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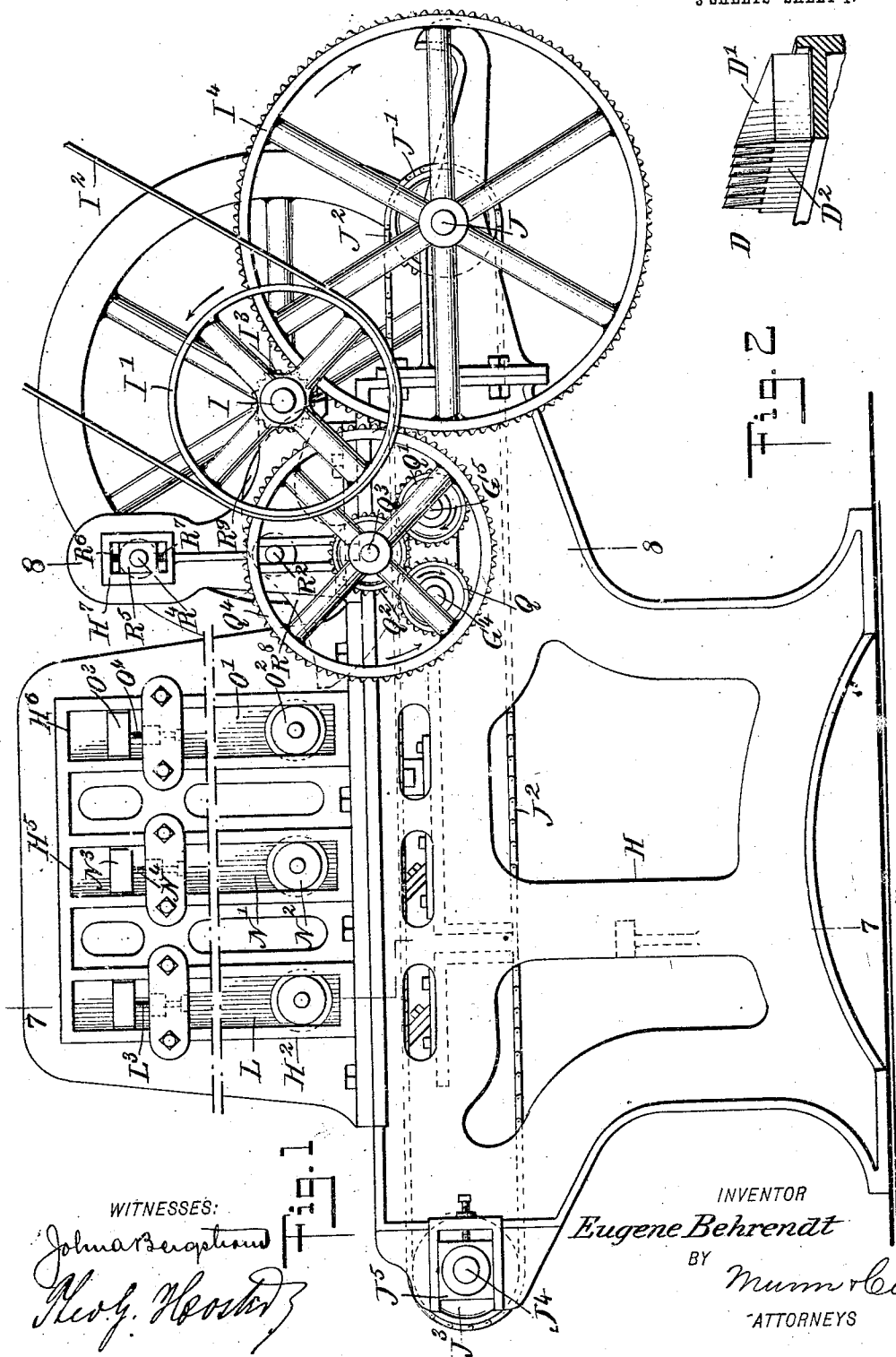
PATENTED OCT. 15, 1907.

E. BEHRENDT.

MACHINE FOR SEPARATING FIBERS FROM THE PULP OF PLANTS AND TREES

APPLICATION FILED JAN. 17, 1906.

