E. BEHRENDT.

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

APPLICATION FILED JUNE 16, 1908.

970,166.

Patented Sept. 13, 1910.

4 SHEETS—SHEET 1.

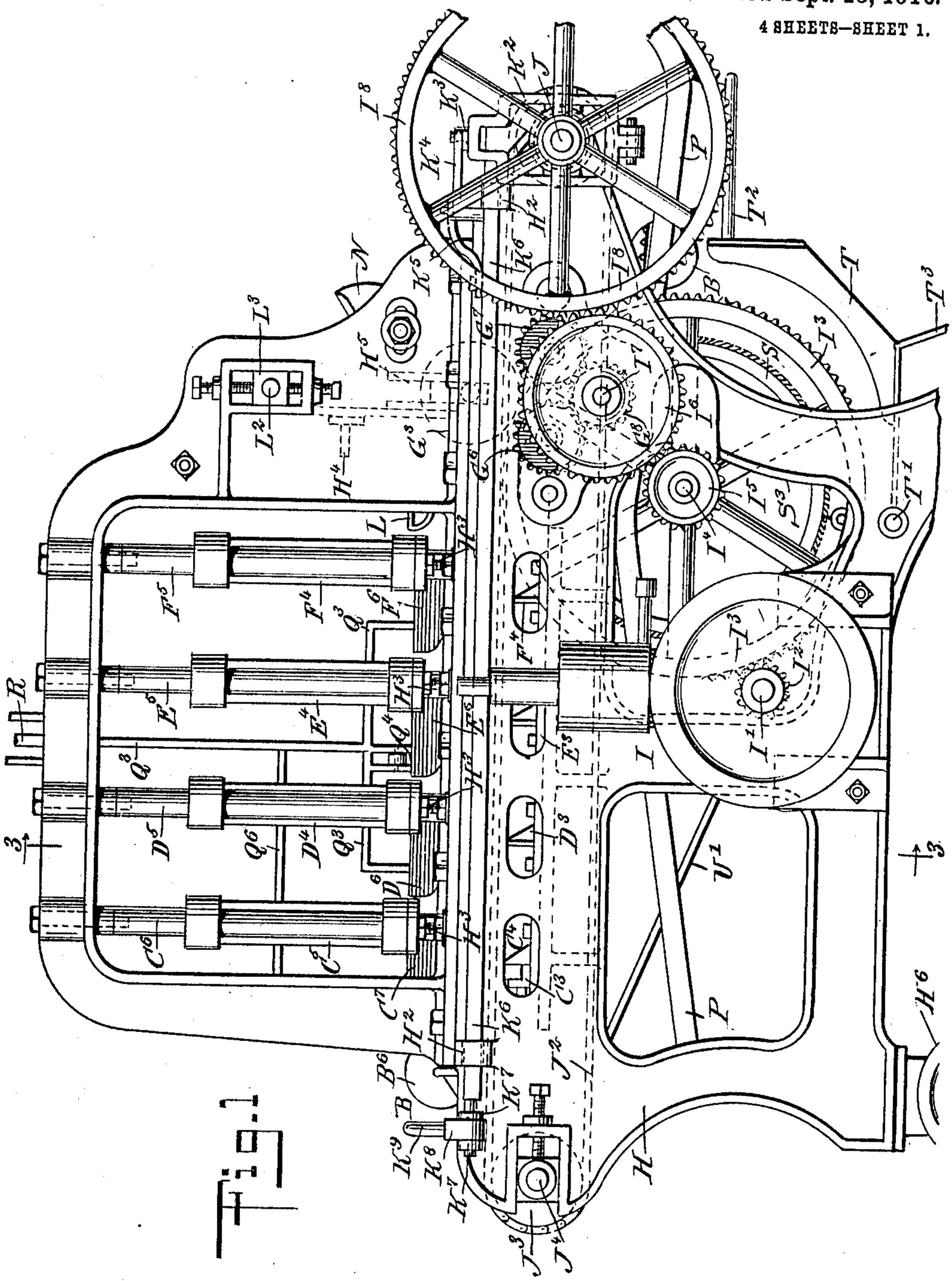

Fig. 1.

