No. 870,838. PATENTED NOV. 12, 1907.

V. A. DE PERINI.

FIBER SEPARATING MACHINE.

APPLICATION FILED MAR. 4, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

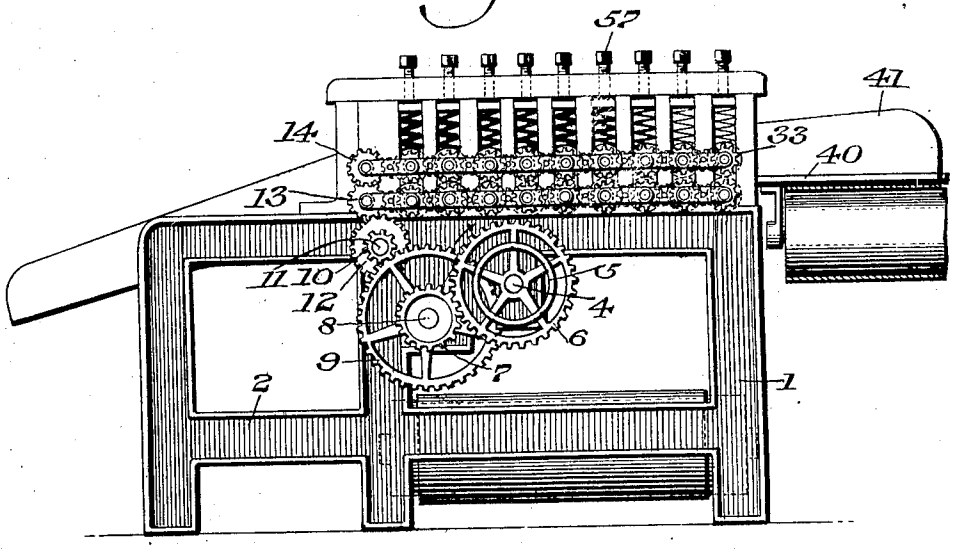
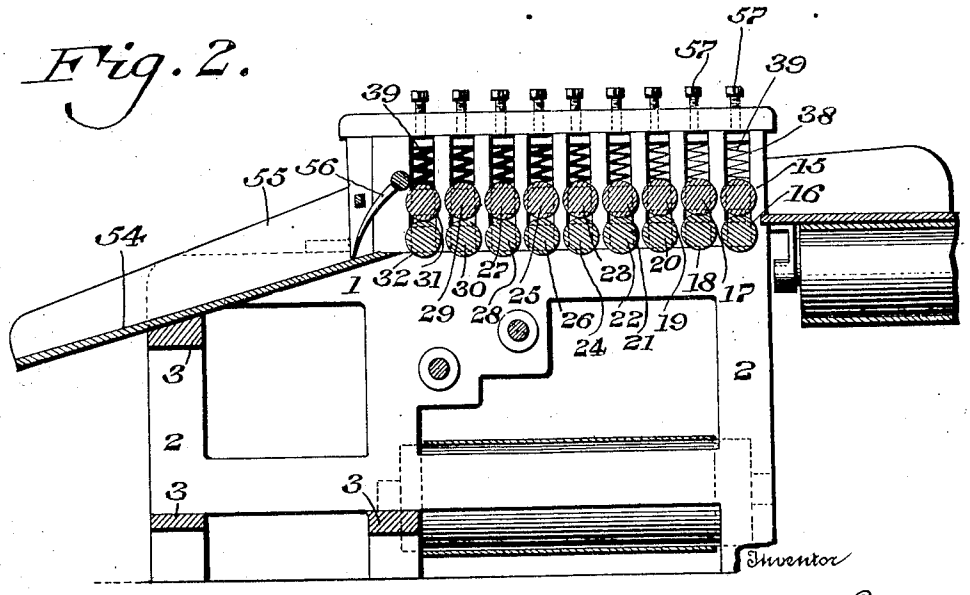


