(No Model.)

4 Sheets—Sheet 1.

A. MORISON.

BREAKING AND SCUTCHING MACHINE FOR FLAX, &c.

No. 511,352. Patented Dec. 26, 1893.

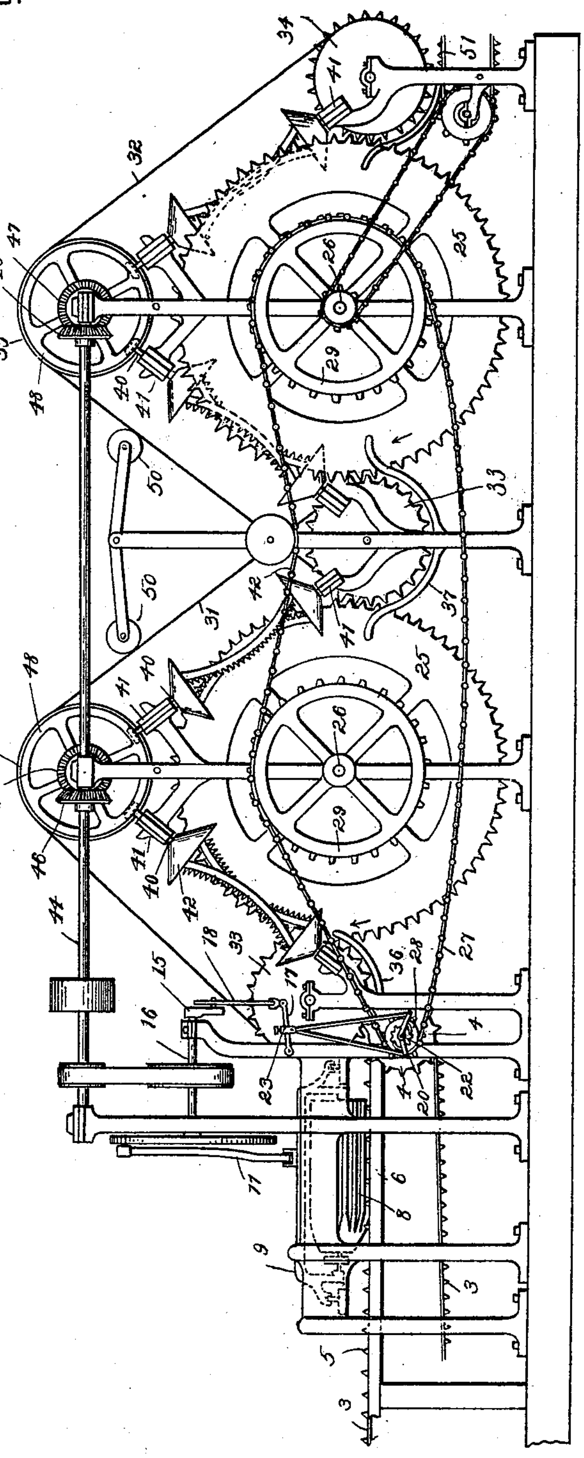

Fig. 1.

Witnesses

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(No Model.) 4 Sheets—Sheet 2.