3 SHEETS—SHEET 1.



WITNESSES:

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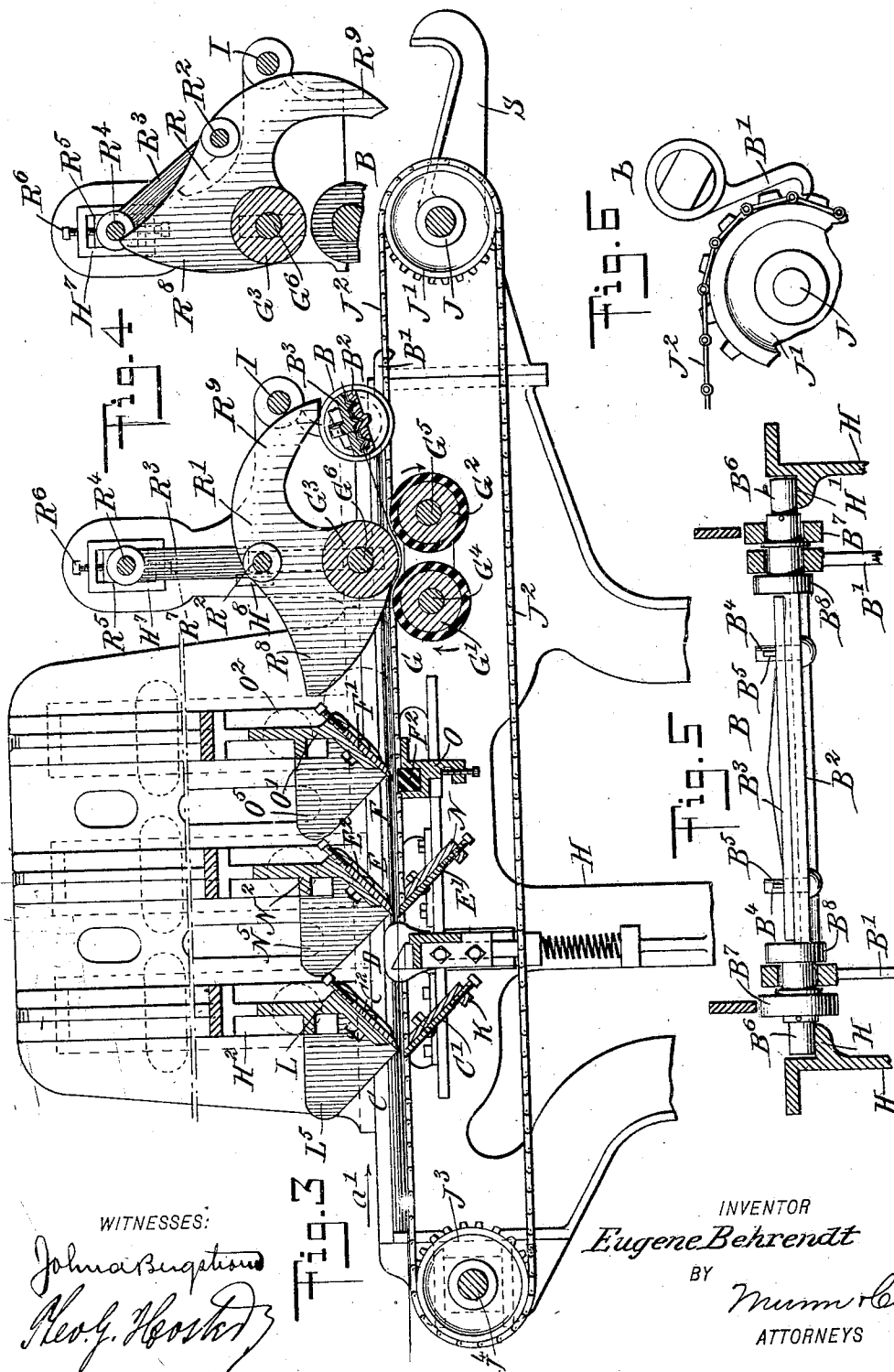
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3 SHEETS—SHEET 2.



