper boxes strong pushing springs c^{21} engage and act to hold the rolls at the lower limit of their adjustment. Wires c^{20} extend longitudinally of the machine around the

lower rolls lying in the grooves between the ribs thereon and afford a support for the material when passing between the rolls.

In advance of the front pair of rolls is provided a feed table D and beneath the same is a transverse shaft D′. Sprocket wheels are secured on the shaft C^8 and the corresponding end of the shaft D′ around which is trained a sprocket chain d. Sprocket wheels d^5—d^6 and d^8 are provided on the shaft D′ and corresponding sprocket wheels d^{10}, d^{11}, d^{12} are secured on the shaft C^8. Feed chains indicated as d'—d^2 and d^3 are trained around the same and each comprising series of toothed links d^4 as shown in Fig. 15 which are articulated together by plain links d^7 and which are trained on said sprocket wheels with the teeth directed outwardly thereby acting to deliver the material progressively to the rolls. The sprocket wheel d^6 carried on the shaft D′ is rotatable on the shaft D′ and the corresponding sprocket wheel d^{12} is rigidly secured on the shaft C^8. The sprocket wheels d^5 and d^8 are rigidly secured upon the shaft D′ and the corresponding sprocket wheels d^{10} and d^{11} are rotatably secured on the shaft C^8, thus driving the central chains d^3 from the sprocket wheel d^{12} on the roll shaft and the chains d' and d^2 from the shaft D′. This permits several variations of feed by varying the size of the sprocket wheels on the shaft D′. Inasmuch as all the sprocket wheels for the feed chains are of the same size when the sprocket wheel d^{13} on the shaft D′ and the sprocket wheel d^{14} on the shaft C^8 are of equal size the material shown by dotted lines in Fig. 7 is fed into the breaking rolls straight and parallel therewith. Should however a smaller sprocket wheel d^{15} be substituted on the shaft D′, said shaft is thereby driven at a higher rate of rotation and the chains d' and d^2 accelerate the feed of the ends of the material while the feed at the center is less rapid as shown in dotted lines Fig. 8 thus feeding the butts or ends of the material into the machine first. For certain material it may be desirable to feed the middle into the rolls first for this purpose a larger sprocket wheel d^{16} is secured upon the shaft D′ thus retarding the drive of the ends of the material and permitting the center of the material to be fed into the rolls first.

Means are provided for distributing the material uniformly to the feed chains and depositing the same squarely across the same. For this purpose a feeder indicated as a whole by E is provided as shown in Figs. 1, 4, 6, and 16. Journaled at the front end of the frame is a shaft E^3 which is driven by the sprocket chain e^4 which trains over a suitable sprocket on a shaft E′ which is driven from the shaft D′ by means of a sprocket chain e. Secured on said shaft E^3 are three sets of oscillating and reciprocating feeders, one set located at the middle, and the others located on each side of the same. Eccentrics e^5 and e^6 are secured on the shaft E^3 in closely adjacent pairs and are arranged to throw oppositely and on each of the same are engaged the yoked front ends of feed bars E^4 each provided upon its upper side with rearwardly directed teeth. Each of said bars is pivotally supported at its middle on a bar or link e^9 the lower end of which is pivoted upon the frame so that as the shaft E^3 is rotated one of said bars is given a rearward and upward movement while the corresponding bar secured on the adjacent eccentric is given a downward and forward movement. At the front end of the machine is secured an upwardly curved plate or shield e^{10} into which the material to be fed into the machine is delivered. Said feeder bars separate the material gradually from the mass and deliver the same to the inclined conveyer belt E^2 one end of which extends beneath the feeders and the other of which extends above the feed table. When the material drops from the feeder to the conveyer the slight drop aids in adjusting the material square with the belt and in the same manner the drop to the feed table aids in arranging the material transversely of the chains, whereby the stock is delivered to the breaking rolls.