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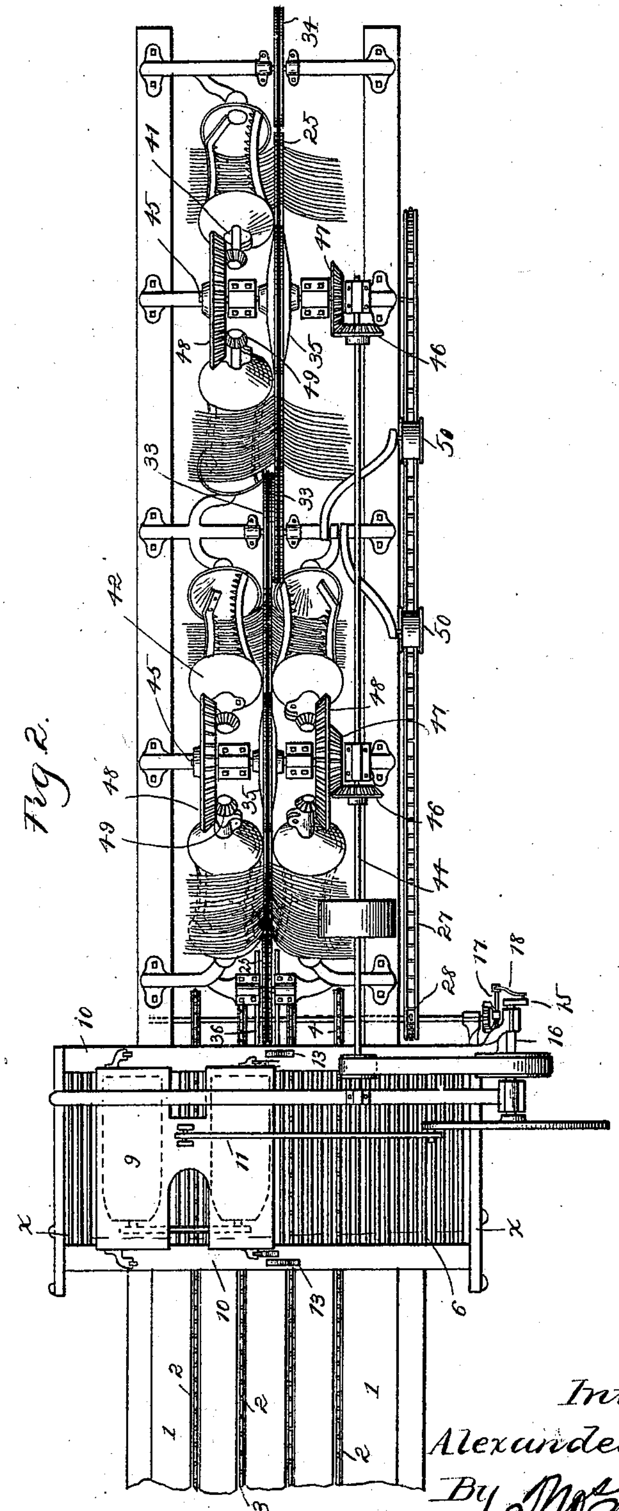

Fig. 2.

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A. MORISON.

BREAKING AND SCUTCHING MACHINE FOR FLAX, &c.

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Fig 3.

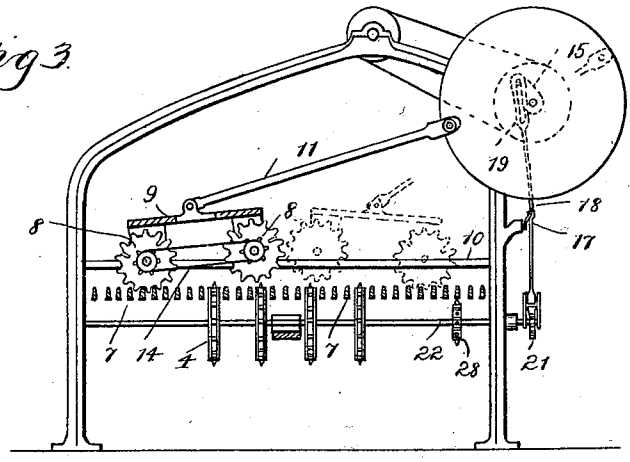

Fig 5.

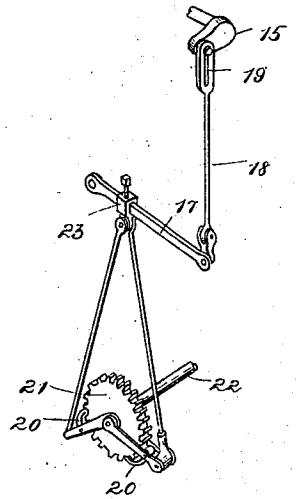

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Fig. 7.

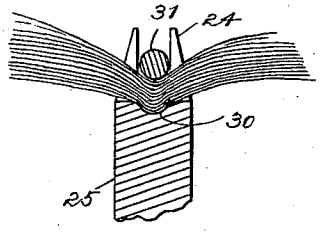


Fig. 1.