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

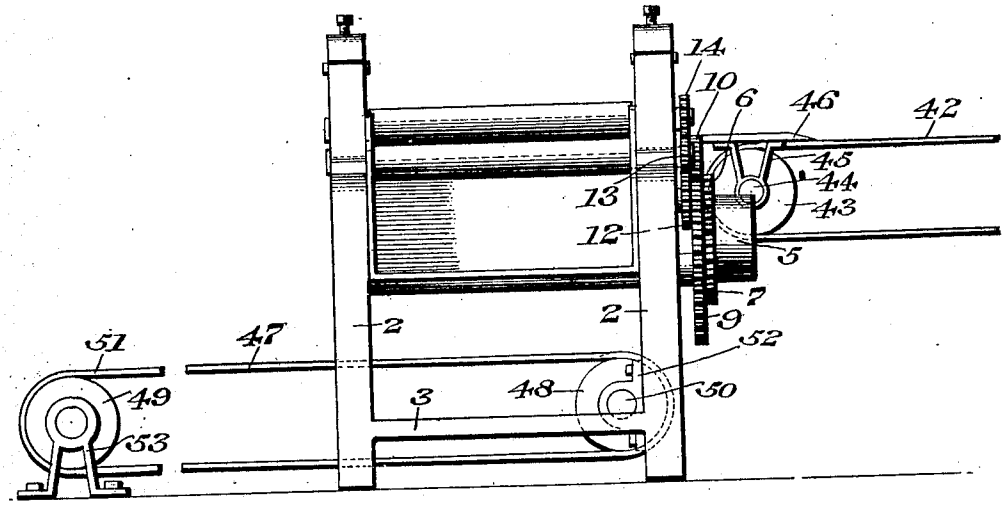


Fig. 4.

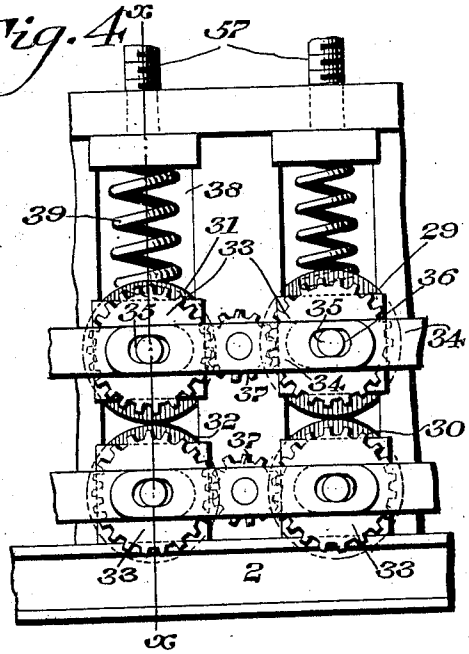
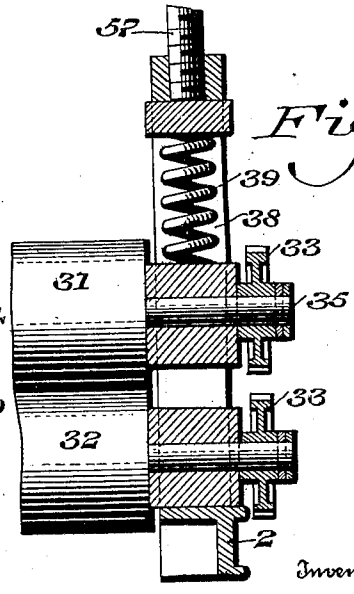


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

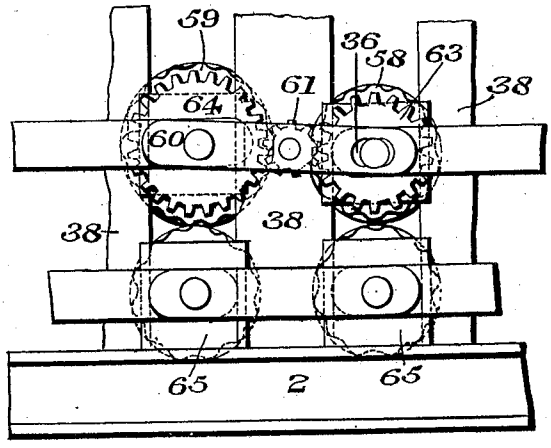
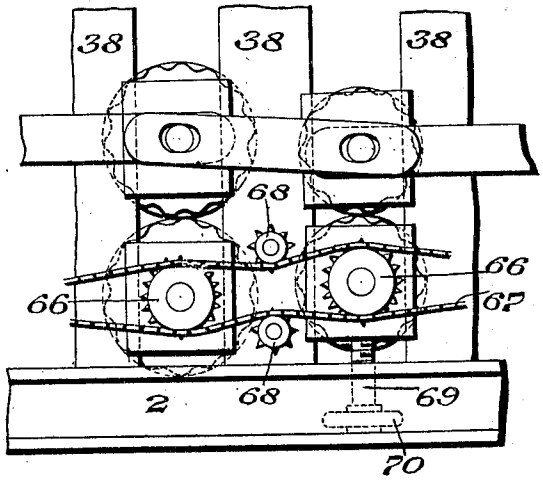


