(No Model.) 4 Sheets—Sheet 1.

L. BACALLADO Y SANCHEZ.

FIBER MACHINE.

No. 474,714. Patented May 10, 1892.

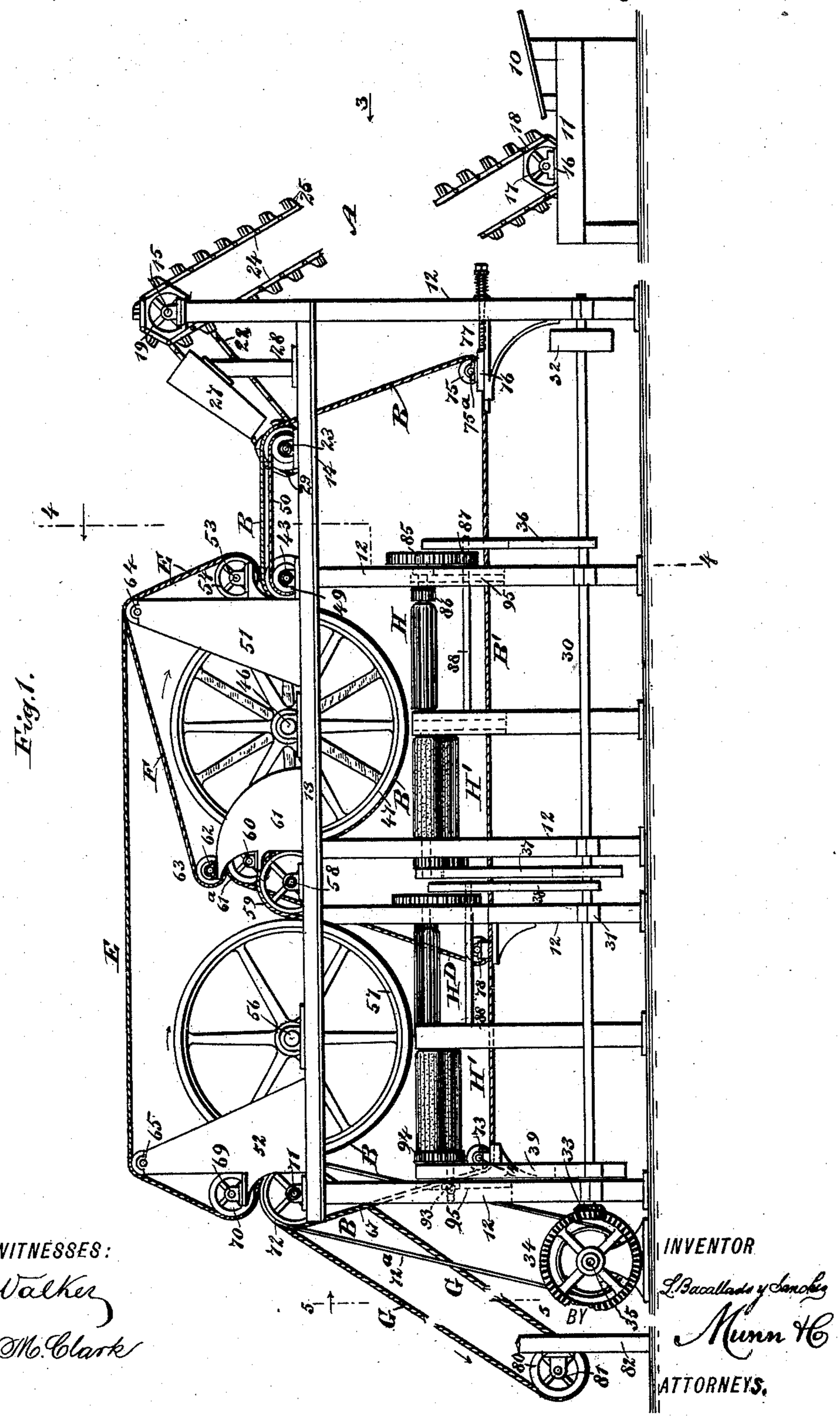

Fig. 1.

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Fig. 2.

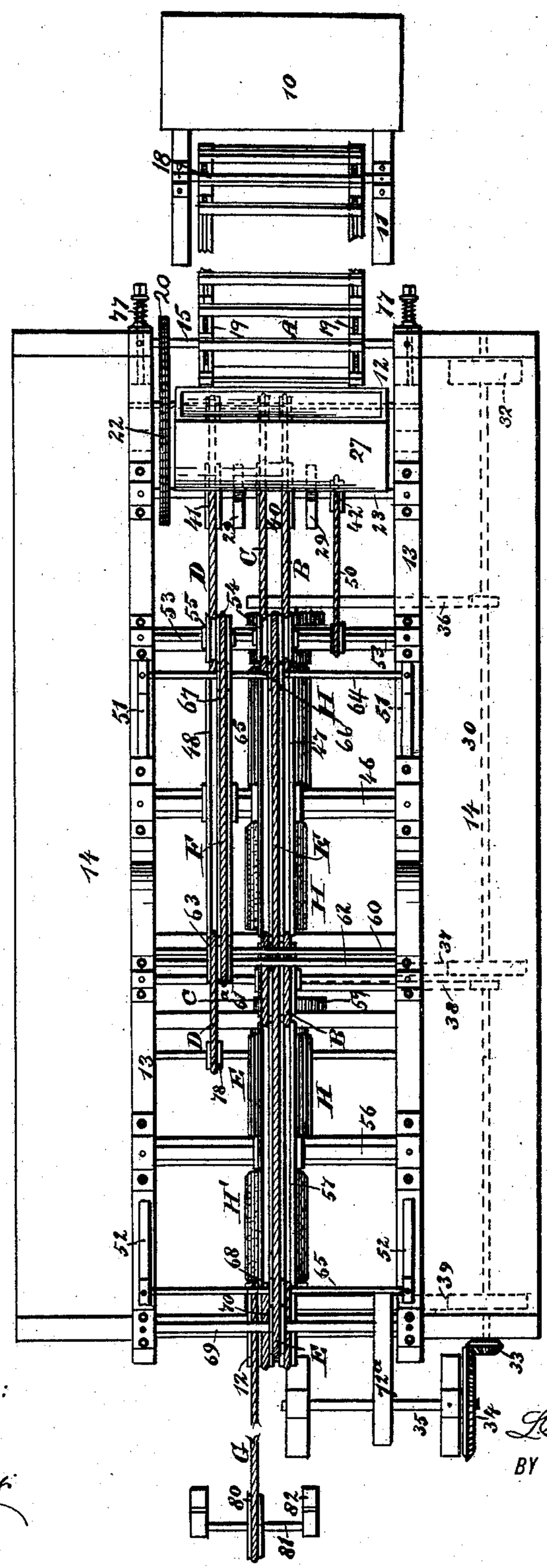

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Fig. 3.