WITNESSES

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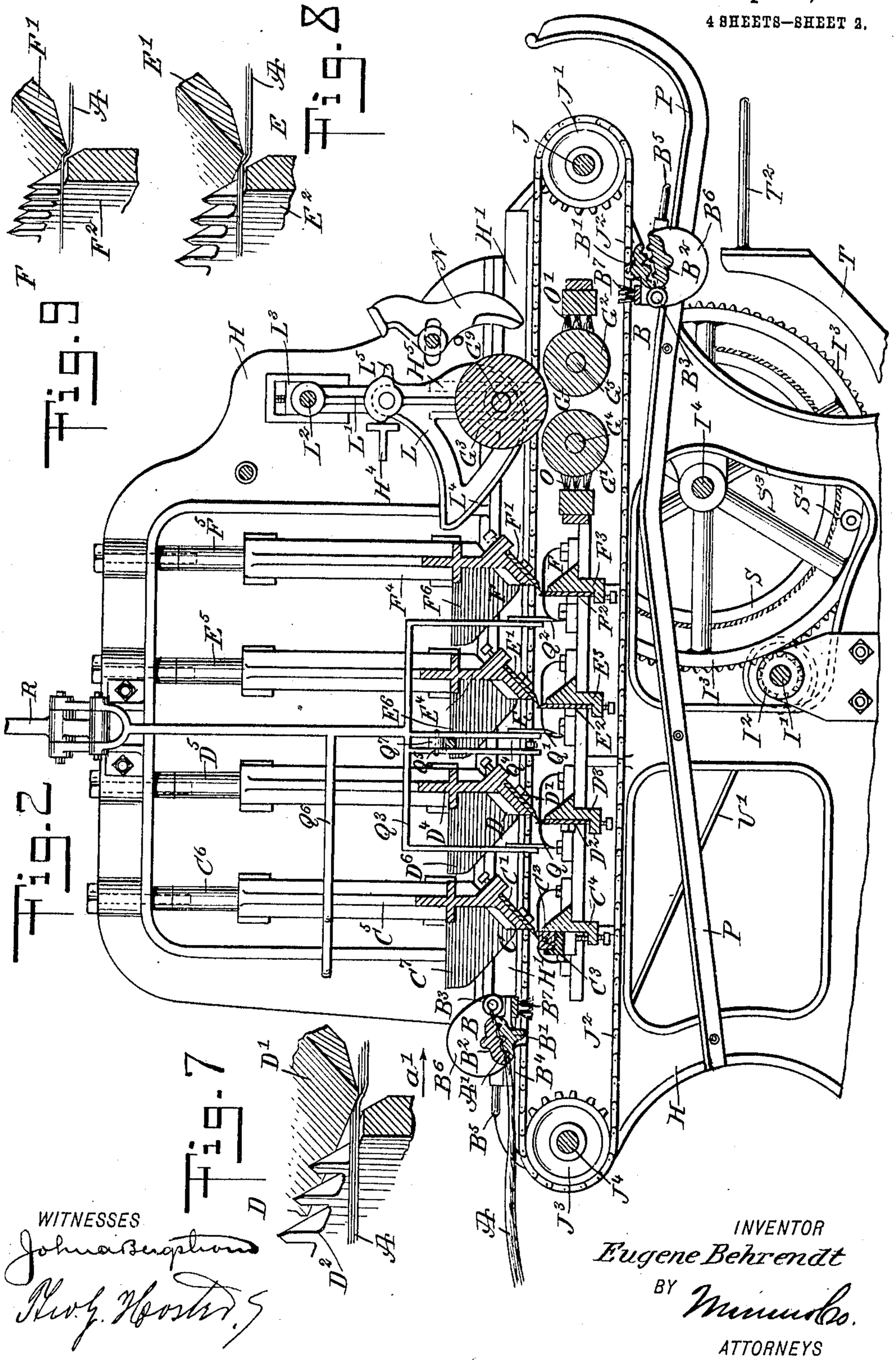

Fig. 2

Fig. 5

Fig. 8

Fig. 7

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4 SHEETS—SHEET 3.