From the breaking rolls the material is delivered to the scutching mechanism occupying the rear half of the machine. This consists in part of scutching cylinders extending longitudinally of the machine and provided with inclined beaters which engage and scutch the material, removing the cellular matter. Journaled upon the transverse sill A^2 near the midde of the frame and on the end sill a^4 are parallel shafts F, and F′ on the inner end of each of which is provided an angle gear f—f' which meshes with a complemental angle gear f^2—f^3 secured on the shaft B, as shown in Fig. 3. These gears are arranged to rotate said shafts oppositely and as shown outwardly, and secured on each of said shafts is a scutching cylinder which for approximately half its length is of larger size than for the remainder of its length. On the shaft F′ the smaller end of the cylinder is in advance of the larger, and on the shaft F the larger end is in advance of the smaller. The smaller ends of the cylinders are somewhat longer than the larger as shown in Fig. 4. Each of said cylinders comprises a spider f^5 for the larger end of each cylinder, a spider f^6 for the smaller end and a central spider f^7 having arms f^8 thereon equal in length to the arms of the spider f^5 and provided as are likewise the arms of the spider f^5 with a flanged head f^9 on each arm. Secured also upon the arms of the spider f^7 at the side

adjacent the spider f^6 are internal brackets f^{11} at equal radial distances from the center with the extremities of the arms on said spiders f^6. The spiders are secured on the shaft so that the beaters f^{10} and f^{12} are arranged obliquely as shown in Figs. 1, 4, and 21 and with their engaging or front edges directed at an angle of about 27 degrees toward the rear or delivery end of the machine. Said beaters may be constructed of any suitable material and secured in any suitable manner to the spider arms and to the brackets on said spiders.

Supported on the transverse frame members a^4 and A^2 is a longitudinal rail, rib, or bar G, extending between the cylinders and having its top in the same plane as the top of the breaking rolls. Inasmuch as each of the cylinders has a large end and a small end of which the large end of one laps with the small end of the other as shown in Fig. 4, said bar or rib is offset laterally between the cylinders and between the spiders f^7. Said rib as shown in Fig. 12 is tubular and closed at each end and opening obliquely upwardly therefrom on each side thereof are apertures g distributed throughout the length of the rail or bar. Supported above the same is a corresponding tubular presser bar G^2 on the under side of which is a channel g' having its flanges directed downwardly and spaced a short distance above the top of the rail G. Said presser bar G^2 is provided with obliquely, upwardly opening apertures g^2 as shown in Fig. 12 distributed throughout its length. Arching over said cylinders at approximately the center of said bar or rail is an angle bar G^3 on which is secured a hanger g^4. Adjacent the front and rear ends of the cylinders are angle bars g^6 the ends of which are bolted to the sills A′ and connecting and supported at its ends on which is a bar g^7 shown as T bar. Said presser bar G^2, is supported upon the hanger g^4 as shown in Fig. 5 and on hangers g^8—g^9—g^{10} and g^{11} secured on the T bar. At the central offset on said rail or rib G is provided a transverse bearing g^5 in which is journaled a shaft, having on each end of the same a sprocket wheel g^{16} g^{18} as shown in Fig. 5. A shaft G^5 extends transversely of the rear end of the machine and is provided with a sprocket wheel thereon g^{12} which receives a sprocket chain g^{15} trained over the sprocket wheel g^{16} on the central sprocket shaft and a corresponding sprocket chain g^{17} is trained around the central sprocket wheel g^{18} and the sprocket wheel c^{13} rotatably engaged on the breaking roll shaft C′.

The sprocket chains as shown are each provided on their outer side with outwardly directed teeth which extend downwardly on each side of the top of the rail or bar G and the inner side of said chain fits within the channel g' on the under side of the presser bar G^2 and thereby holds said chain at unvarying distance from the rail G. A sprocket chain g^{19} is trained around a suitable sprocket wheel secured upon the end of the shaft C′ and at the end of the shaft G^5 from whence said chains g^{15} and g^{17} are driven.