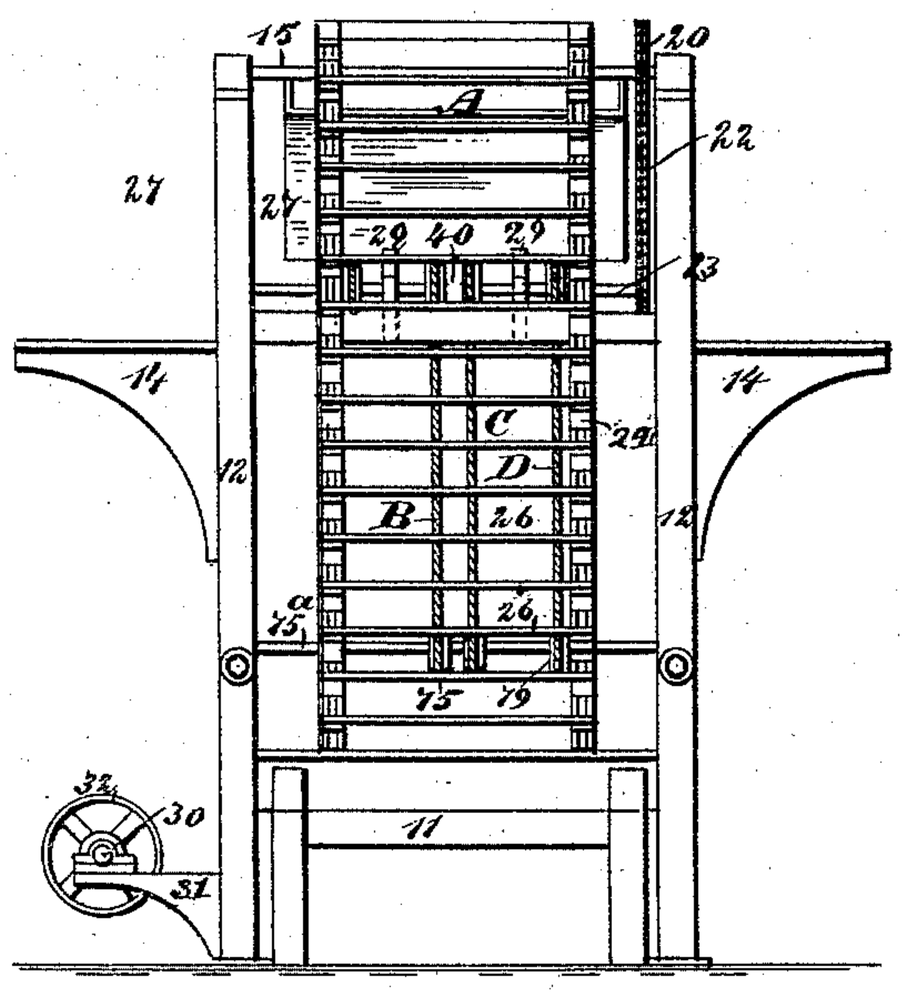


Fig. 4.

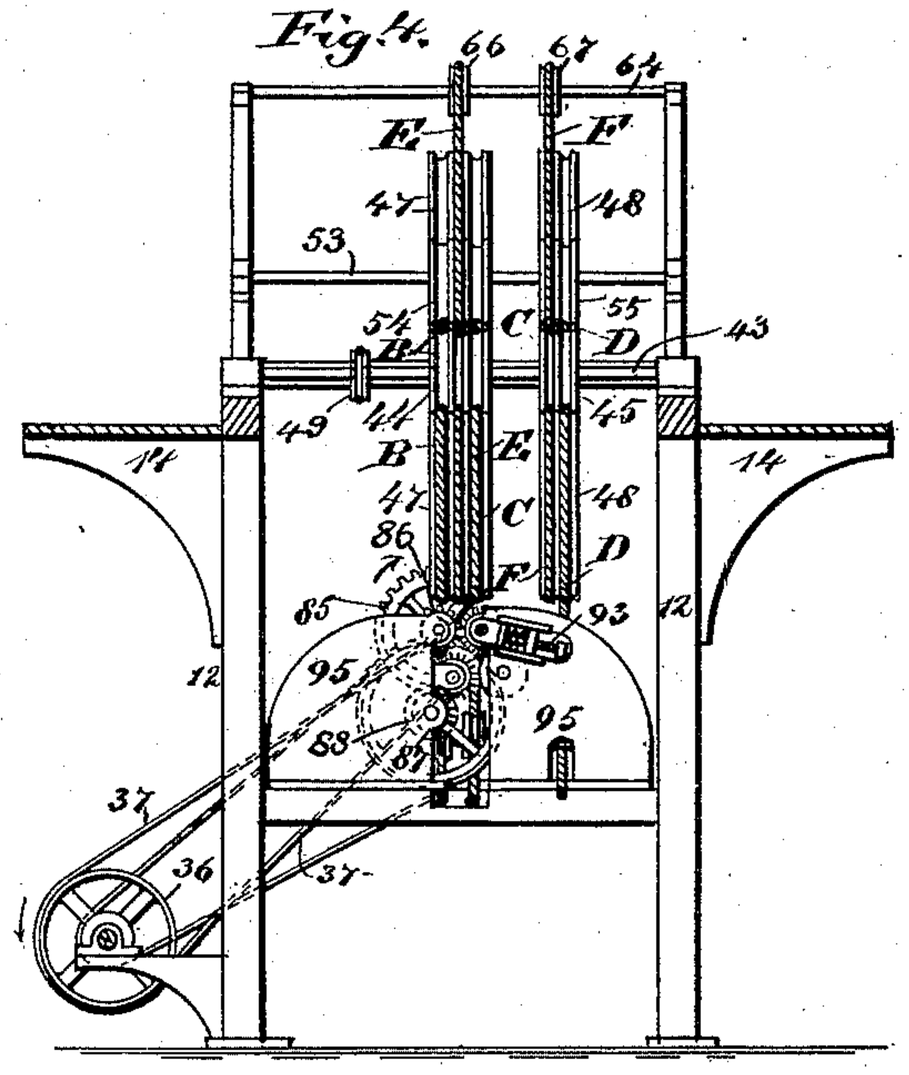


Fig. 5.

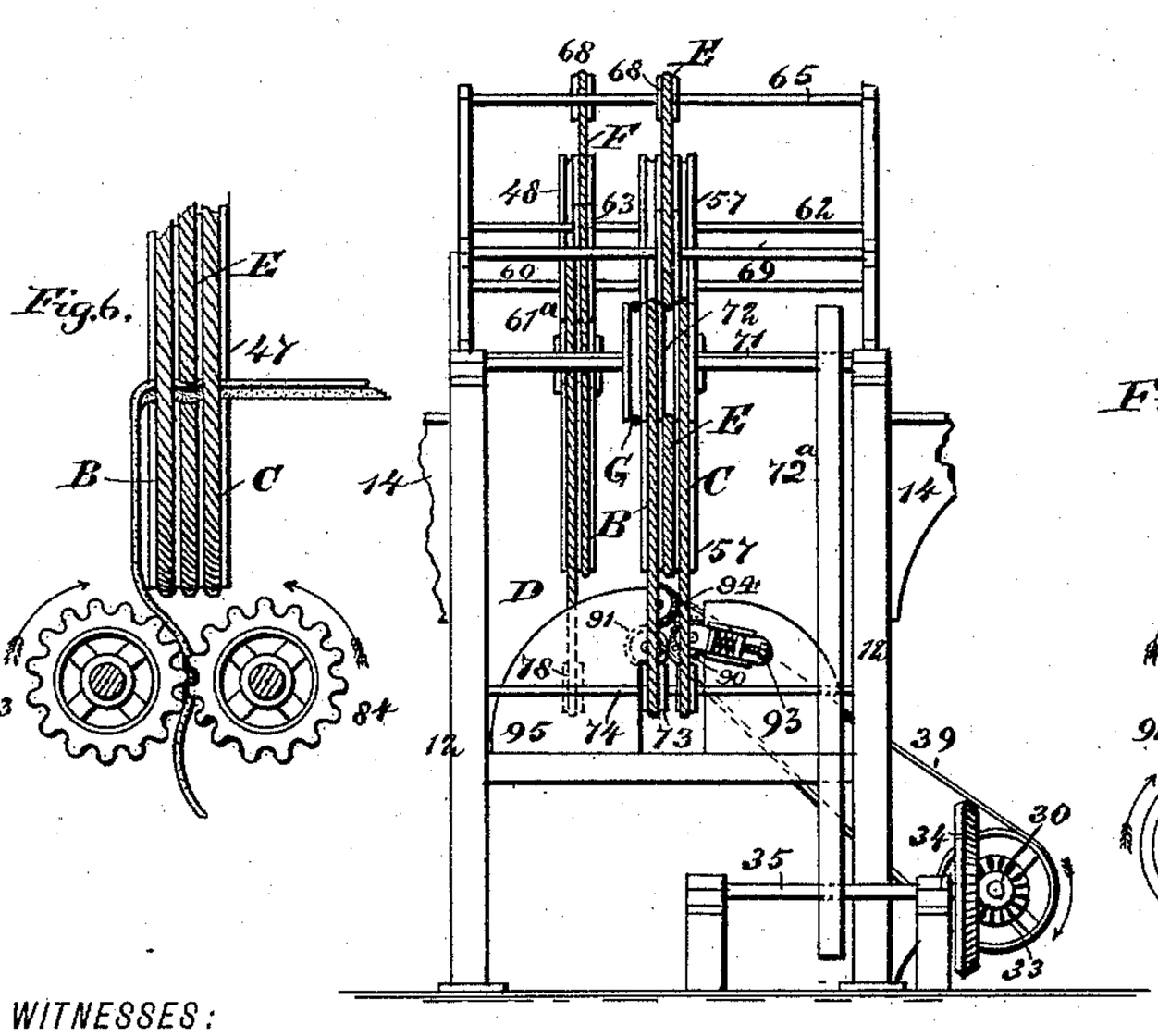
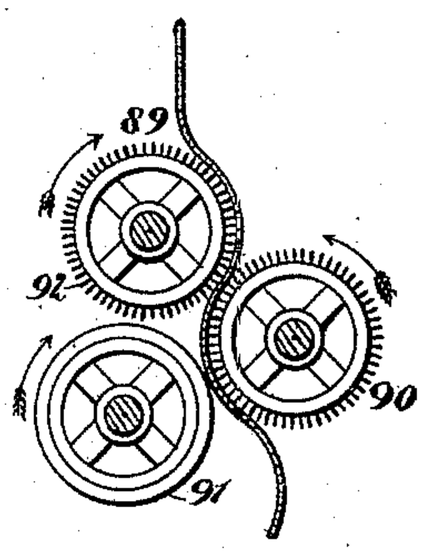