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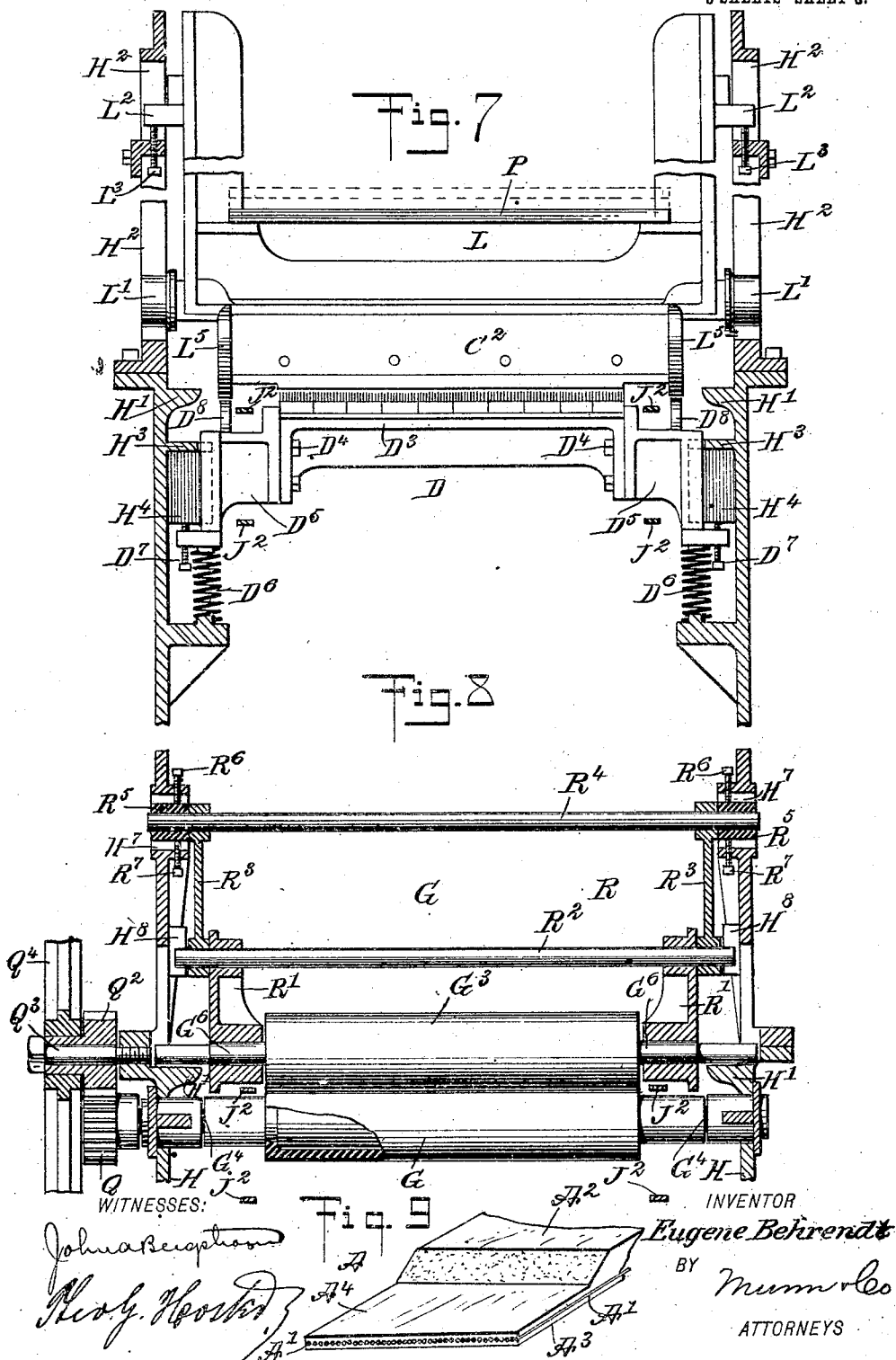
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APPLIOATION FILED JAN. 17, 1906.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

EUGENE BEHRENDT, OF MANILA, PHILIPPINE ISLANDS, ASSIGNOR TO BEHRENDT & CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MACHINE FOR SEPARATING FIBERS FROM THE PULP OF PLANTS AND TREES.

No. 868,526.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed January 17, 1906. Serial No. 286,498.

To all whom it may concern:

Be it known that I, EUGENE BEHRENDT, a citizen of the United States, and a resident of Manila, Philippine Islands, have invented a new and Improved Machine for Separating Fibers from the Pulp of Plants and Trees, of which the following is a full, clear, and exact description.

The invention relates to brakes employed for separating fibers from the pulp of the bark or leaf sheath of the tropical abacá (*Musa textilis*) and other plants and trees, especially such as the abacá, which yields manila hemp.

The object of the invention is to provide a new and improved machine for separating the fibers from the pulp and other extraneous matter in a very simple, effective and economic manner and without danger of injury to the fiber.

The invention consists of novel features and parts and combinations of the same which will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the machine; Fig. 2 is a sectional perspective view of part of the comb; Fig. 3 is a longitudinal sectional elevation of the machine. Fig. 4 is a sectional side elevation of part of the drawing mechanism in an inactive position; Fig. 5 is a cross section of the machine, showing more particularly the draw head and connected parts; Fig. 6 is a side elevation of the draw head disengaged from the driving chain; Fig. 7 is a transverse section of the machine, on the line 7—7 of Fig. 1; Fig. 8 is a transverse section of the same, on the line 8—8 of Fig. 1; and Fig. 9 is an enlarged sectional perspective view of the material, showing the reduced clamping portion.