Inclosing the top of the machine and extending from approximately the rear end of the feeder, for the entire length, is a casing of sheet metal, indicated above the breaking rolls and feed chains by H, which fits closely above the rolls and prevents dust, dirt or any part of the broken cellular material being thrown from the machine. Hinged upon the central T bar are covers H′ and H^2 which fit down upon the angle bars g^6 at each end of the scutching cylinders. Said covers are provided with air inlet or draft apertures through their tops and sides as shown in Figs. 2 and 4 and slidably engaged over said apertures are apertured plates h^2 adapted to regulate the size of said air inlets. As shown a closing plate h extends downwardly on the front angle bar g^6 and in a like manner a closing plate h' slotted transversely for the passage of the material therethrough and apertured for the upper lap of the chain g^{15} is provided at the rear end of the machine. Within the casing for the scutching cylinders, and also supported upon the hangers for the bar G^2 are shields I, which are curved upwardly over the scutching cylinders in close proximity thereto.

Below the scutching cylinders and connected with the front and rear end of the frame is a metallic hopper K, at the bottom of which supported as shown horizontally is an exhaust fan K′ the discharge pipe k of which extends outwardly and rearwardly and is provided at its upper end with an enlarged downwardly directed spout k' for the discharge of heavier cellular matter from the material treated. An approximately horizontally directed smaller spout k^2 is provided above the spout k' through which the lint is delivered to a basket or screen K^2 which as shown is supported on the delivery pipe k.

A blower K^3 is supported below the hopper K and is piped upwardly to connect with the tubular rail or rib G and bar G^2, as shown in Figs. 1, 2 and 3, through a pipe k^5. The exhaust fan and blower are both driven from a shaft K^5 on the outer end of which is a driving pulley k^6 which belts to a pulley k^7 at the end of the shaft B. On the inner end of said shaft K^5 is a bevel gear k^8 which meshes with a bevel gear k^9 on the exhaust fan shaft. A pulley k^{10} is provided on said shaft K^5 which drives the belt of the blower.

The operation is as follows: The material is delivered into the feed end of the machine

and the feed bars by their oscillating and reciprocating movement separate the material into a layer of suitable thickness to deliver to the belt carrier E^2. As the material drops on this the same is straightened square with the feed and the lags e^2 aid in holding the material as it is carried to the chain feeders. The material is moved thereby over the feed table either straight as shown in Fig. 7 or with the ends advanced beyond the center or the center beyond the ends as may prove most advantageous for the particular material to be treated. After passing through the breaking rolls the material thoroughly broken is delivered upon the central rail, rib or bar G. The teeth of the chain g^{17} immediately engage the material firmly upon the bar drawing the same inwardly between the cylinders, the beaters of which throw the ends of said material upwardly over the periphery and beneath the shield I and strip all cellular material therefrom. The inclination of the beaters acts to carry the material along the cylinders and thus all parts of the material except that portion engaged by the chain and upon the rail G are scutched with greater or less thoroughness. As the material reaches the central bearing on said bar the chain g^{17} releases the same and the chain g^{15} engages the material at one side of the point of former engagement. This exposes that portion formerly held by the chain g^{17} to the operation of the beaters at the larger end of the cylinder on the shaft F. The material is carried progressively through the machine and thoroughly scutched and delivered at the rear end thereof to any suitable receiving means. During the entire passage of the material along the scutching cylinders a strong upward blast of air is delivered both above and below the material through the bars G and G^2. This not only aids in preventing injury to the fiber but also removes any adherent material from the fiber and owing to the upward inclination of the apertures in said rails also aids in elevating the ends of the fibers on the rolls. All the cellular material, dust, lint, and dirt are drawn in by the exhaust fan downwardly and delivered out of the machine through the pipe k. The coarser and heavier material falls through the large down spout k' while the lint and any broken fiber is caught in the basket K^2 which as shown is constructed of reticulated material such as wire net, and permits the air to escape readily therethrough while retaining all fibrous material.

As shown in Figs. 13 and 14 a lower sprocket chain L driven on suitable sprocket wheels may be substituted for the rib or bar G in which case as shown the said lower chain comprises a plurality of connected links affording approximately a straight bar on the upper run thereof and over which the teeth of the other chain overlap thus breaking the material downwardly over said lower chains and firmly gripping while moving the same along between the cylinders.