Fig. 6.

Fig. 7.



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FIBER MACHINE.

No. 474,714. Patented May 10, 1892.

Fig. 8.

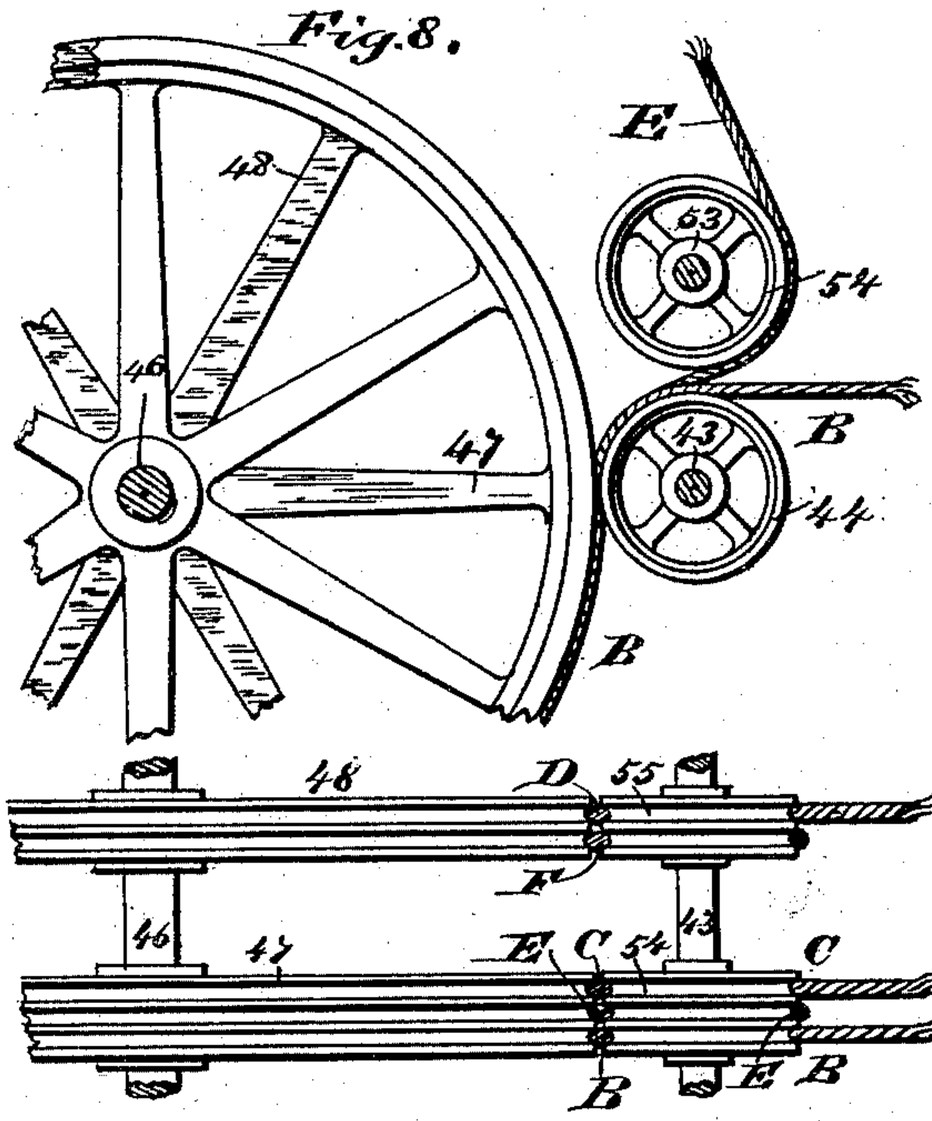


Fig. 9.

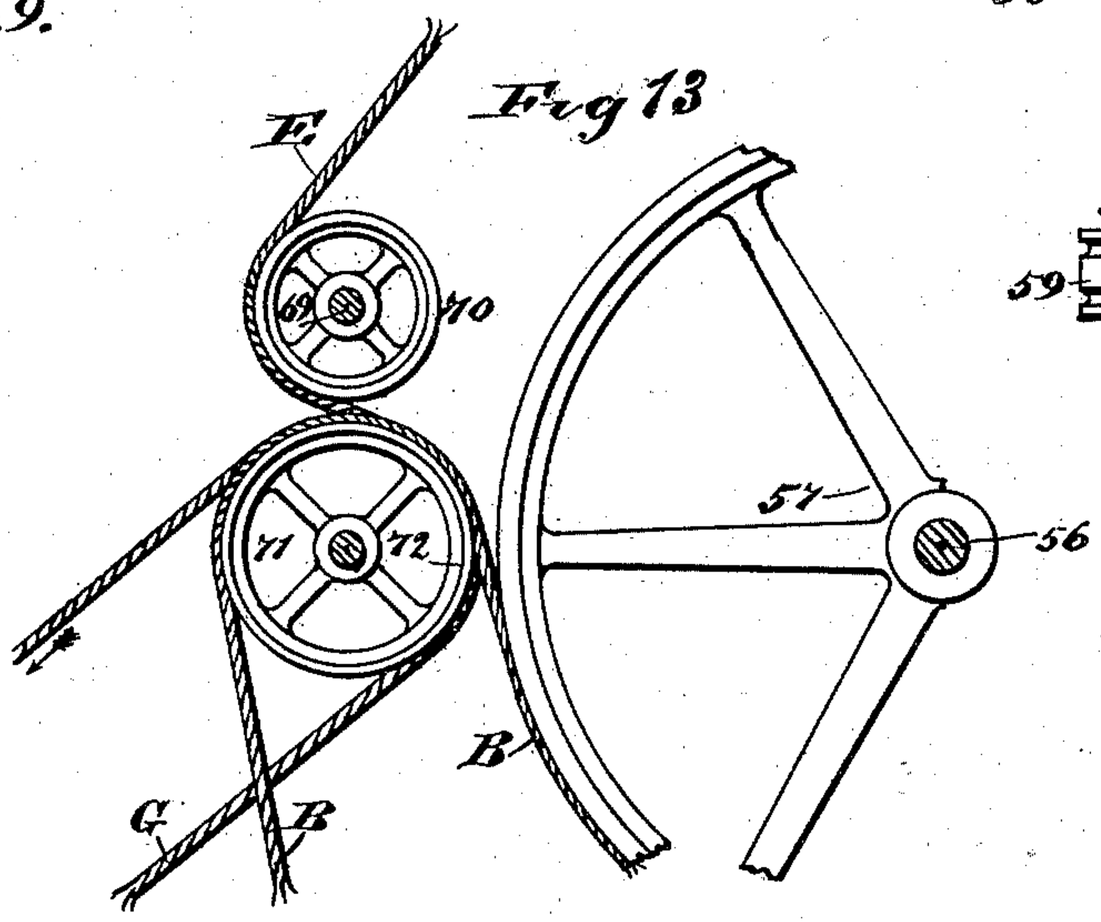


Fig. 10.