Fig. 7.



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UNITED STATES PATENT OFFICE.

VICTORIO ANTONIO DE PERINI, OF RIO DE JANEIRO, BRAZIL.

FIBER-SEPARATING MACHINE.

No. 870,838. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed March 4, 1907. Serial No. 360,570.

To all whom it may concern:

Be it known that I, VICTORIO ANTONIO DE PERINI, a subject of the King of Italy, residing at Rio de Janeiro, Brazil, have invented a new and useful Fiber-Separating Machine, of which the following is a specification.

The purpose of this invention is to break up the attachments formed by the individual fibers to each other in plants.

A further purpose of my invention is to remove the stem or core from the surrounding fibrous tube.

A further purpose of my invention is to remove this core or stem without cutting or mashing the fibers unduly.

A further purpose of my invention is to subject the material to be operated upon to the action of rollers having variant pressure thereon.

A further purpose of my invention is to successively increase the pressure of the operating rollers upon a fibrous material.

It is my purpose to subject the plant to the action of my machine preferably when dried after retting, though permissibly while the plant is in a moist condition as while still wet from the retting process.

While primarily intended for use in the separation of the surrounding fibers from a definite core offering some considerable resistance to crushing strains, such as is found in plants of the general character of the *Hisbiscus cannabinus* and of the *Canhamo braziliensis perini*, by which I refer to the plant identified in my patent, No. 831,521, dated September 18, 1906, and quite effective in the separation of the fibers of the bark of such plants without injury to them, my invention is also well suited to the treatment of a wide variety of fiber-producing plants.

In the process of separation of fibers from the ligneous formations in which they are found, it is essential that the separating means should not unduly bind, cut or crush the fibers themselves. The danger of this injury becomes especially great in treating a plant having the nature of the *Hibiscus cannabinus* or the *Canhamo braziliensis perini*. The *Hibiscus cannabinus* has from time immemorial been treated by pressure in or against water or flailing and has not lent itself readily to treatment by the existing machines. Its woody core about which the fibers are grouped in a sheath has cut and bruised the fibers during the operation of hackling.

Figure 1 is a section showing the machine largely in side elevation. Fig. 2 is a central longitudinal section of the same structure. Fig. 3 is a broken front elevation. Fig. 4 is an enlarged elevation of a portion of the driving mechanism. Fig. 5 is a section of Fig. 4 upon line *x*—*x* of that figure. Figs. 6 and 7 are detail side elevations of modifications of the structure of Fig. 4.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings:—1 designates a frame of any suitable size and shape, comprising side pieces 2 and connecting members 3. Upon the frame is supported a shaft 4 carrying the driving pulley 5 and also a gear 6, which meshes with a pinion 7 upon shaft 8. This shaft carries gear 9 meshing with pinion 10, secured to the same shaft 11 as is gear 12.

It will be evident that other trains of gearing might be provided to transmit the movement from the driving pulley to the circumference of gear 12 and in any desired location. Gear 12 is in mesh with the gear 13, which is the lower of a pair of gears 13—14 which preferably control the movement of the various breaking rollers.

The actual separation of the fibers is accomplished by a train of preferably fluted or corrugated rollers to which the remainder of my machine is secondary. The frame acts as a support for these rollers and the related mechanism, the gearing supplies movement thereto, the traveling aprons and the feeding table cause the delivery and removal of material thereto and therefrom and the tines aline and arrange the fibrous product.

The rollers are arranged in pairs, the two rollers of each pair lying respectively above and below the space within which the plant is intended to be treated.