If preferred the covers H′ and H^2 for the scutching cylinders may be perforated as may also if desired the shields I, thus permitting the downward flow of air to hold the material more closely to the cylinder, thereby enabling the frictional effect of the scutching cylinders to be varied for certain classes of material. If desired also variations in the feed breaking and scutching mechanisms may be made. I therefor do not purpose limiting this application for patent otherwise than necessitated by the prior art as many details of construction and operation my be varied without departing from the principles of this invention.

I claim as my invention:

1. In a machine of the class described scutching mechanism comprising longitudinal, oppositely revolving, horizontal cylinders each constructed of sections of different diameters, said cylinders reversely arranged for the greater diameter of one cylinder to lie opposite the smaller diameter of the other cylinder, means for carrying the material therebetween and means for shifting the engagement thereof to different parts of the material during the passage therethrough.

2. In a machine of the class described a pair of scutching cylinders each having one large and one small end arranged with the large end of one cylinder adjacent the small end of the other and means longitudinally thereof acting to carry material therebetween.

3. In a machine of the class described a pair of oppositely rotating scutching cylinders each having one large end and one small end, the large end of one being arranged adjacent to and in close relation with the small end of the other, rearwardly oblique beaters secured on said cylinders and longitudinally movable means arranged centrally beneath said cylinders and adapted to convey material therebetween.

4. In a machine of the class described a scutching cylinder comprising axially connected large and small cylinders and obliquely arranged ribs or beaters thereon.

5. In a scutching cylinder the combination with a shaft of a large spider at one end thereof and a small spider at the other, a central spider corresponding with the larger and having brackets thereon at a radial distance corresponding with the smaller and obliquely arranged beaters engaged on said spiders and brackets affording a cylinder approximately one half of which is of small diameter and the other half of which is of large diameter.

6. A machine of the class described embracing in combination with a shaft a spider of equal size secured at one end and near the center of the same, a small spider secured near the other end of the shaft, brackets on the central spider at the same radial distances from the shaft as the arms of the smaller spider and beaters having projecting obliquely set edges engaged on said spiders and brackets.

7. In a scutching machine the combination with scutching cylinders arranged approximately parallel, and each comprising a large and a longer small portion, arranged with the large end of one adjacent the small end of the other, obliquely and rearwardly inclined beaters on said cylinders, means rotating the cylinders oppositely, and a carrier acting to grip the material to be treated near its middle and to carry the material between the cylinders and to shift its engagement upon the material as it passes between and along the cylinders and exposing all parts of the material to scutching action.

8. In a machine of the class described the combination with parallel scutching cylinders, each having a large and a small end and arranged with the large end of the one adjacent the small end of the other, of means rotating the cylinders oppositely, a chain conveyer adapted to grip the material to be treated near its middle and carry the same between and along the cylinders, said conveyer acting to shift its engagement with the material during the passage through the cylinders thus exposing the part previously held to the scutching action.

9. In a machine of the class described the combination with parallel oppositely rotated scutching cylinders each comprising a large and a small end of a conveyer therebetween acting to grip the material and to draw the same between the scutching cylinders, there being a jog in said conveyer near the middle of the machine whereby its engagement on the material is shifted, and shields adjacent to the scutching cylinders and confining the ends of the material thereto.

10. The combination with oppositely rotating scutching cylinders of means conveying the material to be treated longitudinally therebetween, means for forcing drafts of air against the material treated during scutching and an exhaust fan positioned to deliver the boon and other cellular matter from the machine.

11. In a machine of the class described a combination with scutching means and a conveyer adapted to deliver the material therethrough, of an exhaust fan acting to discharge the refuse material from the machine and means for catching the lint and fibrous material discharged therewith.

12. A scutching cylinder for a machine of the class described of large size for approximately half its length and smaller for the remainder of its length, obliquely set beaters engaged on the periphery of each cylinder and set to draw in the direction of rotation.

13. In a machine of the class described the combination with a scutching means of an exhaust fan acting to deliver cellular and refuse matter from the machine, a delivery pipe and apertured means at the end of the delivery pipe acting to collect fibrous material discharged therethrough.