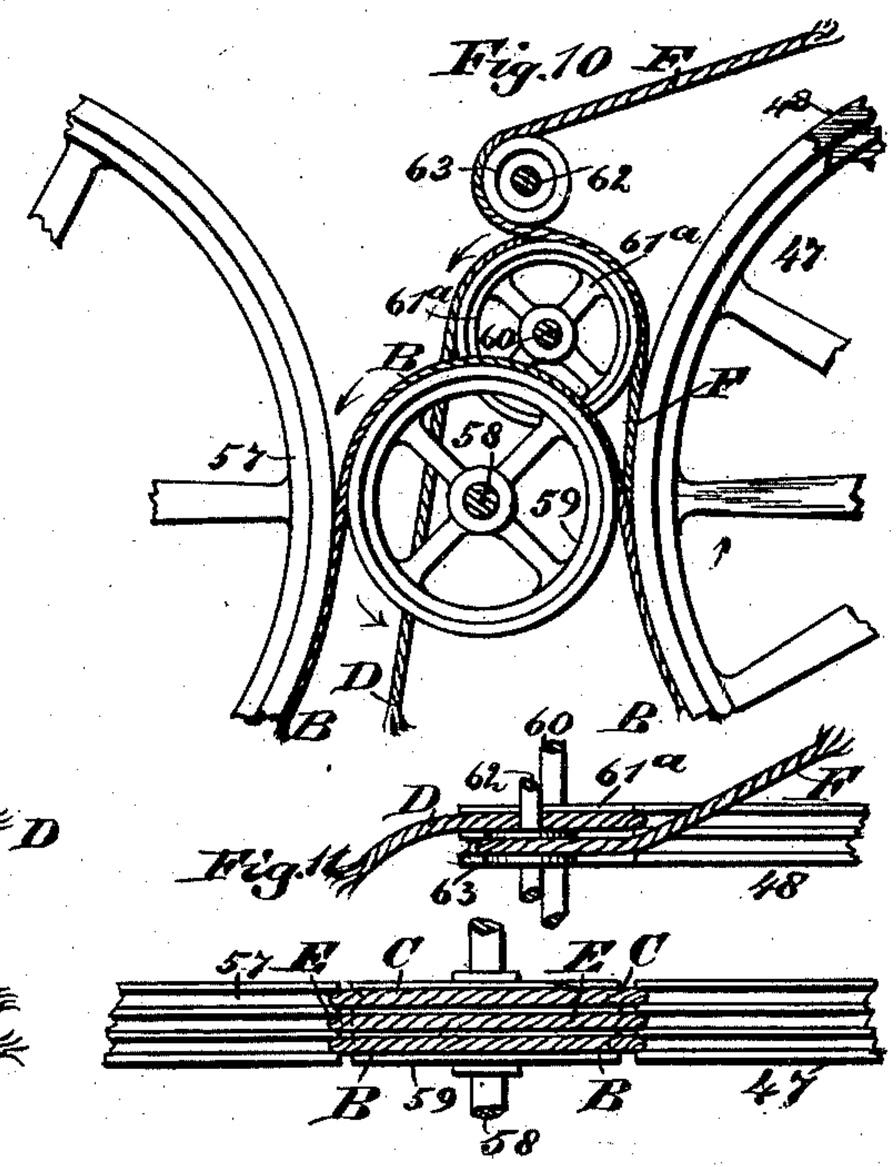


Fig. 11.

Fig. 12.

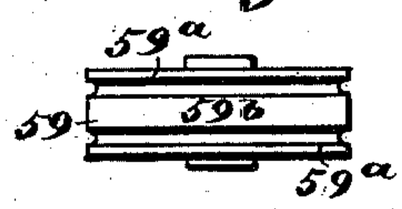
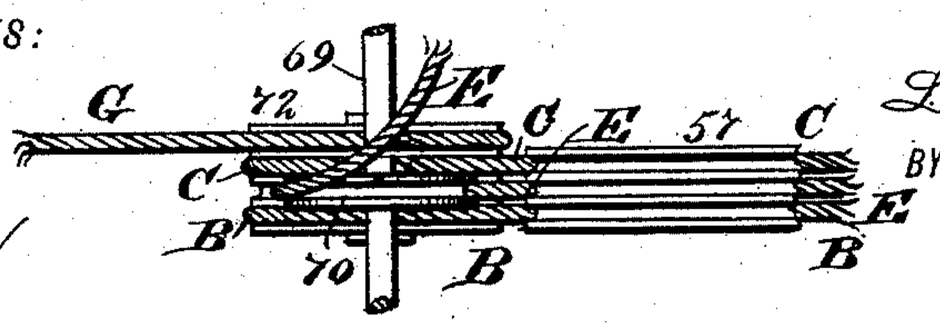


Fig. 13.

Fig. 14.



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UNITED STATES PATENT OFFICE.

LUIS BACALLADO Y SANCHEZ, OF MATANZAS, CUBA.

FIBER-MACHINE.

SPECIFICATION forming part of Letters Patent No. 474,714, dated May 10, 1892.

Application filed August 25, 1891. Serial No. 403,699. (No model.)

To all whom it may concern:

Be it known that I, LUIS BACALLADO Y SANCHEZ, of Matanzas, Cuba, have invented a new and useful Improvement in Fiber-Machines, of which the following is a full, clear, and exact description.

My invention relates to an improvement in fiber-machines, and has for its object to construct the machine in such manner that the leaves from which the fiber is to be extracted may be fed in at one end of the machine and the fiber in a perfect state be delivered from the machine at its opposite end; and a further object of the invention is to provide a means whereby while the leaf is in transit from one end of the machine to the other it will, just prior to being delivered to the first set of mechanism for bruising and loosening the skin and pulp, be so held by traveling cables that one half of the leaf will be presented to the said bruising mechanism, the other half being retained in a fixed position by the cables, and whereby, also, after about one-half of the leaf has been stripped of its pulp, exposing the fibers, an automatic transfer will be effected and the position of the leaf be reversed, so that as the leaf further travels through the machine that portion formerly held by the cables will be subjected to the cleaning process, and, finally, whereby the fibers, thoroughly cleaned and in regular order, will be delivered automatically to an apron or the equivalent thereof for distribution as desired.

Another object of the invention is to so construct the machine that it will be simple, durable, and economic, and whereby the leaves may be fed in consecutively and as rapidly as desired at one end of the machine and be delivered at the opposite end as expeditiously as fed.

It is a further object of the invention to so construct the cleaning rolls or cylinders that they will not discolor the fiber. Ordinarily the cleaning cylinders or rolls of fiber-machines rapidly corrode by the action thereon of the juices from the leaf, and thus so discolor the fiber as to depreciate its market value.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the machine. Fig. 2 is a plan view thereof. Fig. 3 is a front end elevation. Fig. 4 is a section taken, practically, on the line 4 4 of Fig. 1. Fig. 5 is a sectional elevation of the rear end of the machine, taken on the line 5 5 in Fig. 1. Fig. 6 is an enlarged detail view of the first set of cleaning rolls or cylinders, illustrating their position with reference to the carrying wheel or drum, and also illustrating the manner in which the leaf is treated; and Fig. 7 is an end view of the second set of cleaning-cylinders, illustrating their action upon the leaf. Fig. 8 is an enlarged detail view of the first set of carrying-wheels and the cables leading thereto; and Fig. 9 is a plan view of said carrying-wheels, as shown in Fig. 8. Fig. 10 is a detail view of the second set of carrying-wheels and of the intermediate pulleys, whereby the leaf is shifted while being transferred from the first set of carrying-wheels to the second set; and Fig. 11 is a plan view of the mechanism shown in Fig. 9. Fig. 12 is a plan view of the pulley upon which the transfer is made. Fig. 13 is a detail view of the third set of carrying-wheels and the cables and pulleys through the medium of which the finished product is carried from the machine, and Fig. 14 is a plan view of the mechanism illustrated in Fig. 13.