Fig. 3

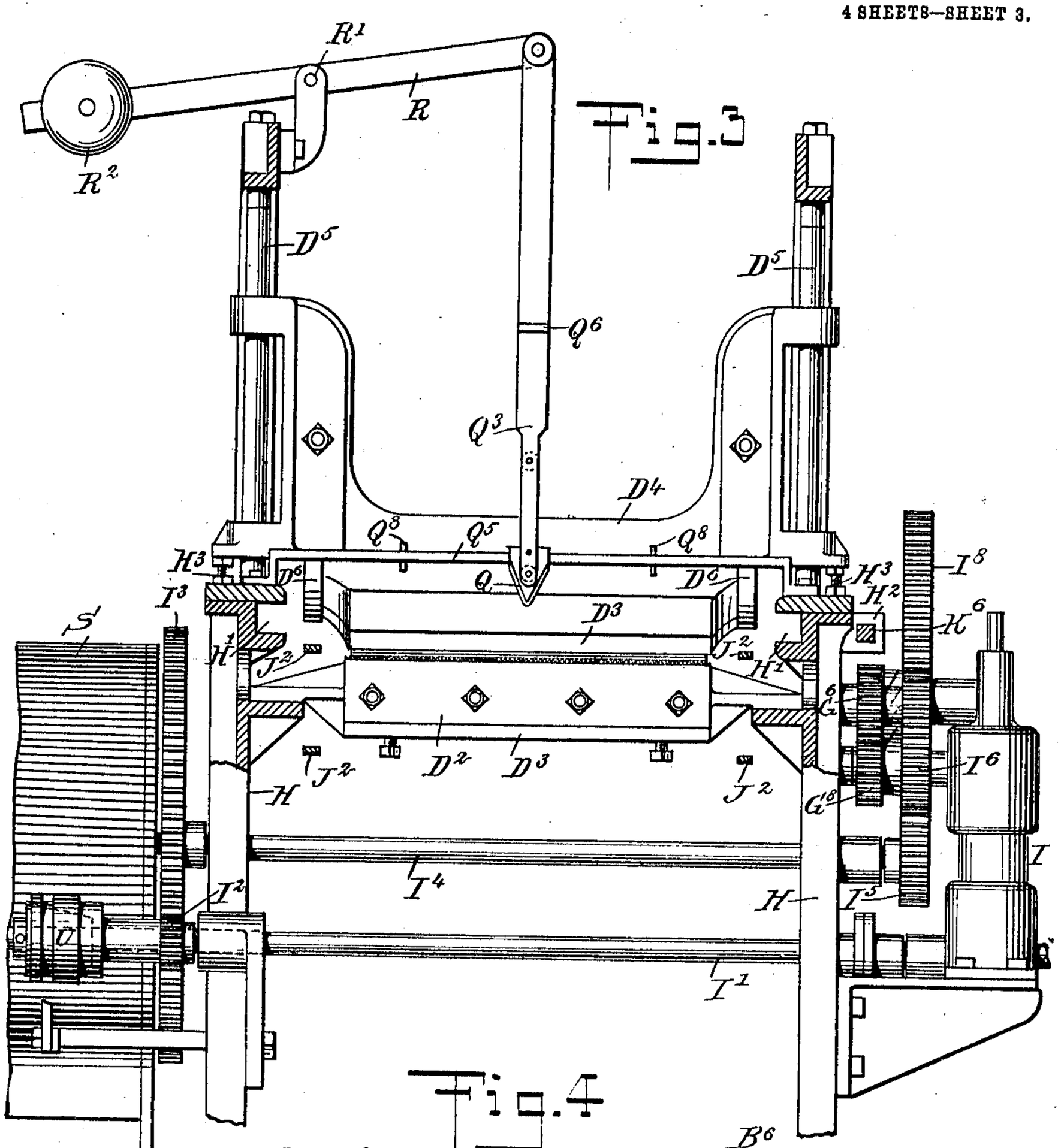

Fig. 4

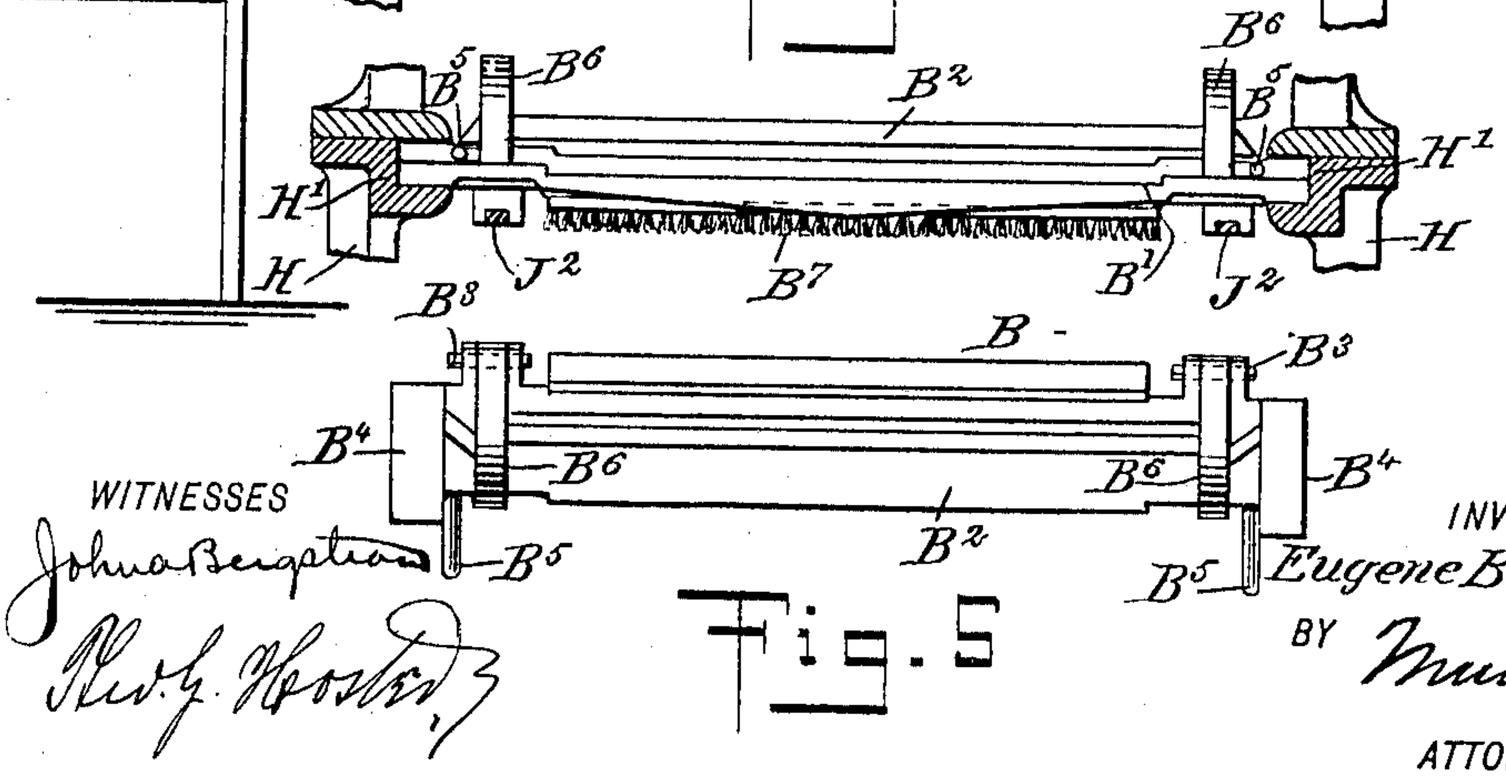

Fig. 5

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4 SHEETS—SHEET 4.