The machine presently to be described in detail is designed for treating the leaf sheath or band-like material A stripped off the abacá and like plants, the said leaf sheath material A consisting of lengthwise-extending fibers A' (see Fig. 9) embedded in a sappy pulp A² of a spongy character, and covered at one side by a hard, tenacious and exceedingly smooth covering A³. With my machine the fibers A' are separated not only from the pulp A², but also from the covering A³, and at the same time the fibers are separated from each other.

The reduced end A⁴ of the material A is clamped in a draw head B, adapted to be moved lengthwise of the machine in the direction of the arrow a' for initially drawing the material A successively through a stripping device C, a combing device D, a second stripping

device E, and a cleaning and polishing device F, to finally bring the fibers to a drawing mechanism G for relieving the draw head B of its drawing function and for engaging the fibers with a view to draw the material through the several devices C, D, E and F.

The several devices mentioned are mounted on a suitably-constructed frame H, in which is journaled a transversely-extending main driving shaft I, provided with a pulley I' connected by a belt I² with other machinery for imparting a rotary motion to the main driving shaft I. On the latter is secured a pinion I³ in mesh with a gear wheel I⁴ secured on a shaft J journaled on the rear portion of the main frame H, and on this shaft J are secured sprocket wheels J' connected by sprocket chains J² with sprocket wheels J³ secured on a transverse shaft J⁴ journaled in bearings J⁵ held lengthwise adjustable on the front end of the main frame H, so as to give the desired tension to the sprocket chains J². The sprocket chains J² are adapted to be engaged by hooks B' held on the draw head B, so that when the machine is in motion and the hooks B' of the draw head B are engaged with the sprocket chains J² at the forward end of the machine, then the said draw head B is bodily carried along by the chains J² in the direction of the arrow a', as previously mentioned.

The draw head B consists essentially of clamping jaws B² and B³, between which the reduced end A⁴ of the material A is clamped; the opposite faces of the said jaws B² and B³ being preferably corrugated or roughened, to insure a secure grip of the jaws on the material, as will be readily understood by reference to Fig. 3. The jaws B² and B³ are fastened together by bolts B⁴ passing through the jaws and locked in place by pins B⁵ passing through the upper ends of the bolts, as indicated in Fig. 5. The jaw B² is provided, at its ends, with trunnions B⁶ mounted to travel on longitudinally-extending guideways H' formed on the main frame H, and on the said trunnions B⁶ are journaled friction rollers B⁷ and the hooks B', the latter being preferably located between the friction rollers B⁷ and collars B⁸ formed on the jaw B² adjacent to the ends of the jaw B³.

The first stripping device C consists essentially of two transversely-extending stripping knives C' and C², inclined in opposite directions and in the direction of the travel of the material A, the knife C' being adjustably secured to a cross bar K attached to the sides of the main frame H. The knife C² is adjustably secured to a cross head L, provided at its ends with friction rollers L' and lugs L² (see Figs. 1 and 7), the said friction rollers L' and the lugs L² engaging vertically-disposed guideways H² formed on the main frame H, so that the cross head L is free to slide up and down in the guideways H². The downward movement of the

cross head L, and consequently that of the knife C², is limited by set-screws L³ held on the main frame H and projecting into the guideways H² for the lugs L² to rest on, as indicated in Figs. 1 and 7. On the ends 5 of the cross head L are also secured V-shaped cams L⁵ extending into the path of and adapted to be engaged by the friction rollers B⁷ of the draw head B, so that when the latter is moved along in the direction of the arrow a', as previously explained, then the friction 10 rollers B⁷ engage the cams L⁵, thus lifting the cross head L and the knife C², to allow the draw head B to pass between the knives C' and C² at the time the knife C² and its cross head L are in a raised position. The cross head L and its knife C² descends gradually on 15 the rear faces of the cams L⁵ traveling down the friction rollers B⁷, and after the draw head B has passed the cutting edges of the knives C' and C², so that the cutting edge of the knife C² passes down into the pulp A² of the material A immediately in the rear of the advancing draw head B, it being understood that the material 20 now extends between the cutting edges of the knives C' and C².