At one end of the machine an inclined table 10 is located upon a suitable frame 11, upon which table the leaves to be cleaned are placed. In front of the frame 11 the frame proper of the machine is located. This frame consists of a series of vertical pillars 12 of any desired number, the pillars upon each side being in transverse alignment. The pillars support side pieces or bars 13, and upon each side bar a horizontal foot-board 14 is secured, upon which the operators or operator may stand to watch and guide the movements of the leaves to be cleaned.

The front pillars 12 extend upward some dis-

tance beyond the side pieces 13, and upon the upper ends of the front pillars 12 boxes are located, in which boxes a shaft 15 is journaled. Like boxes 16 are secured upon the frame 11, in which boxes a shaft 17 is journaled, the shaft 17 having secured thereon two sprocket-wheels 18, and the upper shaft 15 is likewise provided with two similar wheels 19, the upper and lower wheels being located in the same positions upon their respective shafts. The upper shaft 15 is likewise provided with a sprocket-wheel or a pulley 20, which is connected by a belt 22 with a sprocket-wheel on a shaft 23, journaled in suitable bearings upon the side pieces of the frame of the machine near its forward end, as illustrated in Figs. 1 and 2.

The sprocket-wheels 18 and 19 are adapted to carry an elevator A. This elevator consists, preferably, of two parallel chains 24, the links of which chains pass over the sprocket-wheels and are formed with supports or projections 25 at predetermined intervals apart, and upon the projections boards are horizontally and transversely secured in any suitable or approved manner, forming thereby a series of steps 26, which are adapted to carry the leaves from the table 10 upward to the machine.

The leaves are adapted to be delivered into an inclined chute 27, which may be open at one side, if desirable, the said chute being supported by a frame or upright 28, located upon the main frame of the machine. The position of the chute is such that its upper end will receive the leaves from the steps of the elevator, and its lower end will be immediately over two or more spur-wheels 29, two being preferably employed, as shown in Fig. 2, one being attached at each side of the center of the shaft 23. These wheels 29 are adapted to receive the leaves from the chute 27 and to deliver them at proper intervals and one at a time to the cleaning mechanism of the machine.

The spur-wheels 29 regulate the continuous feed of the machine, so that when the machine moves at a medium velocity it will clean about two hundred leaves per minute; and it will be readily understood that the men whose duty it is to place the leaves can do it with the speed and at the distance required by the machine—as, for instance, a man situated at near the table 10 can take the leaves from the floor or from cars or other receptacles and place them upon the table while another man can push the leaves toward the elevator, and as there is sufficient space between the steps of the elevator to admit of two or three leaves being placed the elevator will carry upward a greater number of leaves than the machine consumes. This being the case, the leaves should be placed in the chute 27 at will, and this may be accomplished by enabling the man who places the leaves upon the elevator to suspend operations when he perceives that the receptacle is becoming full, which result may be attained through the medium of any stop mechanism—as, for instance, a shifting-lever may be employed to cast the driving-belt of the elevator upon a loose pulley.

The machine is fed with regularity, owing to the spur-wheels 29, which are preferably provided with six teeth in their peripheral surfaces, taking the leaves deposited in the receptacle one by one and keeping the leaves at equal distances apart.

The drive-shaft 30 is located at one side of the machine, being journaled in suitable bearings 31, carried by the pillars 12. The drive-shaft has attached thereto at a convenient point a drive-pulley 32, and at one end is provided with a bevel-pinion 33, which meshes with a bevel-gear 34, fast upon a shaft 35, the said shaft being located at the rear end of the machine. The drive-shaft is further provided with a series of pulleys carrying belts 36, 37, 38, and 39, adapted to transmit motion to cleaning-cylinders, to be hereinafter described.

The shaft 23 is provided with a central pulley 40, having produced in its upper face two circumferential grooves, and between the pulley carrying the driving-belt 22 and the adjacent spur-receiving wheel 29 a single peripherally-grooved pulley 41 is attached to the shaft, and a smaller pulley 42 is secured between the opposite receiving spur-wheel 29 and the side of the machine, as is best shown in Fig. 2.

In front of the shaft 23 and parallel therewith a shaft 43 is journaled upon the top of the main frame of the machine. Upon this shaft two pulleys 44 and 45 are secured, one pulley being provided with three peripheral grooves and the other with two, as is best shown in Fig. 4. Between the rear end of the machine and the shaft 43 a shaft 46 is journaled, upon which shaft two carrying wheels or drums 47 and 48 are secured, the drum 47 being provided with three peripheral grooves and the drum 48 with two. The drum 47 is located closely to the grooved pulley 44 of the shaft 43, and the drum 48 sustains a like position to the pulley 45 of the said shaft 43, as is likewise best shown in Fig. 4. The shaft 43 is also provided with a small driving-pulley 49, connected with the pulley 42 upon the shaft 23 by a belt 50.

In front of the ends of the shaft 43, between said shaft and the shaft 46, standards 51 are erected upon the frame of the machine, and similar standards 52 are constructed near the rear end of the machine. Upon the forward edge of the front standards 51 brackets are erected, carrying journal-boxes, in which brackets a shaft 53 is journaled, which shaft has secured thereon two pulleys 54 and 55, the said pulleys being located above the pulleys 44 and 45 and being similarly grouped, as shown in Fig. 4.

Near the rear standards 52 a shaft 56 is journaled upon the frame of the machine parallel with the shaft 46, and the shaft 56 is pro-

vided with a carrying drum or wheel 57 of the same size and similarly shaped as the forward drum 47. Between the two drums, also in suitable bearings located upon the frame of machine, a transverse shaft 58 is journaled, which shaft is provided with an attached pulley 59, the said pulley being of such a diameter that its peripheral surface will closely approach the peripheral surfaces of the two longitudinally-aligning drums 47 and 57. The pulley 59 is provided with two peripheral grooves 59^a and a smooth surface 59^b, located between the two grooves, as shown in Fig. 12.

Above and slightly in advance of the shaft 58 a parallel shaft 60 is journaled in boxes carried by standard 61, projected upward from the frame of the machine and located between the standards or uprights 51 and 52; but the intermediate standards are of less height than the end standards, as shown in Fig. 1, and upon the shaft 60 a pulley 61^a is secured, turning with the shaft, the said pulley being smaller than the pulley 59 and so located as to be adjacent to the forward drum 48. The pulley 61^a is grooved to correspond to the grooves in the said drum.

Above the shaft 60 another shaft 62 is journaled upon the tops of the intermediate standards 61, and upon this latter shaft a small pulley 63 is secured, containing a single peripheral groove. The location of these pulleys 59, 61^a, and 63 is illustrated in detail in in Fig. 10 and is likewise shown in Fig. 2.

In the upper ends of the standards 51 and 52 shafts 64 and 65, respectively, are secured, and upon the forward shaft 64 two grooved pulleys 66 and 67 are held to revolve, one of said pulleys being in vertical alignment or essentially so with the forward peripheral portion of the drum 47, while the other sustains a like relation to the adjacent drum 48, as is best shown in Fig. 4. The shaft 65 is provided with a single grooved pulley 68, held to turn thereon, which pulley is so located as to be over the rear peripheral surface of the rear drum 57. Upon a bracket-extension at the rear of the rear standard or upright 52 a transverse shaft 69 is journaled, upon which shaft a single grooved pulley 70 is secured, and below the shaft 69, in bearings located upon the main frame of the machine, a shaft 71 is journaled, which carries a pulley 72, (shown best in Fig. 5,) which pulley is immediately opposite and almost in engagement with the rear peripheral surface of the rear carrying-drum 57, and is provided with four peripheral grooves. The shaft 71 is also provided with a pulley and a belt 72^a, connecting said pulley with a driving-pulley upon the rear driving-shaft 35.