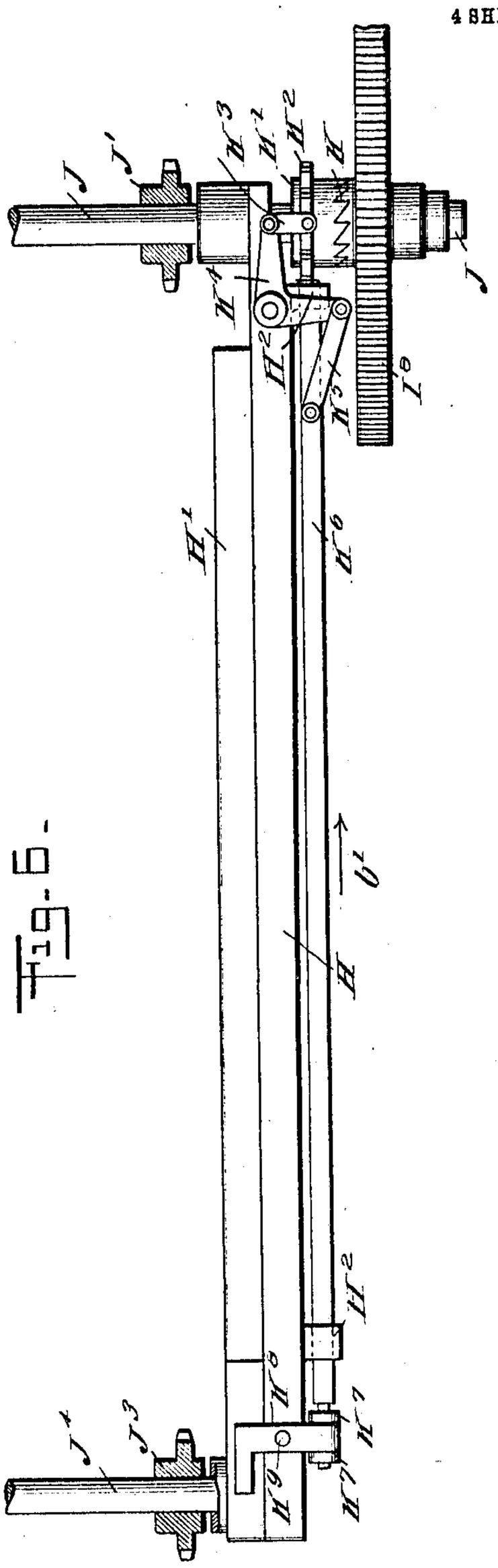

Fig. 6.

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UNITED STATES PATENT OFFICE.

EUGENE BEHRENDT, OF MANILA, PHILIPPINE ISLANDS.

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

970,166. Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed June 16, 1908. Serial No. 438,720.

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 and Extraneous Matter of Plants and Trees, of which the following is a full, clear, and exact description.

The invention relates to machines for separating fibers from the pulp and extraneous matter of plants and trees, such as shown and described in the Letters Patent of the United States, No. 868,396, No. 868,525, and No. 868,526, granted to me on October 15, 1907.

The object of the present invention is to provide a new and improved machine for separating the fibers from the pulp and extraneous matter of plants and trees, notably tropical abaca (*Musa textilis*) in an effective manner and without danger of injury to its fibers or waste thereof, the fibers leaving the machine in a straight, clean and polished condition, completely free of gum and like substances.

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 improvement; Fig. 2 is a longitudinal section of the same; Fig. 3 is a transverse section of the same on the line 3—3 of Fig. 1; Fig. 4 is a cross section of the frame and showing the draw head in position thereon; Fig. 5 is a plan view of the draw head; Fig. 6 is a plan view of the clutch mechanism for the endless carrier, parts of the latter being shown in section; Fig. 7 is an enlarged sectional perspective view of the first fiber dividing and separating device; Fig. 8 is a like view of the second fiber dividing and seperating device; and Fig. 9 is a similar view of the final fiber dividing and separating device.

The end A′ of the leaf, sheaf or band-like material A is clamped in one of two draw heads B, B, adapted to move lengthwise of the machine in the direction of the arrow *a′*, for initially drawing the material A successively through a shaving or stripping device C and sets of fiber dividing and separating devices D, E and F, to finally deliver the fibers to a drawing mechanism G for releasing 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 are mounted on a suitably constructed frame H on which is arranged a motor I of any approved construction, preferably, however, an internal combustion engine, the shaft I′ of which extends transversely and is journaled in the frame H, and on the said shaft I′ is loosely mounted a pinion I^2 in mesh with a gear wheel I^3 secured on a shaft I^4 extending transversely and likewise journaled in the frame H. On the shaft I^4 is secured a pinion I^5 in mesh with a gear wheel I^6 secured on a shaft I^7 journaled in one side of the frame H, and the said gear wheel I^6 is in mesh with a gear wheel I^8 mounted to turn loosely on the shaft J, forming part of the carrier for the draw head B, the said shaft J extending transversely and being journaled in suitable bearings arranged on the rear end of the frame H. On the shaft J are secured sprocket wheels J′ connected by sprocket chains J^2 with sprocket wheels J^3 secured on a transverse shaft J^4 journaled in suitable bearings held on the front end of the frame H.

The draw heads B, B are attached to the sprocket chains J^2 in such a manner that when one draw head is on the forward travel the other is on the return travel (see Fig. 2). Each draw head B is provided with coöperating jaws B′, B^2 for clamping the end A′ of the material A between the said jaws. The jaw B′ is secured to the sprocket chains J^2 and the jaws B′, B^2 (see Figs. 2, 4 and 5) are hinged together at B^3 and are provided at the sides with integral blocks B^4 adapted to pass into longitudinally-extending guideways H′ formed or secured on the frame H, to hold the jaws B′ and B^2 firmly closed while drawing the material A initially through the several devices C, D, E and F and through the drawing mechanism G. The top jaw B^2 is provided with handles B^5 to allow the operator to swing the jaw B^2 into a closed position after the butt end A′ of the material

A is placed in position on the upper surface of the other jaw B′, and at the time the draw head B is at the front end of the machine at the sprocket wheels J³. The opposite faces of the jaws B′, B² are preferably provided with transverse teeth and grooves, to securely hold the butt end A′ in position after the jaws are closed. The draw head B automatically controls the stopping of the jaw carrier and for this purpose the following arrangement is made:

On the hub of the gear wheel I⁸ (see Fig. 6) is formed or secured a clutch member K adapted to be engaged by a clutch member K′ mounted to slide on and to turn with the carrier shaft J, and on the clutch member K′ is mounted a shifting ring K² connected by a link K³ with a bell crank lever K⁴ fulcrumed on one side of the frame H. The bell crank lever K⁴ is pivotally connected by a link K⁵ with a shifting rod K⁶ mounted to slide longitudinally in bearings H² arranged on one side of the frame H, and on the forward end of the shifting rod K⁶ is held between collars K⁷ a transverse arm K⁸ provided with a handle K⁹ adapted to be taken hold of by the operator, to swing the arm K⁸ on the forward end of the shifting rod K⁶. The arm K⁸ is located at a point in front of the guideways H′ and extends into the path of the blocks B⁴ on one side of the draw head B, so that when the latter is carried around the sprocket wheels J³ it strikes the arm K⁸ and shifts the same in the direction of the arrow *b′* (see Fig. 6), thus causing the clutch member K′ to move out of engagement with the clutch member K, with a view to stop the rotation of the shaft J on which rotates loosely the gear wheel I⁸, as previously stated. When the shaft J comes to a stop the traveling motion of the carrier ceases and consequently the draw head B comes to a stop at the front end of the machine. The operator can now place the butt end A′ of the material in position on the draw head B and clamps the same between the jaws B′ and B², after which the operator takes hold of the handle K⁹ and swings the arm K⁸ over out of engagement with the draw head B, and he then shifts the rod K⁶ in the inverse direction of the arrow *b′* with a view to move the clutch member K′ back into engagement with the clutch member K. When this takes place the shaft J is again rotated by the action of the gear wheel I⁸ and the clutch members K, K′, so that the draw head B starts on its forward travel in the direction of the arrow *a′*.

The shaving device C consists of a transverse knife C′ operating with its cutting edge in conjunction with a transverse bar C², preferably made of wood, and held in a support C³, vertically adjustable on a cross bar C⁴ attached to the frame H. The knife C′ is inclined upwardly and rearwardly and is adjustably secured to a cross head C⁵ mounted to slide up and down on guideways C⁶ removably mounted on the frame H.

The first dividing and separating device D consists of a knife D′ operating in conjunction with a notched bar D² held vertically adjustable on a cross bar D³ attached to the frame H, and the said knife D′ is adjustably secured to a cross head D⁴ mounted to slide up and down on guideways D⁵ removably held on the frame H. The second dividing and separating device E is provided with a knife E′ operating in conjunction with a notched bar E² held vertically adjustable on a supporting bar E³ attached to the frame H, and the knife E′ is adjustably secured to a cross head E⁴ mounted to slide up and down on guideways E⁵ removably held on the frame H. The third and last dividing and separating device F consists of a knife F′ operating in conjunction with a notched bar F² held vertically adjustable on a cross bar F³ attached to the frame H, and the knife F′ is adjustably secured to a cross head F⁴ mounted to slide up and down on guideways F⁵ removably held on the frame H.

The knives C′, D′, E′ and F′ are practically alike in construction, while the serrations of the notched bars D², E², F² vary, that is, are graduated, and in practice I have found that the best result is obtained by making the teeth or notches in the bar D² about sixteen to the inch, in the bar E² about 20 to the inch and in the bar F² about 24 to the inch.

In order to successively raise the cross heads C⁵, D⁴, E⁴, and F⁴, for the passage of the draw head B, the said cross heads are provided at their sides with cams C⁷, D⁶, E⁶ and F⁶, respectively, adapted to be engaged by cams B⁶ formed or secured on the jaw B² of the draw head B, so that when the latter is drawn along by the sprocket chains J² in the direction of the arrow *a′* then the said cams B⁶ come in contact with the cams C⁷, D⁶, E⁶ and F⁶, to raise the corresponding cross heads C⁵, D⁴, E⁴ and F⁴, to allow the draw head B to pass under the several knives C′, D′, E′ and F′, to bring the material between the members of the several devices C, D, E and F. The forward ends of the cams C⁷, D⁶, E⁶ and F⁶ are arranged to cause the cams B⁶ to slowly raise the cross heads C⁵, D⁴, E⁴ and F⁴, to insure the knives C′, D′, E′ and F′ being brought in contact with the fibers drawn along over the bars C², D², E² and F². Now when the knife C′ comes down onto the material it cuts into the pulp and rubs the same off as the material is drawn along, thus removing the pulp from the fibers and thereby leaving a wide band of fibers to pass through the next device D, in which the band of fibers is split into a

number of narrow strips by the action of the knife D′ pressing the band of fibers down onto the serrated edge of the bar D^2 (see Fig. 7). The strips thus produced are next divided again into still narrower strips by the action of the knife E′ and its notched bar E^2 (see Fig. 8), and the narrow strips are finally divided into individual fibers by the action of the knife F′ and the notched bar F^2 (see Fig. 9). By reference to Figs. 7, 8 and 9 it will be seen that the cutting edges of the knives D′, E′, F′ pass slightly below the bottoms of the notches in the bars D^2, E^2 and F^2, so that the material A is pressed down to the bases of the teeth of the bars D^2, E^2, F^2, to split the band successively until finally only single fibers leave the device F (see Fig. 9). By moving the knives D′, E′, F′ down to the point mentioned and shown in Figs. 7, 8 and 9, the knife edges completely strip the fibers of all extraneous matter not previously removed, so that the devices D, E and F besides separting the fibers also clean and polish the same. It will also be noticed that as the fibers are drawn along and subjected to the action of the devices D, E and F the fibers are separated from all extraneous matter and the fibers finally leave the device F in a perfectly clean and polished state.