14. In a machine of the class described a conveyer comprising a tubular rib having lateral apertures opening therethrough and adapted to support the material thereon, a chain provided with downwardly directed teeth engaging over said rib at each side thereof and acting to draw the material along the same and means admitting a blast of air into the bore of said rib.

15. In a machine of the class described a conveyer comprising an offset tubular rib having laterally opening apertures therein, of a chain above said rib, teeth on said chain extending downwardly on each side of the rib and a presser bar above said chain.

16. In a machine of the class described a conveyer comprising upper and lower rigid tubular members with laterally opening apertures therein, a blower connected with each, a conveyer chain between said tubular members and supported thereby acting to engage the material to be treated on one of said bars and to convey the same through the machine, said conveyer being constructed in two sections each of which carries the material half the length of the machine, and means for exhausting the refuse from the machine.

17. In a machine of the class described the combination with breaking means of a feed conveyer therefor comprising positively driven sprocket chains and means varying the rate of feed at the center of the conveyer as compared with that at the sides thereof.

18. In a machine of the class described scutching mechanism comprising parallel, oppositely revolving, horizontal cylinders each having a large and a small end, those of one being directed oppositely from those of the other, means carrying material therebetween and acting to shift its engagement with the material during the passage of the same along the cylinders and means applying an air blast to the material during treatment.

19. In a machine of the class described, scutching mechanism comprising parallel, oppositely revolving cylinders, means carrying material therebetween and acting to shift its engagement with the material during the passage of the same along the cylinders, means applying an air blast to the material

during treatment, a close fitting casing inclosing the scutching mechanism and means exhausting the air therefrom during treatment.

20. In a machine of the class described scutching mechanism comprising parallel, oppositely revolving cylinders, means carrying material therebetween and acting to shift its engagement with the material during the passage of the same along the cylinders, a close fitting casing inclosing the scutching mechanism, means exhausting the air therefrom and regulating means controlling the flow of air in the casing.

21. In a machine of the class described scutching mechanism comprising parallel, oppositely revolving cylinders means carrying material therebetween and acting to shift its engagement with the material during the passage of the same along the cylinders, a tight fitting casing inclosing the same, means delivering an air blast through the carrying mechanism and regulators in the casing controlling the flow of air therein.

22. In a machine of the class described the combination with scutching mechanism of means delivering a blast of air to one part of the material during treatment and exhausting the air from other parts.

23. In a machine of the class described the combination with scutching mechanism of means affording a regulable flow of air therethrough.

24. In a machine of the class described the combination with scutching mechanism of means affording a regulable and downward flow of air through the material during treatment.

25. In a machine of the class described a casing having regulable draft openings therein, scutching mechanism in said casing and an exhaust fan positioned to draw air through the material during scutching.

26. In a machine of the class described a closed casing having regulable draft apertures therein near the top and bottom, scutching mechanism in said casing, a conveyer delivering material thereto, an exhaust fan at the bottom of the casing acting to draw air through the material during treatment, and means adapted to receive the lint from the delivery of the fan.

27. In a machine of the class described the combination with parallel oppositely rotated scutching cylinders each comprising a large and a small end of a conveyer between the scutching cylinders, there being a jog in said conveyer near the middle of the machine whereby its engagement on the material is shifted, shields adjacent to the scutching cylinders and confining the ends of the material treated thereto, and means applying an air blast to the material during the treatment.

28. In a machine of the class described the combination with parallel oppositely rotated scutching cylinders each comprising a large and a small end of a conveyer therebetween acting to grip the material and to draw the same between the scutching cylinders, there being a jog in said conveyer near the middle of the machine whereby its engagement on the material is shifted, shields adjacent to the scutching cylinders and confining the ends of the material treated thereto, means applying an air blast to the material during treatment, a close fitting casing inclosing the scutching mechanism and means exhausting the air therefrom during treatment.