The grooved pulley 72 carries endless cables B, C, E, and G, which cables serve the dual purpose of transmitting movement to a large portion of the machine, and also of carrying the leaves in a natural state to the cleaning mechanism, and from said mechanism when cleaned.

The cables B, C, and E may be properly termed "gripping," "supporting," or "carrying" cables, as they hold one portion of the leaves in position, while another portion is being cleaned, and conduct the leaves from the hopper or receptacle 27 to the carrying-drums. The cables B and C run alike. They pass over the grooved pulley 40 on the shaft 23 at the front of the machine in a horizontal line, as shown in Figs. 1 and 2, down over the pulley 44 in front of the forward drum 47 in the outer grooves of said pulley, thence farther downward in the outer grooves of the drum 47, as shown in Figs. 8 and 9, around the lower portion of said drum and upward therefrom over the lower of the central or intermediate pulleys 59 in the outer groove 59^a thereof, as shown in Figs. 10 and 11, and continuing over this pulley the two cables pass downward in the outer grooves of the rear carrying-drum 57, hugging the lower portion of the same. The cables are then again carried upward over one outer and the inner groove in the periphery of the rear guide-pulley 72, and after passing over this pulley the cables B and C are carried downward under and in contact with guide-pulleys 73, secured to a shaft 74, journaled in brackets projected from the rear end posts of the machine-frame. (See Figs. 1 and 5.) From this point the cables extend horizontally under and around a second set of guide-pulleys 75, the shaft 75^a, upon which the pulleys are secured, being journaled in bearings 76, laterally adjustable upon brackets projected from the front posts of the frame, as shown in Figs. 1 and 3, the adjustment of the boxes being effected through the medium of spring-pressed screws 77, passing through the posts into the bearing-boxes; or equivalent devices may be employed. From the forward guide-pulleys 75 the cables are carried upward to the upper guide-pulley 40, from which point they have been described as starting. These cables, it will be observed, transmit motion from the rear shaft 71 to the forward shaft 23, from which motion is communicated to the elevator A by the belt 22.

As the cables B and C contact but slightly with the pulley 40, in order to insure movement to the shaft 23 under all conditions the belt 50 is provided, connecting the shafts 23 and 43, as the latter shaft 43 surely revolves whenever the cables are in motion. The belt 50, in addition to transmitting motion, serves to support the longer ends of the leaves as they are carried by the cables B and C from the hopper or receptacle 27 to the forward carrying-drums. A third cable D is employed in conveying the leaves from the hopper or receptacle to the forward drum. I will therefore first describe its location before describing that of the cables E and G.

The cable D, which is endless, is carried from the grooved pulley 41 on the forward shaft 23 parallel with the cables B and C, downward over and in one of the grooves of

the pulley 45, located in front of the forward drum 48, thence downward in contact with the lower portion of this drum in one of its grooves and upward around said drum, as shown in Figs. 2 and 9. From the drum the cable is carried over the intermediate pulley 61^a of the centrally-located pulleys, as shown in Fig. 11, and thence down over a friction-pulley 78, journaled in bearings attached to one of the posts 12, as shown in Fig. 1, from which pulley the cable runs horizontally and parallel with the cables B and C upward over a second friction-pulley 79, secured to the adjustable shaft 75^a, to the pulley 41, from which the description of the course of this cable was commenced.

The endless cable G is adapted to carry off the finished product and passes around over the outer grooved portion of the guide-pulley 72 and downward over a grooved pulley 80, secured upon a shaft 81, journaled in suitable standards 82. The cable G forms an inclined plane and may be made of metal; but as the work to be accomplished is very simple I prefer to construct this cable of the fiber for cleaning which the machine is designed.

Having finished the description of the four lower cables and the auxiliary driving-belt 50, I pass to a description of the two upper cables E and F, the cable E being adapted for use in connection with the two drums 47 and 57 and the cables B and C and the other cable for use with the drum 48 and its main cable D only.

The cable E passes over the upper guide-pulley 66 at the front of the machine, thence downward and under the upper pulley 54 in front of the drum 47, as shown in Figs. 1, 8, and 9, in the central groove of said pulley. Leaving the pulley 54, the cable E passes over the face of the pulley 44 contiguous to the periphery of the drum 47 in the central groove of this latter pulley, and from thence into the central groove of the drum, around the under portion of the drum, and leaving the drum the cable passes over the plain surface 59^b of the lower pulley 59 of the centrally-located ones, as shown in Figs. 10 and 11. After passing over the upper portion of this pulley the cable E enters the central groove in the rear drum 57 and follows the under portion of this drum until it reaches the opposite side, from whence it passes into the upper central grooved portion of the rear guide-pulley 72, over the upper rear guide-pulley 70, and thence over the uppermost guide-pulley 68, and leaving said pulley it extends horizontally above the machine to the pulley 66, from which point its course was described as commenced. This cable is especially adapted to tie the leaves to the drums in the manner illustrated in Fig. 6. It will be observed that this cable forms in its course somewhat of the shape of the letter **S** while passing in contact with the forward grooved pulleys 44 and 54 and the rear guide-pulleys 70 and 72.

The cable F passes from the uppermost guide-pulley 67 upon the shaft 64 at the front of the machine downward over the front of the upper grooved pulley 55, facing the forward drum 48, and from thence downward over the rear face of the pulley 45, immediately below the pulley 55, and leaving the pulley 45 the cable passes into one of the grooves of the drum 48 and follows the contour of the lower portion of the drum, leaving it at the rear side, where it passes over the rear face of the pulley 61^a, as shown in Figs. 10 and 11, upward over the uppermost pulley 63 of the centrally-located set, diagonally upward to the pulley 67, from whence it started. Where the cable F passes in contact with the pulleys 61^a and 63, it forms, essentially, the letter **S**, and the cable F and the cable D are the only two cables which engage with the forward drum 48.

All the cables being connected in the manner indicated, I now proceed to explain the effect which they have in the movement of the machine, and for this purpose return to the shaft 30, which receives its movement from the motor. This shaft is driven at a velocity of about one hundred and fifty revolutions per minute, and the rear end of the shaft is connected with the rear or transverse drive-shaft 35 in the proportion of about six to one—that is, while the pinion 33 makes six revolutions the bevel-gear 34 makes only one. This being the case, as the bevel-gear is connected with the shaft 35, this shaft will make twenty-five revolutions in a minute, while the main drive-shaft 30 makes one hundred and fifty. Diminishing the speed in this way, I take as a basis the fact that the velocity of the machine transmitted by the pulley of the shaft 35 to the pulley on the rear upper shaft 71 will be twenty-five revolutions per minute, and as the wheel 72, which is connected with the shaft that attains this velocity, has a diameter having a certain relation to the diameter of the wheel 70 it will be seen that when the pulley 72 makes one revolution the wheel or pulley 70 will make one and one-third revolutions during the same time, as in each revolution of this pulley the toothed receiving-wheels 29 also make one revolution. When the pulley 72 makes a revolution, the toothed receiving-wheels 29 will have presented eight of their sides for the reception of the leaves which are in the receptacle 27, and consequently remove eight leaves from said receptacle. Thus when the pulley 72 makes twenty-five revolutions per minute the spur-receiving wheels 29 will remove two hundred leaves in the same time. All of the cables move with the same velocity. The result is that each time the teeth of the wheels 29 remove the leaves from the receptacle 27 they leave them on the cables B, C, and D, and the belt 50 with great regularity and with equal distances between them ready to be carried to the machine.