The rollers may consist of any desired number of pairs, according to the duty required of them, depending upon the character of the material to be treated, age of the plants, degree of moisture possible or preferred, ultimate range of pressure and desirable difference in pressure of adjoining pairs. I have chosen to illustrate my machine as provided with nine pairs of rollers 15—16, 17—18, 19—20, 21—22, 23—24, 25—26, 27—28, 29—30, and 31—32, which are all of the same size in the illustration, but which may evidently vary in size without requiring other change in the arrangement than to normally so arrange them that the pairs meet in a common plane and to so space and connect them as to accommodate the driving mechanism to the rollers. With the form of link and idler connection I have illustrated, this would require merely the fitting of the links to the spacing and the use of idlers of whatever size might be required to span between the gears upon the shafts.

In Fig. 6 I have shown lower rollers of equal size and upper rollers of unequal size without springs. The difference in size may in itself be desirable in specific cases and may determine the variation in pressure brought to bear upon the fiber. The upper rollers 58, 59 in this case are joined by links 60 in which I have shown an elongated hole 36 in one end only, the amount of movement being insufficient ordinarily to require more. The idler 61 spans between the gears 63, 64 and the difference in size of gears 63 and 64 determines a different angular speed. In the particular illustration the peripheral speeds are approximately the same

though this need not be so in all cases as a stretching of the fiber may be desirable. The lower rolls 65 are dragged by the upper rolls.

Upon each of the roll shafts 35 or whatever number may be used, in my preferred form, I place a gear 33, uniting each of the shafts in the same plane with the adjoining shafts by means of links 34, the said links for purposes of conveninece being alternately outer and inner with respect to the position of the gear, that is, ends of adjoining links overlappnig as illustrated. In each of the links 34, I preferably provide room for movement of the links longitudinally with respect to the shafts in order that the links may continue to maintain contact with the shafts when one or more of the shafts 35 is lifted, which would vary the distance between it and the next shaft. I have shown an elongation 36 for this purpose and have shown it in each end of the link, although it will be evident that with relatively small variation in distance between the shafts, a single enlargement 36 would be sufficient, as seen in Fig. 6. It will be further evident that other means of joining the shafts and providing for this movement might be applied.

In Fig. 7 I have illustrated adjoining pairs of rolls as of different size though the same size upper as lower roll within the pair and have illustrated a different form of drive in which a sprocket wheel 66 upon each lower roll receives its impulse from a sprocket chain 67 which is held to its duty by any suitable means as by rollers which I have illustrated by sprocket idlers 68. Here the lower rolls only are drawn and the peripheral speeds are different. I preferably support the rolls so as to make the pairs of rolls meet in a common plane and have illustrated a suggested means of support and adjustment of smaller rolls in screw 69 and wheel 70.

Evidently the links between the lower rolls in Fig. 6 and the upper rolls in Fig. 7 are not essential and may be omitted.

Upon each link 34, I support an idler 37 adapted to engage with the gears upon each of the shafts adjoining and to lie therebetween. The difference in distance between the shafts in operation of my device never becomes sufficient to render this gear inoperative for the purpose of supplying motion between the shafts and it will be evident that this gear lies always in the axial line between the shafts upon which its intermeshing gears are supported. I preferably mount this idler shaft rigidly upon the approximate center of the link, the distance from the link to the gear evidently being different for the outside links from that required for the inside links by the thickness of the link.

I have thus provided several means for continuous rotation of the rolls. Each roll may be rotated through the agency of the rolls between it and gear 13 or 14, according to whether it lies in the lower or upper plane of rollers or independently. By the arrangement of the gears 13 and 14 at the end of heaviest roll duty, as will be hereafter pointed out, the rolls having lighter duty receive their rotation through those having heavier duty which places the greatest strain upon the gearing of rolls 31 and 32.

I prefer to connect the gears 13 and 14 with the adjoining gears upon rolls 32 and 31 respectively, in the same manner that I form the connection between successive rolls in the same plane which, in one form of my invention illustrated is by means of links 34 and idlers 37.

Each of the upper rolls is arranged at each end in a housing 38, within which it is free to move vertically except as its own weight and, if needed, a spring or other means of variable pressure may prevent. This is for the purpose of allowing the rolls to lift sufficiently to permit the passage of the material to be operated upon through between the upper and lower rolls.