29. In a machine of the class described the combination with parallel oppositely rotated scutching cylinders each comprising a large and a small end of a conveyer between the scutching cylinders, there being a jog in said conveyer near the middle of the machine whereby its engagement on the material is shifted, shields adjacent to the scutching cylinders and confining the ends of the material treated thereto, a close fitting casing inclosing the scutching mechanism, means exhausting the air therefrom and regulating means controlling the flow of air in the casing.

30. In a machine of the class described the combination with parallel oppositely rotated scutching cylinders each comprising a large and a small end of a conveyer therebetween acting to grip the material and to draw the same between the scutching cylinders, there being a jog in said conveyer near the middle of the machine whereby its engagement on the material is shifted, shields adjacent to the material treated, a tight fitting casing inclosing the same, means delivering an air blast through the carrying means to the material treated, an exhaust mechanism and regulators in the casing controlling the flow of air therein.

31. In a machine of the class described the combination with breaking mechanism of a regulable feed mechanism acting to adjust the material relative to the breaking mechanism during the feed.

32. In a machine of the class described a breaking mechanism, and a feed mechanism adapted to automatically adjust the material fed, approximately parallel with the breaking mechanism.

33. In a machine of the class described the combination with breaking mechanism of feed mechanism therefor embracing means acting to spread, and arrange the material transversely of the machine.

34. In a device of the class described the combination with breaking mechanism of feed mechanism therefor embracing reciprocating means acting to spread the material, a conveyer upon which the material is dropped and regulable means adapted to

advance the ends and the middle of the material into the breaking mechanism at different speed rate.

35. In a machine of the class described the combination with breaking mechanism of feed mechanism embracing chains, adjustable to different feed rates relatively to each other.

36. In a machine of the class described a combination with a breaking mechanism of a feed mechanism therefor embracing a table extending to the breaking mechanism, a plurality of flexible conveyers thereon acting to deliver the material to the breaking mechanism, driving means for said conveyers, said driving means being adapted to admit different feed rates for the conveyer chains relatively to each other.

37. In a machine of the class described a combination with breaking mechanism of feed mechanism therefor comprising a plurality of toothed bars means reciprocating and oscillating said bars oppositely of each other in pairs, a conveyer upon which the material is dropped, acting to deliver the material into the breaking mechanism.

38. In a machine of the class described a combination with breaking mechanism of feed mechanism therefor comprising a plurality of toothed bars, means reciprocating and oscillating said bars oppositely of each other in pairs, a conveyer upon which the material is dropped, acting to deliver the material into the breaking mechanism and capable of adjustment to admit a part of each stalk of material being feed in advance of the remainder.

39. In a machine of the class described the combination with breaking mechanism of feed mechanism therefor adapted to adjust material transversely of the machine by dropping the material upon a part of the feed mechanism and means for feeding said material at different rates of speed throughout its length.

40. In a machine of the class described the combination with breaking mechanism, embracing a plurality of pairs of co-acting peripherally grooved rolls of a feed table, and lateral and central conveyer chains movable thereon and driven from one of the rolls and upon which the material is dropped transversely of the machine.

41. In a machine of the class described the combination with breaking mechanism, embracing a plurality of pairs of co-acting peripherally grooved rolls of a feed table, lateral and central conveyer chains movable thereon and driven from one of the rolls and upon which the material is dropped transversely of the machine and means acting to drive the lateral conveyer chains at a different rate from the central, thus bending the material as fed to the roll.

42. In a machine of the class described the combination with breaking mechanism of feed mechanism therefor embracing means acting to spread, and arrange the material transversely of the machine and scutching cylinders arranged longitudinally of the machine and between which the material is fed from the breaking mechanism.

43. In a machine of the class described the combination with breaking mechanism, embracing a plurality of pairs of co-acting peripherally grooved rolls of a feed table, lateral and central conveyer chains movable thereon and driven from one of the rolls and upon which the material is dropped transversely of the machine, means acting to drive the lateral conveyer chains at a different rate from the central, thus bending the material as fed to the roll and means subjecting the material under treatment to an air blast after passing through the rolls.