In connection with each of the drums 47

and 57 two sets of cleaning-cylinders are employed. One set H, comprising two cylinders, is the preparatory set, and the second set H′, consisting of three cylinders, is the finishing or cleaning set. The cylinders of each set represent, practically, in length the semi-diameter of the drum above it, and the sets are arranged, respectively, at each side of a central vertical line drawn through the axis of the drums. The first set is the preparatory set, and, as heretofore stated, it consists of two cylinders 83 and 84, as shown in the end view Fig. 6. These cylinders have their peripheral faces provided with longitudinal ribs or corrugations, which mesh practically in the nature of gears, as is also shown in Fig. 6, and the cylinders revolve in the direction indicated by the arrows in said figure, bruising and breaking the skin and pulp of the leaf passed between them. The gearing preferably employed in the operation of these two cylinders is a large gear 85, attached to the trunnion of one of the cylinders, and the trunnions of both cylinders are provided with interlocking pinions 86. The gear 85 meshes with a pinion 87, fast upon a shaft 88, held to revolve in suitable bearings beneath the cylinders, as shown in Fig. 1. This shaft is provided at its outer end with a pulley, and the pulleys of the two sets of preparatory cylinders are connected with the drive-pulleys of the drive-shaft 30 through the medium of the belts 36 and 38, heretofore referred to.

The cleaning or finishing sets of cylinders are three in number, and are designated in the drawings as 89, 90, and 91. This set of cylinders is shown in detail in Fig. 7, and the direction of their movement is indicated by arrows. The upper cylinder 89 has its peripheral surface covered by a series of teeth 92, knives, or the equivalent thereof, and the cylinder 90, which is the side cylinder, is covered in the same manner. The lower cylinder 91, however, has a smooth periphery and acts in the nature of an anvil or bed-cylinder. The side cylinder 90 is adjustable to and from the bed-cylinder and the upper cleaning-cylinder, and its adjustment is usually effected through the medium of an adjusting-screw 93, having direct communication with one bearing of the cylinder, as shown in Fig. 4, or any equivalent of this arrangement may be employed. By this means the teeth or knives may be made to penetrate the leaf more or less deeply. The gearing employed for driving this set of cylinders usually consists of three interlocking-pinions 94, one being contained on a trunnion of each cylinder. A driving-pulley is carried by one cylinder (the adjustable one) and the pulleys of the adjustable cylinders of each set H′ are connected with the driving-shaft 30 through the medium of the belts 37 and 39, heretofore alluded to, and shown in Fig. 1. The cylinders are journaled in brackets 95, as shown in Figs. 1 and 4, which brackets are projected inward from the posts 12 of the frame. The leaves in passing through the cleaning or finishing set of cylinders are made to assume more or less of an undulating or S-shaped contour in edge view.

A further description of the construction of the cylinders and their action, together with sundry details in the construction of the machine, will be hereinafter alluded to.

When the leaves arrive at the series of pulleys 44 and 45, they receive the pressure given them by the upper pulleys 54 and 55, which pressure destroys the surface of the leaves and substance forming the tissue of the leaves and leaves them so that they double by their own weight. Having passed the point of contact of the pressure of the above-named pulleys, the leaves follow the movement of the cables in a downward direction until they come in engagement with the drums 47 and 48, of which the former takes them by the center and the latter by the thick end; but before the leaves reach this point it should be observed that the cables B, C, and D always serve as a lower support for them, and that the two upper cables E and F act to compress them on the pulleys 44 and 45 and the cables B, C, and D, so that the leaves cannot move downward by gravity; but as the outer or thick end of the leaf resting upon the belt 50 is engaged by no upper cable and as the pressure of the pulleys 44 and 45 has broken their structure at the center the result is that when the leaf or leaves reach the center of the pulleys that end of the leaf or leaves descends by gravity and assumes the perpendicular position shown in Fig. 6 to pass into the first set of preparatory cylinders H. When the leaf arrives in front of the drums 47 and 48, the cables E and F have no effect whatever upon them, because said cables remain between the grooves of the drum and the leaf. On the contrary, the cables B, C, and D compress the leaf with considerable force between themselves and the grooved surfaces of the drums. As before stated, only one half of a leaf is grasped between the drums 47 and 48 and the lower cables, and the other half, hanging from the drum 47, follows the rotary movement of the first or clasped half first downward and then upward. When the leaf descends, its hanging end passes between the preparatory cylinders 83 and 84, which compress the leaf, breaking its structure, and as the drum 47 rotates, the leaf pressed to its lower semi-circumference, descends at the same time that they advance lengthwise or longitudinally of the cylinders, so that the leaf necessarily leaves room between the cylinders for the succeeding leaves, and this is the reason why the cylinders have a length almost equal to the semi-diameter of the drums above them. When the leaf has reached the lower part of the drum 47, it will be observed that all the hanging extension has passed from the preparatory set of cylinders H, and that from this point on the said wheel the leaves ascend between the cleaning-cylinders 89, 90, and 91,

passing through their length in the same manner that they passed through the preparatory cylinders.

From the above statement it will also be observed that when the drum 47 has made a half-revolution the first leaf with which it engaged has passed through the space occupied by the first set of preparatory and cleaning cylinders, the following leaves occupying their respective places between said cylinders and advancing in the same direction as the first leaf, according to the movement of the machine. Five leaves will be under the action of each set of cylinders. Now by returning to the first leaf I find its lower half cleaned and held by its center between the drum 47 and the lower of the central cable-pulleys 59 and pressed at its upper end between the drum 48 and the cable D. The pulley 59, as heretofore stated, is provided with a central plain surface 59^b, over which the cable E passes—that is, it has no groove at that point—so that when the leaf leaves the drum 47 it continues to be supported by the cables B and C, which remain below it, and is slightly compressed by the cable E, which causes it to ascend to the pulley 59. When the leaf is passing over this pulley, it is still pressed between the cable D and the drum 48 at its upper end, and as it advances, when it passes over the pulley 59 and ascends, and in ascending it passes over the drum 48 and in passing over this drum the leaf is turned in the direction of the formerly-retained end, which causes the leaf to pass from beneath the cable E, which, as before stated, holds it but slightly upon the pulley 59, as there is no groove at that point, and on account of the force of attraction exerted by the drum 48 the leaf is compelled to move far enough so that the cleaned part will remain upon the pulley 59. When the leaf has moved the necessary distance—about twenty centimeters—it abandons the drum 48, and then the cable F compresses it upon the wheel 61^a, and thus held it ascends to the point of contact which exists between this pulley and the pulley 63 above it, over which the cable F continues its movement, abandoning the leaf, and at that time the inclined end descends to take a perpendicular position, having been previously pressed between the drum 57 and the cables B and C in the same manner in which it was retained between the drum 47 and the same cables. When the leaf descends, it passes between the second set of preparatory cylinders, which has the same effect upon it as the first set. When the leaf arrives at the lower center of the drum 57, it passes between the last set of cleaning-cylinders H′, where the cleaning is finished, in like manner as was accomplished by the first set of cylinders of the same class. When the leaf is cleaned throughout its entire length, it is immediately in front of the pulley 72, and at this time the cables B and C, which before pressed it to the drum 57, are underneath it and the cable E compresses its upper part against the said pulley 72 until it reaches the upper end pulley 70, on which the cable E continues its upward movement, abandoning the leaf. The latter is thus rendered free from the compressing-cable and, converted into a light mass of cleaned fiber, folds itself over upon the exit-cable G, which conducts it over the lower pulley 80, upon which said cable travels, where workmen receive the fiber and carry the same to the driers. In order to facilitate the work at this point in the operation, the cable G can be extended in a straight line to the place where the fiber is to be delivered.

The description for a single leaf is ended; but as the leaves are scarcely twenty centimeters apart it will be understood that about twenty leaves will always be under the action of the four sets of cylinders and that they will follow simultaneously as soon as the machine is in operation.