In order to provide for increase of the effect of the rolls upon the fiber to be separated, I arrange for a variation of pressure between successive rolls and illustrate two methods of obtaining this variation of pressure, by spring and by variant weight, though other methods may evidently be made use of. The preferred method of pressure variation of which I make use is by means of springs 39, the springs being of varying strength, so that the lightest pressure is brought by the spring at the end at which the fiber is introduced and the greatest pressure is brought to bear by the springs at the end adjoining gears 13 and 14. The weight variation may be accomplished by using different sizes of rolls or by loading them, as by use of different quantities or kinds of metal for the roll or as filling therefor.

While it is necessary to place the driving mechanism at but one side of the machine, that is, so as to operate upon one end only of the rollers, I preferably place springs 39, where these are used, in the housings at each end of each upper roller making these springs of equal strength upon the two ends of the roller and most desirably depending upon them for a part, if not all, of the varying pressure brought to bear.

It will be evident that one of the rollers of a pair if rotated, would tend to produce rotation of the other roller of this pair and that, for many uses therefore, it is necessary to apply gearing to but one of the rolls of each pair as in Figs. 6 and 7, the gearing being preferably applied in such case to the same ones, that is, either to all of the upper rollers or to all of the lower rollers of the pairs.

It will be evident that the lower rollers may be fixed in position in case the upper rollers are the only ones whose movement other than rotation is desired and that the links 34 with openings 36 are not necessary in connection with the lower set of rolls, but that the lower set may be permanently geared together by gears supported upon the frame of the machine where the upper rollers only are moved.

It will be further evident that both rollers of a pair may be made movable against resistance if desired, or that the lower member only may be so movable. In this last case, of course, advantage cannot be taken of the weight of the roller to cause or vary the pressure of the roller upon the fiber passing through the machine and that any spring or other resilient pressure brought to bear to hold the lower roller up to its duty must take care of the weight of the roller in addition to the pressure which the roller must exert against the fiber operated upon.

I preferably provide a feed table 40, having a guard 41, upon which table the plants are supported and arranged preliminarily to insertion into the machine. It is desirable to supply the plants to the feed table by means of a conveyer or traveling apron and I have

illustrated such an apron at 42 moving endlessly about pulley 43, which is pivoted at 44 within hanger 45. I have illustrated the edge of the table 40 as beveled at 46 in proximity to the conveyer or apron. The other support for the endless conveyer 42 is not shown.

For like reasons of convenience, I provide an endless conveyer 47 which passes about pulleys 48 and 49 supported in any suitable manner as by shafts 50 and 51 moving within pillow blocks 52 and 53.

I preferably provide a second table 54 having guard 55 at what might be called the delivery end of my machine to receive and support the fiber as it comes from the machine. Before reaching this delivery table and after it has passed through the succession of rolls, the fiber is combed by means of fingers 56.

Upon the upper part of each housing, I preferably provide a screw 57, by means of which the pressure of the springs 39 upon the bearings of my rolls may be adjusted for any desired conditions.

My machine is intended primarily for the separation of the inclosing tube of bark or fiber from plants having a woody core and is best adapted to plants of the type of *Hibiscus cannabinus* and *Canhamo braziliensis perini*, but is evidently advantageous for other forms also. The plants are placed upon the carrier 42 transversely thereof and by it are delivered to table 40 whence they are preferably fed into the machine by hand. They are most desirably treated in the dry condition after having been retted. The successive rollers acting upon the plants, break the wood and this wood in its splintered condition drops between the rolls and upon the carrier 47 by which it is removed from the machine. The fiber loosened both from its mixture of wood and from its interfibral bonding is carried through the successive rolls and delivered upon the table 54.

It will be evident that various changes in my machine may be made while still obtaining the advantage thereof, and I desire to include such changes herein.

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

In a device of the character described, a frame, a plurality of rollers supported thereon and arranged in pairs, one of each pair of rollers having vertical movement, vertically movable springs of different pressure resisting movement of the rollers of adjoining pairs, and means for maintaining full operative driving connection between the rollers throughout their movement.

VICTORIO ANTONIO DE PERINI.

Witnesses:

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