44. In a machine of the class described co-acting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders at the rear thereof, a conveyer acting to carry the material from the breaking rolls between the scutching cylinders and means for treating the material to an air blast while passing through the conveyer.

45. In a machine of the class described co-acting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders arranged adjacent thereto and longitudinally of the machine, a conveyer carrying the material from the breaking rolls between the scutching cylinders and driven from one of the breaking rolls and regulable means admitting an air draft through the machine.

46. In a machine of the class described co-acting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders adjacent thereto, a conveyer carrying the material from the breaking rolls between the scutching cylinders and means delivering an air blast to the material during its passage along the conveyer.

47. In a machine of the class described co-acting peripherally grooved breaking rolls arranged transversely of the machine, a conveyer embracing a tubular and apertured frame for carrying the material from the breaking rolls and between the scutching cylinders and a blower connected in said tubular frame.

48. In a machine of the class described co-acting peripherally grooved breaking rolls arranged transversely of the machine, parallel scutching cylinders and a conveyer carrying the material from the breaking rolls between the scutching cylinders, and means acting to circulate air through the material during scutching.

49. In a machine of the class described co-

acting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders, a conveyer carrying the material from the breaking rolls through the scutching cylinders and regulable means affording circulation through the material during treatment.

50. In a machine of the class described coacting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders arranged parallel and having each one large and one small end, a conveyer carrying the material from the breaking rolls between the scutching cylinders and a close fitting casing inclosing the breaking and the scutching mechanisms.

51. In a machine of the class described coacting peripherally grooved breaking rolls arranged transversely of the machine, scutching cylinders, a conveyer carrying the material from the breaking rolls between the scutching cylinders and a close fitting metal casing inclosing the breaking and scutching mechanism and having regulable draft apertures therein.

52. In a machine of the class described the combination with feed mechanism and breaking mechanism of a pair of scutching cylinders, each having one large and one small end thereon and arranged parallel with the large end of one adjacent the small end the other, a conveyer passing between the cylinders and a curved shield extending over each cylinder.

53. In a machine of the class described the combination with feed and breaking mechanisms and parallel scutching cylinders of a conveyer delivering the material from the breaking to the scutching mechanism, apertured curved shields arching over the scutching cylinder and a close fitting shell or casing inclosing the whole.

54. In a machine of the class described, automatically fed breaking rolls, scutching cylinders at the rear thereof, means carrying the material treated from the breaking rolls, between the scutching cylinders, oblique beaters on the scutching cylinders, a curved and apertured plate extending over each roll, a casing inclosing the whole and having regulable air drafts therein and a fan exhausting the air therefrom.

55. In a machine of the class described a feed mechanism comprising a plurality of reciprocating and oscillating toothed bars, a plurality of parallel sprocket chains, means adapted to drive said chains at different rates of speed and an elevator adapted to deliver material from said bars to said chains.

56. In a device of the class described the combination with coacting peripherally grooved breaking rolls, of a plurality of sprocket chains driven therefrom and adapted to feed material thereto, means adapting said chains to feed material at a different rate of speed at its ends than at its center and means for separating the material from a mass and delivering it evenly to said chains.

57. In a device of the class described the combination with breaking rolls of a plurality of reciprocating and oscillating toothed bars extending longitudinally of the machine and adapted to separate material from a mass and adjustable means for delivering said material from the bar to the rolls at an angle thereto

58. In a device of the class described the combination with feeding and breaking mechanisms of a pair of oppositely rotatable scutching cylinders, parallel tubular bars between said cylinder having apertures therein, a blower, pipes connecting said blower with said bars and a conveyer movable longitudinally between said bars.

59. In a device of the class described the combination with feeding and breaking mechanisms of scutching cylinders each having a large and a small portion each of uniform size, a conveyer chain between the cylinders, apertured, tubular bars forming compression members for said conveyers and means for forcing a blast of air through said bars.

60. In a device of the class described the combination with feeding and breaking mechanism of a pair of oppositely rotatable scutching cylinders, a conveyer adapted to carry material between said cylinders, means for subjecting the material to a blast of air during scutching, a casing inclosing said cylinders and means affording regulable draft passages therethrough.