The grooved surfaces of the preparatory cylinders form, as heretofore stated, essentially sharp circular gearing in cross-section, the ribs of one cylinder fitting into the grooves of the other, and on account of this construction the leaves are pressed continuously when the cylinders are turned in the direction indicated by the arrows, because as the movement of the machine is unalterable it is necessary that the cylinders should act with equal exactitude and without any slipping between the cylinders and the leaves. This construction of the cylinders prevents all difficulty, and at the same time a better result is obtained from the pressure upon the leaves, because on account of the convexities and concavities presented by the surfaces of both cylinders the structure of the leaves passing between them is destroyed far better than if the surfaces were smooth or only slightly roughened. The cylinders of adjacent sets are journaled in bearings which admit of the leaves passing uninterruptedly from the preparatory to the finishing cylinders. The cylinders are preferably made slightly conical at one end, so that when the leaves present themselves to the cylinders to be operated upon the leaves can conveniently enter and take the form of an **S**, in which form they follow the movements of the cylinders. The velocity with which these cylinders operate depends upon the class of fiber to be cleaned; but the experiments made and which were the origin of this machine were upon the leaves of henequen, and said experiments proved that about four hundred and fifty revolutions per minute give excellent results.

As heretofore stated, in the first set of cylinders H the first half of the leaves is prepared and in the second set the remaining half of the respective leaves is treated. Care should be taken in placing the leaves upon the elevator that the leaves shall be delivered to the receptacle 27 with their thicker ends to the right and their thinner ends to the left. Otherwise when the leaves are passed over to

the drums 47 and 48 the cables might operate upon the thin portion of the leaves, which portion is that adapted to be first treated.

All the wheels or pulleys of which this machine is composed are preferably made of cast-iron; but those having grooves in their peripheral surfaces will be provided with superimposed bronze rings, some being only of bronze and others of bronze and rubber. The drums 47, 48, and 57 are preferably provided with elastic rings—such as rubber, that being the preferred material—between the grooves in their circumference, so that the fibers of the leaves will find a soft support on which to receive the pressure of the cables B, C, and D, which compress them. Thus the drums always present a surface which adapts itself to the inequalities of the leaves which pass into the machine and insure a pressure upon them without danger that the excess of pressure might destroy the fibers when they are subjected to the action of the cables. The other pulleys, from which the leaves do not suffer as great a pressure, will be covered with the bronze rings already mentioned or with an anti-corroding metal for the purpose of avoiding the action of the oxide of iron, which undoubtedly would come to the surface if they were constructed wholly of iron when they were brought in contact with the acid contained in the juice of the leaves, thus preserving the surfaces of the pulleys without oxidation and preventing the spotting of the fibers with oxide of iron from said surfaces. The pulleys may be made entirely of bronze; but as their points of contact with the cables and leaves are only on the surfaces of the circumference a great economy is obtained by facing them in the manner above explained, or oxidation may be avoided in certain parts which are made of iron by the application of suitable paint which will adhere to the surfaces.

The cylinders for cleaning or preparing the leaves have their surfaces covered in the same manner as the pulleys, with rings of bronze or a like metal, which preserve the exterior form of the cylinders and cover the smooth iron surfaces, the facings being adjusted properly and screwed or otherwise fastened to place, so that they cannot move. Thus the effects of the oxide of iron is prevented in these parts also.

The object of the reversing mechanism located between the large or main carrying-drums of the machine will be understood to be that of turning the leaves, as after the leaves have passed over the first set of receiving-drums one section of the leaves will have been cleaned by the first set of cleaning-cylinders. Therefore the position of the leaf must be shifted—that is, a leaf must be turned end for end—which is accomplished by the reversing mechanism and in a manner to cause the cleaned end to be held in engagement with the rear carrying-drum when it reaches said drum, while the uncleaned portion is freed and sustained in position to pass through the second set of cleaning-cylinders. The actual course of the leaves in passing through the cleaning-cylinders is really more diagonal and upward than longitudinally thereof.

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

1. In a fiber-machine, the combination, with carrying wheels or drums arranged one in advance of the other, and cables passing over said drums, of a reversing mechanism located between the carrying-drums and adapted to turn a leaf end for end, and cables acting in conjunction with the reversing mechanism and with the carrying-drums, whereby the leaves are held in engagement with said reversing mechanism and in engagement with the said drums, as specified.

2. In a fiber-machine, the combination, with a set of carrying-drums, a single drum arranged at the rear of the set, and a smaller drum interposed between two aligning larger drums, of cables passed over the aligning large drums and the smaller interposed drums, a reversing mechanism located between the aligning drums, turning a leaf when submitted thereto end for end, the leaf being in transit from the first set of carrying-drums to the second or rear drums, cables engaging with the larger drums and with the reversing mechanism, and means for delivering the material to the drums and carrying it from the drums, substantially as shown as described.

3. In a fiber-machine, the combination, with carrying-drums arranged one in advance of the other, an intermediate drum, a reversing mechanism, and cables engaging with the drums and reversing mechanism, of cleaning rolls or cylinders located beneath the carrying-drums, the said rolls or cylinders being arranged in sets, one set beneath the front and the other beneath the rear carrying-drum, the said cleaning rolls or cylinders acting to strip of pulpy matter the fiber of the leaves clamped to the carrying-drums by the cables, substantially in the manner specified.

4. In a fiber-machine, the combination, with an elevator and a series of spur-receiving wheels located adjacent to the elevator, of a set of large carrying drums or wheels having grooved peripheries, endless cables passed around the carrying wheels or drums, which cables are adapted to receive a leaf from the receiving-wheels and bind said leaf to the carrying-drum, cleaning rolls or cylinders located beneath the carrying-drum and adjacent thereto, a driving-shaft, and a connection between the driving-shaft and the cleaning rolls or cylinders, substantially as described.

5. In a fiber-machine, the combination, with an elevator and receiving spur-wheels fixed upon a shaft journaled adjacent to the elevator, and a series of carrying drums or cylinders held to revolve in front of the receiv-

ing-wheels, of endless cables passed over pulleys located upon the shaft carrying the receiving-wheels, and also engaging with the peripheries of the carrying-drums, and an endless cable located above the aforesaid cables and engaging with the periphery of one carrying-drum only, two sets of cleaning-cylinders located beneath the carrying-drum, one set being corrugated and the other set toothed, a drive-shaft, and a connection between the drive-shaft, the elevator, and the cleaning-cylinders, as and for the purpose specified.

6. In a fiber-cleaning machine, the combination, with an elevator, receiving spur-gears fixed upon a shaft journaled in front of the elevator, a conducting-funnel and conducting-belts located between the receiving-wheels and the elevator, and carrying drums or wheels held to revolve in front of the receiving-wheels, of endless carrying-cables passed over guide-pulleys, and pulleys located upon the shaft carrying the receiving-wheels, said carrying-cables also engaging with grooves in the peripheries of the carrying-drums, and an endless binding-cable engaging with the periphery of one of said drums between two of the carrying or delivery cables, and cleaning-cylinders arranged in two sets beneath one of the carrying-drums, one set consisting of two corrugated cylinders and the other set of two toothed cylinders, and a bed-cylinder, substantially as and for the purpose specified.

7. In a fiber-cleaning machine, the combination, with an elevator, receiving-wheels located in front of the elevator, carrying-drums held to revolve in front of the receiving-wheels, and a second series of carrying-drums located back of the first series, of delivery or carrying endless cables, one of which engages with the peripheral surface of one of the first set of carrying-drums and the others with the other carrying-drum of said set and with the rear carrying-drum, a pulley located between two carrying-drums in longitudinal alignment, which pulley also receives the carrying-cables engaging with said drums, a shifting-pulley located above the pulley interposed between the carrying-drums, two endless cables, both of which engage with the shifting-pulley and with the first set of drums, said cables having independent movement, a delivery-belt located at the rear of the machine, and cleaning-cylinders arranged in two sets beneath each of the longitudinally-aligning carrying-drums, substantially as shown and described, whereby one end of a leaf is first cleaned, the other end being held fast, and when the leaf arrives between the two longitudinally-aligning carrying-drums the position of the leaf is shifted, the cleaned end being held fast and the uncleaned end treated, as set forth.

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