The comb D is formed of comb plates D' spaced apart by spacers D², and a plurality of such comb plates D' and spacers D² are soldered or otherwise fastened together to form comb sections, the several comb sections being supported on a transverse bed D³ fastened by bolts D⁴ to brackets D⁵ mounted to slide up and down in guideways H³ formed on the main frame H, the lower 30 ends of the brackets being supported on springs D⁶ held on the main frame H and serving to yieldingly support the comb D, the upward movement thereof being limited by set-screws D⁷ engaging projections H⁴ on the main frame H, as plainly indicated in Fig. 7. When 35 the several comb sections are in position on the bed D³ and the latter is bolted onto the brackets D⁵, then the projecting upper ends of the brackets securely clamp the comb sections in place. On loosening the bolts D⁴, any one of the comb sections can be readily removed 40 for repairs and then replaced, or a new one placed in the position of the one removed. Considerable time and expense is saved by arranging the comb D as described. On the brackets D⁵ of the comb D are formed cams D⁸ projecting into the path of and adapted to be engaged by 45 the friction rollers B⁷ of the draw head B, so that when the latter advances, the friction rollers engage the cams D⁸, thus forcing the comb D downward against the tension of its springs D⁶, to allow the draw head B to pass over the comb D without injury to the sharp points of 50 the comb plates D'. When the friction rollers B⁷ leave the cams D⁸, then the comb D is returned to its uppermost position by the action of the springs D⁶, and the comb in doing so causes the points of its comb plates D' to cut into the material from underneath, so as to slit 55 the same on the material being drawn forward by the draw head B. By this arrangement the material A is divided into narrow strips, each containing a few fibers one alongside the other.

The second stripping device E is similar to the first 60 stripping device C; that is, consists of a fixed knife E' adjustably secured to a cross bar N attached to the main frame H, and a knife E² adjustably secured to a cross head N' having friction rollers N² and lugs N³ mounted to slide in vertical bearings H⁵ formed on the main 65 frame H. The downward sliding motion of the cross

head N' is limited by set-screws N⁴ (see Fig. 1) similar to the set-screws L³, previously mentioned and illustrated in Fig. 7. The cross head N' is also provided with cams N⁵ similar to the cams L⁵ and likewise adapted to be engaged by the friction rollers B⁷ of the draw 70 head B, to lift the cross head N' and the knife E² for the passage of the cross head, the same as above described in reference to the first stripping device C.

The cleaning and polishing device F, located in the rear of the stripping device E, consists of a stripping 75 knife F', similar to the stripping knives C² and E² and operating in conjunction with a block F² of rubber or other elastic material and attached to a cross bar O secured to the main frame H. The knife F' is adjustably secured to a cross head O' having friction rollers O² and lugs O³ mounted to slide in vertical guideways H⁶ 80 formed on the main frame H, and the downward sliding movement of the cross head O² is limited by set-screws O⁴ similar to the set-screws N⁴ and L³, previously mentioned. On the cross head O' are secured cams O⁵ 85 similar to the cams N⁵ and L⁵ and likewise projecting into the path of and adapted to be engaged by the friction rollers B⁷ of the draw head B, to lift the cross head O' and its knife F', to permit the draw head B to pass between the block F² and the cutting edge of the 90 knife F'.

The several cross heads L, N' and O' are adapted to be weighted by suitable weights P, indicated in Fig. 7, so as to hold the knives C², E² and F' with the desired force in engagement with the material drawn through 95 the several devices C, D, E and F.

The main drawing mechanism G consists essentially of rubber covered driven rollers G' and G², arranged one alongside the other and operating in conjunction with a pressing roller G³ adapted to press the fibers in peripheral contact with the upper peripheral surfaces of the driven rollers G' and G², so that the rollers draw the fibers forward, with a view to draw the material through the several devices C, D, E and F after the draw head B has passed the drawing mechanism G. The shafts G⁴ 105 and G⁵ of the driven rollers G' and G² are journaled in suitable bearings held on the main frame H, and on the said shafts are secured pinions Q and Q' in mesh with a pinion Q² journaled on a stud Q³ attached to the main frame H, and on the said pinion Q² is secured a gear 110 wheel Q⁴ in mesh with the gear wheel I⁴, previously referred to, so that when the machine is in operation, a rotary motion is transmitted by the gearing shown and described to the rollers G' and G², to rotate the same in the direction of the arrows indicated in Figs. 1 115 and 3. The shaft G⁶ of the pressing roller G³ is journaled in cam links R' of a link frame R, and the said cam links R' are connected by a transverse pivot rod R² with the lower ends of links R³ hung on a rod R⁴ journaled in suitable bearings R⁵ vertically adjustable 120 in guideways H⁷ formed on the main frame H, the adjustment of the bearings R⁵ being accomplished by suitable set-screws R⁶ and R⁷ screwing on the main frame H and engaging the top and bottom of the bearings R⁵, as plainly indicated in Fig. 8. Stops H⁸ 125 formed or secured on the main frame H are adapted to be engaged by the terminals of the rod R² so as to limit the forward or return swinging motion of the rod R², to allow a forward swinging movement thereof. The cam links R' have cams R⁸ projecting toward the device F 130