Owing to the cutting edges of the knives D′, E′ and F′ when in a lowermost position being somewhat below the points of the notches of the corresponding bars D^2, E^2 and F^2, and the said notches being V-shaped the fibers will be thoroughly cleaned of all extraneous matter and separated into individual fibers kept in a straight condition.

The downward movement of the cross heads C^5, D^4, E^4 and F^4 and their knives C′, D′, E′ and F′ is limited by set screws H^3 held on the frame H (see Fig. 3), and on which set screws the said cross heads are adapted to rest when reaching a lowermost position.

The main drawing mechanism G consists essentially of rollers G′ and G^2 arranged one alongside the other and operating in conjunction with a pressing roller G^3 adapted to press the fibers in contact with the upper peripheral surfaces of the rollers G′ and G^2. The shafts G^4 and G^5 of the rollers G′ and G^2 are journaled in the frame H and are provided with gear wheel G^6, G^7 (see Fig. 1) in mesh with a pinion G^8 secured on the shaft I^7 previously referred to and driven from the main shaft I′. Thus when the motor I is running, a continuous rotary motion is given to the rollers G′ and G^2. In order to keep the peripheral faces of the rollers G′ and G^2 clean, brushes O and O′ are provided, attached to the frame H and having their bristles in contact with the peripheral faces of the said rollers, as plainly shown in Fig. 2.

The pressing roller G^3 has its shaft G^9 journaled in links L on a link frame and pivotally connected with links L′ held on a transverse shaft L^2 journaled in bearings L^3 adjustably secured on the main frame H. The upper ends of the links L normally rest with their front ends against a cross bar H^4 forming part of the main frame H, and the lower front portions of the links L are provided with cams L^4 adapted to be engaged by the cams B^6 of the draw head B. The ends of the shaft G^9 are mounted to slide in vertical bearings H^5 formed on the frame H, so that when the cams B^6 of the draw head B engage the cams L^4 then the link frame is opened in a rearward direction and the pressing roller G^3 is lifted to allow the draw head B to pass under the pressing roller G^3. The cams B^6 of the draw head B after having passed the pressing roller G^3 engage locking levers N adjustably fulcrumed on the frame H and adapted to engage projections L^5 on the link frame, to close the latter, that is, to bring the links L and L′ back into a vertical position and against the side bar H^4, as indicated in Fig. 2. On closing the link frame, the pressing roller G^3 is moved downward into engagement with the fibers, to press the same against the peripheral surfaces of the rollers G′, G^2, and as the latter are driven, it is evident that the fibers are drawn forward by the action of the drawing device, thus relieving the draw head B of its drawing function.

The draw head B when reaching the rear end of the machine passes with its blocks B^4 out of the guideways H′, and as the draw head B now passes around the sprocket wheels J′, it is evident that the upper jaw B^2 swings automatically open, thus releasing the butt end A′ of the material, the open jaw B^2 swinging in contact with a guide P, attached to the frame H and extending longitudinally thereof, with a view to guide the open jaw during its forward movement and to relieve the hinge B^3 of all undue strain.

Stray fibers are liable to be retained and stretched in the lower members of the devices C, D, E and F, and in order to cut the said stray fibers and to remove the same from the devices mentioned, the following arrangement is made:

V-shaped knives Q, Q′ and Q^2 (see Figs. 2 and 3) are held on a frame Q^3 having a guideway Q^4 engaged by a bar Q^5 attached to the frame H to guide the frame Q^3 up and down, with a view to bring the knives Q, Q′ and Q^2 down and in front of the notched bars D^2, E^2 and F^2, respectively, as indicated in Fig. 2. Normally the knives Q, Q′ and Q^2 are in an uppermost position. that is, above the lower members of the devices C, D, E and F, as indicated in Fig. 3, it being understood that the frame Q^3 is pro-

vided with a handle Q^6 under the control of the operator, and the frame is hung on a counterbalancing lever R fulcrumed at R′ on the frame H and carrying a balancing weight R^2, to normally hold the frame Q^3 and its knives Q, Q′, Q^2 in an uppermost position. Now when it is desired to use the knives Q, Q′ and Q^2, the operator takes hold of the handle Q^6 and draws the frame Q^3 downward and moves the same transversely along the guideway bar Q^5, so as to cut any fibers that may be stretched on the lower members of the devices C, D, E and F.

In order to insure an easy transverse movement of the knives Q, Q′, and Q^2, the guideway Q^4 is provided with a friction roller Q^7 traveling on top of the cross bar Q^5 at the time the frame Q^3 is in its lowermost position, the said friction roller Q^7 limiting the downward movement of the frame Q^3 and the transverse movement of the knives Q, Q′ and Q^2, and the frame Q^3 is limited by stops Q^8 held on the cross bar Q^5 and for the friction roller Q^7 to abut against (see Fig. 3).

After the stretched fibers are cut, the frame Q^3 with its knives is returned to an uppermost position, and in order to remove the cut fibers from the lower members, a brush B^7 is mounted on the front end of the draw head B, so that when the latter moves forward in the direction of the arrow *a′* the bristles of the brush B^7 come successively in contact with the lower members C^2, D^2, E^2 and F^2, to remove the cut fibers from the said members.