61. In a device of the class described the combination with feeding mechanism, of a plurality of upper and lower peripherally corrugated breaking rolls, a plurality of longitudinal rods or wires extending between the rolls, scutching cylinders journaled at the rear of said rolls, each having a large and a small portion of uniform size and arranged oppositely, upper and lower tubular bars between said cylinder each having a lateral offset centrally thereof and a conveyer movable between adjacent faces of said bars.

62. In a machine of the class described the combination with scutching cylinders, of a conveyer adapted to carry the material therethrough longitudinally between the cylinders and means for shifting said conveyer's engagement from one part of the material to another, means for forcing drafts of air longitudinally of the cylinders and into the same, and means for conducting the waste material from the cylinders to a suitable receptacle.

63. In a machine of the class described the combination with breaking mechanism, em-

bracing a plurality of pairs of co-acting peripherally grooved rolls of a feed table and lateral and central conveyer chains movable thereon and driven from one of the rolls and upon which the material is dropped transversely of the machine and means driving the central conveyer chain at a different rate of speed than the lateral conveyer chains.

64. In a device of the class described the combination with feeding mechanism of a plurality of pairs of upper and lower breaking rolls, rods or wires extending between the rolls and acting as carrying supports between the same, alined bearings for the lower breaking rolls and vertically slidable bearings supported thereon for the upper breaking rolls.

65. In a device of the class described the combination with feeding mechanism of a plurality of pairs of upper and lower breaking rolls, rods or wires extending between the rolls and acting as carrying supports between the same, alined bearings for the lower breaking rolls and vertical slidable bearings supported thereon for the upper breaking rolls, oppositely revolving scutching cylinders at the rear of said breaking rolls, a conveyer running longitudinally between the cylinders and means delivering the material from the brake thereto.

66. In a machine of the class described the combination with a plurality of transverse pairs of co-acting breaking rolls, means for delivering the material to the breaking rolls, means for carrying the material from one set of breaking rolls to the succeeding set, bearings engaging the ends of co-acting breaking rolls, said bearing for one breaking roll of each pair being rigid and the other slidable thereon and therefrom, a spring acting to hold said bearings engaging in close relation, longitudinally parallel oppositely rotating scutching cylinders at the rear of said breaking rolls, conveyer mechanism longitudinally therebetween approximately the entire length thereof, means for forcing air through the material treated and exhaust means at the rear of the same.

67. In a machine of the class described a conveyer, parallel cylinders, each comprising sections of different diameters and arranged in close relation, side by side with the large section of each opposite the small section of the other and obliquely arranged ribs or beaters thereon.

68. In a device of the class described the combination with parallel cylinders each consisting of sections of unequal lengths and reversedly arranged so that the short section of each cylinder lies opposite the long section of the other cylinder, and with the sides of the cylinders in close relation for the entire length of means rotating the cylinders oppositely, a chain conveyer adapted to grip the material to be treated and carry the same between and along the cylinders, means for shifting the engagement of the conveyer on the material, shields adjacent to the ends of the material means for forcing drafts of air through the material treated during scutching and an exhaust fan acting to deliver the boon and other cellular matter from the machine.

69. In a device of the class described a conveyer and a sectional scutching cylinder constructed of obliquely arranged spiral blades or beaters and the beaters at one end of the cylinder arranged to provide a section of different diameter than the opposite end of the cylinder.

70. In a device of the class described a conveyer, scutching cylinders constructed in sections, each section of each cylinder being of different diameters, and the cylinders reversely arranged for the greater diameter of one cylinder to lie opposite the smaller diameter of the other cylinder.

71. In a machine of the class described a conveyer, scutching cylinders comprising spiders, spiral beating blades secured thereto forming a hollow cylinder to permit free passage of air and refuse therethrough and an exhaust fan adapted to deliver said refuse from the machine.

In testimony whereof, I have hereunto subscribed my name in the presence of two subscribing witnesses.

JAMES M. WORTH.

Witnesses:
C. W. HIRES,
W. W. WITHENBURY.