and into the path of the friction rollers B⁷ of the draw head B, so that when the latter is drawn forward and the friction rollers B⁷ come in contact with the cam R⁴, then the link frame R is swung rearwardly to the position shown in Fig. 4, so that the roller G³ is raised, to allow the passage of the draw head B. The links R¹ are also provided with rearwardly-extending cams R², adapted to be engaged by the friction rollers B⁷ after the draw head B has passed the roller G³, and by the friction rollers B⁷ acting on the cams R², the link frame R is returned to its normal position; that is, is swung forwardly to bring the roller G³ back into pressing position, that is, to press the fibers down onto the driven rollers G¹ and G².

The gearing for driving the rollers G¹ and G² is so arranged that the said rollers are driven at a higher peripheral speed than that of the chains J², so that after the drawing mechanism G takes hold of the fibers and draws the same rearward, then the draw head B travels rearward at a less speed than the motion given to the fibers; and when the hooks B¹ of the draw head B finally come in contact with corresponding teeth on the sprocket wheels J¹, then the said hooks B¹ are drawn out of engagement with the chains J² (see Fig. 6), to allow the draw head B to drop down onto a bearing S projecting from the rear end of the main frame H. The operator in charge of the machine now cuts the fibers close to the jaws B² and B³ of the draw head B, and then takes hold of the fibers with the hands, to gather the fibers as the same are drawn rearwardly by the drawing mechanism G. In the meantime the draw head B which dropped into the bearing S is removed by another operator and the jaws thereof are opened, to allow removal of the reduced clamped portion and to permit placing a reduced portion of a new bunch of material in position on the draw head. This draw head is then returned to the forward or beginning end of the machine for treating the next bunch of material.

The operation is as follows: When the main shaft I is rotated, then a traveling motion is given to the chains J² and a draw head B, with the end A⁴ of the material A clamped therein is placed in position at the forward end of the machine, and the hooks B¹ of this draw head are drawn forward in engagement with links of the chains J², so that the latter move the draw head B bodily forward. The draw head B, in moving forward, moves its friction rollers B⁷ in engagement with the cams L⁵, to raise the cross head L and the knife C² for the passage of the draw head between the cutting edges of the knives C¹ and C². As soon as this has been done, the cross head L is returned so that the knife C² cuts into the pulp of the material now extending between the knives C¹ and C². As the material is drawn forward it is acted on by both the stripping knives C¹ and C², so as to remove the main portion of the pulp A² and the covering A³ of the material by stripping the same off opposite sides of the fibers A¹ lying side by side, with some pulp material between individual fibers, thus leaving a band or web. On the further forward movement of the draw head B the comb D is depressed, to allow the passage of the draw head B over the said comb, which, on returning, pierces, by the points of its comb plates D¹, the band or web of fibers, to slit the band or web into very narrow strips. The draw head B, in the meantime, causes a raising of the cross head N¹ and the

stripping knife E², so that the draw head passes between the cutting edges of the stripping knives E¹ and E², the cross head N¹ and its knife E² finally returning to lowermost position, so that the stripping knives E¹ and E² act on the narrow strips to break up the same and loosen and separate the individual fibers, at the same time removing any woody portion or pulp which adheres to the separated fibers, loosened or broken up by the knives E¹ and E². The draw head B, in the meantime, has raised the cross head O¹ and its knife F¹ to pass the same and to introduce the fibers between the knife F¹ and the block F², so that the fibers are subjected to the action of this knife F¹ and the block F², with a view to clean and polish and also to straighten and round the fibers. The draw head B, in its further movement, causes a raising of the pressing roller G³, as previously described, for the draw head B to pass between the driven rollers G¹ and G², and the pressing roller G³. The latter, on returning to its normal position, engages the fibers and presses the same onto the driven rollers G¹ and G², so that the drawing mechanism G now becomes inactive, to draw the fibers forward, thus drawing the material along through the several devices C, D, E and F, for the purpose of completely separating the extraneous material from the fibers and to thoroughly clean and polish the same. The draw head B is finally automatically released from the chains J², as previously explained, and the fibers are cut off close to the jaws of the draw head B, to allow removal of the latter and opening thereof, as previously explained. After the fibers are cut off at the draw head B, the operator takes hold of the cut off ends of the fibers to gather the same as the latter leave the drawing mechanism G.