The pinion I^2 is caused to rotate with the shaft I′ by means of a friction clutch U under the control of the operator by means of the shifting lever U′, it being understood that when starting the motor I the clutch U is opened for the time being until the motor is running at full speed without the load. After the motor is fairly started, the clutch is thrown in to rotate the pinion I^2 with the shaft I′ and thus start up the machine.

The operation is as follows: When the motor I is running and the clutch U is thrown in and the clutch members K, K′ are out of engagement, then the carrier is at a standstill with the draw head B at the front end of the machine. The operator now places the butt end A′ of the material A between the jaws B′, B^2 of the draw head B and then closes the jaws, to lock the butt end of the material in place. The operator now swings the arm K^8 up into a vertical position and pulls the rod K^6 in the inverse direction of the arrow *b′*, to draw the clutch member K′ into engagement with the clutch member K, as shown in Fig. 2. The carrier chains J^2 are now caused to travel, whereby the draw head B is moved along in the direction of the arrow *a′*, and its blocks B^4 enter the guideways H′, to keep the jaws B′ and B^2 firmly closed during the travel of the draw head B from the front end of the machine to the rear end thereof. Now as the draw head B advances, its cam B^6 acting on the cam C^7 lift the cross head C^5 and with it the knife C′, and when the cam B^6 leaves the cam C^7 the cross head C^5 slides downward, to bring the knife C′ into engagement with the pulp, thus shaving the same off as the material is drawn forward with the forwardly moving cross head B. The cross head B by its cams B^6 successively lifts and drops the cross heads D^4, E^4 and F^4 with their knives D′, E′, F′, so that the knife D′ in conjunction with the notched bar D^2 divides the band of fibers into strips, and each strip is sub-divided by the knife E′ and the bar E^2 to make narrower strips, which in turn are separated into individual fibers by the action of the knife F′ and the notched bar F^2. Thus as the fibers are drawn along through the several devices C, D, E and F, the pulp and other extraneous matter is first removed and then the fibers are gradually separated and cleaned and polished on being drawn through the teeth of the bars D^2, E^2 and F^2. The cross head B finally passes the drawing device G, by lifting the link frame and the roller G^3, as previously explained, and when the cross head has passed the drawing device G and the roller G^3 has moved down into engagement with the fibers, then the roller G^3 in pressing the fibers against the pressing rollers G′, G^2 causes the latter to draw the fibers forward, thus relieving the draw head B of its drawing function. The blocks B^4 of the draw head B finally leave the guideways H′, to permit the operator to swing the jaw B^2 open to allow removal of the butt end A′ from the draw head B. The operator in taking hold of the butt end gathers the fibers and then places the butt end A′ onto the arm T, and swings the same upward, to cause the carding drum S to clean the butt end of the pulp and other extraneous matter. Thus by the arrangement described none of the fibers are lost or wasted. In the meantime, the draw head B is on the return travel with the lower run of the carrier chains J^2, and the draw head B finally passes around the sprocket wheels J^3 and moves into engagement with the arm K^8, to shift the latter forward in the direction of the arrow *b′* and with it the shifting rod K^6, so that the clutch member K′ is thrown out of mesh with the clutch member K and the carrier and the draw head B come to a standstill. The above described operation is then repeated, that is, the butt end A′ of a new batch of material is engaged between the jaws B′, B^2 of the draw head B, and then the operator swings the arm K^8 upward and pulls on the same, to move the rod K^6 in the inverse direction of

the arrow b', with a view to again throw the clutch member K′ into engagement with the clutch member K to start the carrier and the cross head B. The above-described operation is then repeated.

The frame H is preferably mounted on wheels H^6, to allow of conveniently moving the machine about from place to place.

If any fibers remain stretched between the members C, D, E and F, then the operator actuates the knives Q, Q′ and Q^2, as previously explained.

To save the fibers of the butt ends of the material, the said ends may be subjected to the action of the teeth of a carding drum S. The drum S is mounted at one side of the machine on the shaft I^4, and extending up in front of the drum S is the presser arm T, by means of which the butt ends are pressed against the drum. The presser arm T is mounted on the stud T′ below the drum and is provided with the handle T^2 and leg T^3. Attached to the stud T′ is an arm S^2 carrying a comb S′ for keeping the drum clean, and to prevent the pulp from being scattered over the machine, a hood S^3 extends on the sides and at the rear of the drum.

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

1. A machine for separating fibers from the pulp of plant or tree material, comprising, in combination, a shaving device for shaving off the pulp, sets of fiber-separating devices in the rear of the said shaving device, and independent of the shaving device and of each other, the separating devices being in rear of one another and graduated to separate the width of the band of fibers into successively narrower strips and finally into individual fibers, and means for drawing the material through the said devices.

2. A machine for separating fibers from the pulp of plant or tree material, comprising, in combination, a shaving device for shaving off the pulp, sets of fiber separating and cleaning devices in the rear of the said shaving device, and one in the rear of the other, each fiber-separating and cleaning device consisting of a single knife and a bar having a serrated edge, the knives being independently mounted and the serrations of successive bars increasing in number to the inch, and means for drawing the material through the said devices.

3. A machine for separating fibers from the pulp of plant or tree material comprising in combination, a shaving device for shaving off the pulp, a plurality of fiber separating and cleaning devices in rear of the shaving device and in rear of one another, the separating and cleaning devices each consisting of a stationary bar having a serrated edge and a vertically movable and independently mounted knife adjacent to said bar, said knives serving to press the fiber upon the bars and strip the extraneous matter from the fiber, and means for drawing the material through the said devices.

4. A machine for separating fibers from the pulp of plant or tree material, comprising, in combination a shaving device consisting of a block and a knife coöperating with the block to shave off the pulp, a plurality of separating and cleaning devices arranged in rear of the shaving device and in rear of one another, each separating and cleaning device consisting of a stationary bar having a serrated edge and a vertically movable knife in rear of the bar, said knives being mounted independently of one another and serving to press the fiber upon the bars and strip the extraneous matter from the fiber, the serrations of successive bars being gradually finer to successively separate the band of fibers into strips and finally into individual fibers, and means for drawing the material through the said devices.

5. A machine for separating fibers from the pulp of plant or tree material, comprising, in combination, a block and a knife cooperating therewith for shaving off the pulp, sets of bars and knives, the bars having serrated edges, the sets of knives and bars being arranged in the rear of the said knife and block and one in the rear of the other, the serrations of successive bars being gradually finer to successively separate the band of fibers into narrow strips and finally into individual fibers, means for drawing the material through the said devices, and cutters capable of being moved transversely adjacent to the serrated bars for cutting stray fibers.

6. A machine for separating fibers from the pulp of plant or tree material, comprising, in combination, a block and a knife cooperating therewith for shaving off the pulp, sets of bars and knives, the bars having serrated edges, the sets of knives and bars being arranged in the rear of the said knife and block and one in the rear of the other, the serrations of successive bars being gradually finer to successively separate the band of fibers into narrow strips and finally into individual fibers, means for drawing the material through the said devices, cutters normally in an inactive position relative to said serrated bars, and manually controlled means for the said cutters, to move the same down and transversely in front of the said serrated bars for cutting stray fibers caught and held stretched in the serrations of the said bars.

7. A machine for separating fibers from the pulp of plant or tree material, provided with a shaving device for removing the pulp from the band of fibers, sets of dividing and separating devices for dividing the band

into narrow strips and the latter into the individual fibers, a draw head for drawing the material through the said devices, and a brush on the draw head for cleaning the said devices ahead of the material in the draw head.

8. A machine for separating fibers from the pulp of plant or tree material, provided with a shaving device for removing the pulp from the band of fibers, sets of dividing and separating devices for dividing the band into narrow strips and the latter into the individual fibers, manually-controlled cutters for cutting stray fibers held in the said dividing and separating devices, a draw head for drawing the material through the said devices, and a brush on the draw head for cleaning the said devices ahead of the material in the draw head.

9. A machine for separating fibers from the pulp of plant or tree material, provided with devices for separating the band of fibers successively into narrower strips and finally into individual fibers, and with manually-controlled cutters for cutting stray fibers adhering to said devices.

10. A machine for separating fibers from the pulp of plant or tree material, provided with transversely-extending notched bars, and cutters capable of moving transversely adjacent to the notched bars to cut any stray fibers lodged in and stretched over the said notched bars from one to the other.

11. A machine for separating fibers from the pulp of plant or tree material, provided with transversely-extending notched bars, cutters capable of moving transversely adjacent to the notched bars to cut any stray fibers lodged in and stretched over the said notched bars from one to the other, a frame carrying the said cutters, and a counter-balancing lever for the said frame.

12. A machine for separating fibers from the pulp of plant or tree material, provided with transversely-extending notched bars, cutters capable of moving transversely adjacent to the notched bars to cut any stray fibers lodged in and stretched over the said notched bars from one to the other, a frame carrying the said cutters, a counterbalancing lever for the said frame, and means for guiding the frame transversely.

13. A machine for separating fibers from the pulp of plant or tree material, provided with transversely-extending notched bars, cutters capable of moving transversely adjacent to the notched bars to cut any stray fibers lodged in and stretched over the said notched bars from one to the other, a counterbalanced frame carrying the said cutters, and guiding means for guiding the said frame up and down and transversely.

14. A machine for separating fibers from the pulp of plant or tree material, provided with transversely-extending notched bars, cutters capable of moving transversely adjacent to the notched bars to cut any stray fibers lodged in and stretched over the said notched bars from one to the other, a counterbalanced frame carrying the said cutters, guiding means for guiding the said frame up and down and transversely, and means for limiting the vertical and transverse movement of the said frame.

15. A machine for separating fibers from the pulp of plant or tree material, provided with a main drawing device having a pair of driven rollers, and a presser roller for pressing the material onto the said driven rollers, a link frame in which the said pressing roller is journaled, and a pivoted lever for engaging the link frame to return it to normal position.

16. A machine for separating fibers from the pulp of plant or tree material, provided with a main drawing device having a pair of driven rollers and a presser roller for pressing the material onto the said driven rollers, a link frame in which the said pressing roller is journaled and provided with a projection, a pivoted lever for engaging the projection of the said link frame, and a traveling draw head having cams for successively engaging the said link frame and the said lever to open the link frame and to cause the said lever to close the link frame.

17. A machine for separating fibers from the pulp of plant or tree material, provided with devices for separating the pulp from the fibers and separating the latter into individual fibers, a draw head for drawing the material through the said devices, and a brush on the said draw head for cleaning the said devices ahead of the material in the draw head.

18. A machine for separating fibers from the pulp of plant or tree material, provided with devices for separating the pulp from the fibers and separating the latter into individual fibers, a draw head for drawing the material through the said devices and having jaws hinged together, an endless carrier on which one of the jaws is fastened, and a guide for guiding and supporting the open jaw of the draw head on its return movement.

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

EUGENE BEHRENDT.

Witnesses:

ALBERT B. LESINSKY,

HERMAN P. BOWMANN.