From the foregoing it will be seen that after the material A has been drawn through the machine, a second draw head with another bunch of material clamped therein can be placed in position on the machine, to insure a successive operation on the materials without loss of time.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. A machine for separating the fibers from the extraneous matter of plant or tree material, comprising means for separating the fibers and the extraneous matter, a draw head for initially drawing the material through the said separating means, and a drawing mechanism for engaging the fibers and relieving the said draw head of its drawing function.

2. A machine for separating the fibers from extraneous matter of plant or tree material, comprising separating means for separating the fibers and the extraneous matter, a traveling draw head passing between the members of the said separating means and drawing the material between the said members, and a drawing mechanism in the rear of the said separating means and between the members of which passes the said draw head, the said drawing mechanism after the passage of the draw head engaging the fibers to draw the material through the said separating means.

3. A machine for separating the fibers from extraneous matter of plant or tree material, comprising separating means having fixed and movable members, a traveling draw head to which one end of the material is fastened, the draw head being arranged for moving the said movable member to allow passage of the draw head between the members and to pass the material between the said members, and a drawing mechanism in the rear of the said separating means and having a member capable of being moved bodily by the said draw head to allow passage of

the draw head, the said drawing mechanism engaging the fibers to draw the same through the said separating means.

4. A machine for separating the fibers from extraneous matter of plant and tree material, comprising a plurality of separating devices, one in front of the other for successively acting on the material to separate the fibers from the extraneous matter, each of the separating devices having a fixed and a movable member capable of rising and falling, a traveling draw head in which one end of the material is fastened, the draw head having means for bodily moving the movable members of the said separating devices to allow the draw head to pass between the fixed and movable members and to allow the movable member to engage the material after the passage of the draw head between the members of a separating device, and a drawing mechanism in the rear of the said separating devices and having a bodily movable member adapted to be moved by the said means on the draw head to allow passage of the draw head, the said drawing mechanism engaging the fibers between the draw head and the separating devices to draw the material through the separating devices.

5. A machine for separating the fibers from extraneous matter of plant and tree material, comprising a plurality of separating devices, one in front of the other for successively acting on the material to separate the fibers from the extraneous matter, each of the separating devices having a fixed and a movable member capable of rising and falling, a comb arranged between adjacent separating devices for slitting the material into strips, a traveling draw head in which one end of the material is fastened, the draw head having means for bodily moving the movable members of the said separating devices to allow the draw head to pass between the fixed and movable members, and to allow the movable member to engage the material after the passage of the draw head between the members of a separating device, and a drawing mechanism in the rear of the said separating devices and having a bodily movable member adapted to be moved by the said means on the draw head to allow passage of the draw head, the said drawing mechanism engaging the fibers between the draw head and the separating devices to draw the material through the separating devices and the said comb.

6. A machine for separating the fibers from extraneous matter of plant and tree material, comprising a plurality of separating devices, one in front of the other for successively acting on the material to separate the fibers from the extraneous matter, each of the separating devices having a fixed and a movable member capable of rising and falling, a comb arranged between adjacent separating devices for slitting the material into strips, the comb being spring-pressed and mounted to slide, a traveling draw head in which one end of the material is fastened, the draw head having means for bodily moving the movable members of the said separating devices to allow the draw head to pass between the fixed and movable members and to allow the movable member to engage the material after the passage of the draw head between the members of a separating device, the said means on the draw head engaging and moving the said comb bodily for the passage of the draw head, and a drawing mechanism in the rear of the said separating devices and having a bodily movable member adapted to be moved by the said means on the draw head to allow passage of the draw head, the said drawing mechanism engaging the fibers between the draw head and the separating devices to draw the material through the separating devices and the said comb.

7. A machine for separating the fibers from extraneous matter of plant and tree material, provided with separating means for separating the fibers from the extraneous matter, a drawing mechanism in the rear of the said separating means for engaging the fibers and drawing the material through the said separating means, the said drawing mechanism consisting of a pair of driven rollers and a pressing roller adapted to press the fibers down onto the said driven rollers, and a suspended link frame in which the said pressing roller is journaled.

8. A machine for separating the fibers from extraneous matter of plant and tree material, provided with separat-

ing means for separating the fibers from the extraneous matter, a traveling draw head for initially drawing the material through the said separating means, and a drawing mechanism having a pair of driven rollers, a pressing roller for pressing the fibers in contact with the driven rollers, and a suspended link frame in which the pressing roller is journaled, the link frame being adapted to be swung out of an active position by the said draw head to allow passage thereof between the said driven rollers and the said pressing rollers.

9. A machine for separating the fibers from extraneous matter of plant and tree material, provided with separating means for separating the fibers from the extraneous matter, a traveling draw head for initially drawing the material through the said separating means, and a drawing mechanism having a pair of driven rollers, a pressing roller for pressing the fibers in contact with the driven rollers, and a suspended link frame in which the pressing roller is journaled, the said link frame having cams, and the said draw head having means for engaging the said cams to swing the link frame into an inactive position for the passage of the draw head between the driven rollers and the pressing roller.

10. A machine for separating the fibers from extraneous matter of plant and tree material, provided with separating means for separating the fibers from the extraneous matter, a traveling draw head for initially drawing the material through the said separating means, and a drawing mechanism having a pair of driven rollers, a pressing roller for pressing the fibers in contact with the driven rollers, and a suspended link frame in which the pressing roller is journaled, the said link frame having cams, and the said draw head having means for engaging the said cams to swing the link frame into an inactive position for the passage of the draw head between the driven rollers and the pressing roller, the said cams having rearward extensions for engagement by the said draw head means for returning the link frame and its pressing roller to active position.

11. A machine for separating the fibers from extraneous matter of plant and tree material, provided with separating means for separating the fibers from the extraneous matter, a traveling draw head for initially drawing the material through the said separating means, a drawing mechanism having a pair of driven rollers, a pressing roller for pressing the fibers in contact with the driven rollers, and a suspended link frame in which the pressing roller is journaled, the said link frame having cams, and the said draw head having means for engaging the said cams to swing the link frame into an inactive position for the passage of the draw head between the driven rollers and the pressing roller, the said cams having rearward extensions for engagement by the said draw head means for returning the link frame and its pressing roller to active position, means for driving the said driven rollers, and means for imparting a traveling motion to the said draw head for the latter to travel at less speed than that given to the fibers by the said driven rollers and pressing roller.

12. A machine for separating the fibers from extraneous matter of plant and tree material, provided with a separating device having a fixed stripping knife, a movable stripping knife operating in conjunction with the said fixed stripping knife, a weighted slide carrying the said movable knife, a cam on the said slide, a traveling draw head having friction rollers for engaging the said cam to raise the slide and its knife for the passage of the draw head between the said knives, and adjustable stops for limiting the return movement of the said slide.

13. A machine for separating the fibers from extraneous matter of plant and tree material, provided with a comb having a frame mounted to slide up and down, and springs for yieldingly supporting the said frame.

14. A machine for separating the fibers from extraneous matter of plant and tree material, provided with a comb having a frame mounted to slide up and down, springs for yieldingly supporting the said frame, cams on the said frame, and a traveling draw head having friction rollers for engaging the said cams to move the comb out of the path of the draw head.

15. A machine for separating the fibers from extraneous

matter of plant and tree material, provided with a comb comprising a frame, teeth sections held on the frame and each having plates, spacing blocks between the plates, and means for securing the blocks and plates together for each section.

16. A machine for separating the fibers from extraneous matter of plant and tree material, provided with endless traveling chains, sprocket wheels over which pass the chains, and a draw head having hooks adapted to hook into links of the chains and adapted to be disengaged therefrom by teeth on the said sprocket wheels.

17. A machine for separating fibers from the extraneous matter of plants and tree material, provided with separating means for separating the fibers from the extraneous matter, and a drawing mechanism in rear of the separating means and comprising a pair of driven rollers, a frame, a pressing roller mounted in the frame, and adjustably supported links pivotally connected with the said frame.

18. A machine for separating fibers from the extraneous matter of plants and tree material, provided with separating means for separating the fibers from the extraneous

matter, and a drawing mechanism in rear of the separating means, said drawing mechanism comprising a pair of driven rollers, a cam frame, a pressing roller mounted in the cam frame, an adjustably supported rod, links carried by the rod, and a pivot rod connecting the links with the said frame.

19. In a machine for separating fibers from the extraneous matter of plant and tree material, a supporting frame having vertical guideways, a fixed stripping knife, a movable stripping knife, a weighted slide carrying the movable knife, said slide having rollers and lugs at its ends working in the guideways and V-shaped cams, screws projecting into the guideways to be engaged by said lugs, and a traveling draw head having rollers at its ends for engaging the cams of the slide.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EUGENE BEHRENDT.

Witnesses:

EVERARD B. MARSHALL,
P. D. ROLLEHAUS.