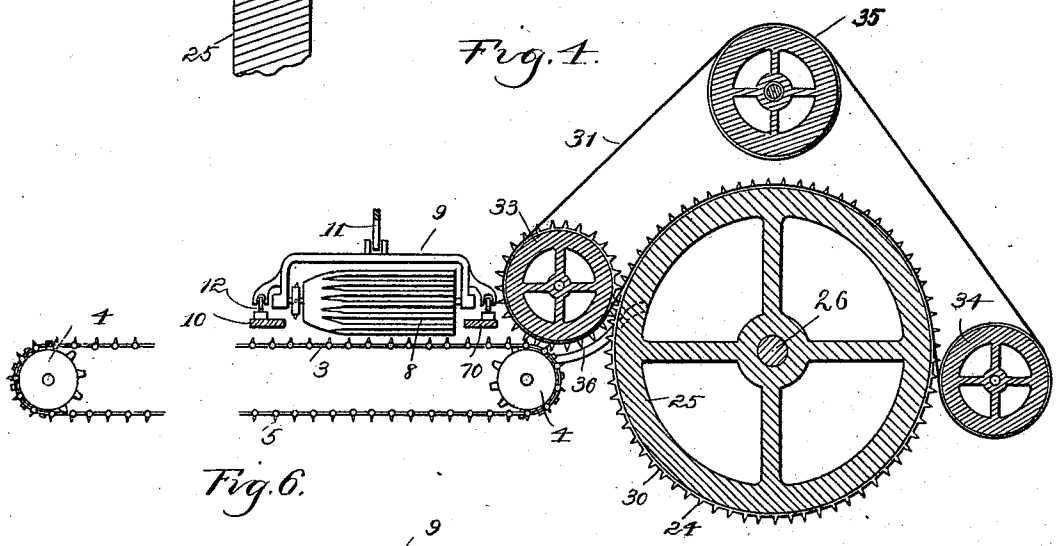
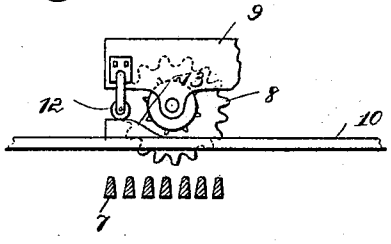


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALEXANDER MORISON, OF ALPENA, MICHIGAN.

BREAKING AND SCUTCHING MACHINE FOR FLAX, &c.

SPECIFICATION forming part of Letters Patent No. 511,352, dated December 26, 1893.

Application filed August 17, 1892. Serial No. 443,288. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER MORISON, a citizen of the United States, residing at Alpena, in the county of Alpena and State of Michigan, have invented certain new and useful Improvements in Breaking and Scutching Machines for Flax, &c., of which the following is a specification, reference being had therein to the accompanying drawings.

My invention is designed to carry out the parts of the process in the preparation of fiber from fibrous plants, such as flax, hemp, &c., which are known to the art as breaking and scutching, and the objects of which are to separate and remove the woody and cellular matter from the fiber.

To this end my machine embodies two distinct sets of devices, one for breaking and the other for scutching the fiber, both devices being operatively combined in the same machine, whereby the straw or stock fed to the machine is transformed into fiber ready for the next step of hackling.

My invention consists in the novel construction and arrangement of parts which form the means for doing this work and the object of which is especially to do away with the harsh manner with which the material is treated in the present machines and whereby a large percentage of valuable fiber is lost, while the product is much entangled, and I will in the course of this specification specifically refer to and point out in the claims the particular arrangement and combination of parts to which my improved results are due.

In the drawings, Figure 1 is a side elevation of my improved machine with part of the supporting frame on the front side omitted. Fig. 2 is a plan view thereof. Fig. 3 is a cross-section on line *x*—*x* in Fig. 2. Fig. 4 is a central longitudinal vertical section through the front portion of the machine, omitting the frame. Fig. 5 is a detached perspective view of the feed mechanism of the carrier. Fig. 6 is an end elevation of one of the breaking rolls showing the device for raising it off the breaking table. Fig. 7 is an enlarged detail section through the periphery of one of the carrier wheels illustrating the action of the gripping cable.

At the front of my machine is arranged a table 1, in which are longitudinal grooves 2 which form longitudinal guides for a number of endless carrier chains 3, the drawings showing four of these chains. These chains run around suitable sprocket wheels 4, journaled transversely below the table, and are for the purpose of feeding the material to the operating parts of the machine, and to this end the chains are provided with upwardly projecting spurs 5, the arrangement being such that the attendant in standing along one side of the table and throwing his bundles transversely upon the table has sufficient room for spreading the material out in a thin layer which in this manner is fed by the chains intermittently to the rear. The rear of this table connects with the breaking platform 6 which is on a level with the spreading table, but is constructed of a series of longitudinal bars 7 suitably secured within a supporting frame and forming open interstices between the bars, whereby the whole substantially forms a grating. The carrier chains 3 also extend through this grating in the intervals between the bars and the stalks are thus carried transversely across the bars forming the grating and during such passage, they are subjected to the breaking action of one or more fluted rollers 8 journaled in a transversely reciprocating carriage 9. The flutings of the rollers of which there are two shown in the drawings are adapted to loosely intermesh with the bars similar to cog gearing, so that in the back and forth movement of the carriage the rollers are caused to revolve, and by their great weight added to the weight of the carriage, the stalks are crushed and broken along their whole length sufficiently to bring them in suitable condition to free the fiber from the woody and cellular portion by the subsequent process of scutching.

In order to allow the stalks to be fed forward at intervals, the carriage with the rollers must either be reciprocated far enough to carry the rollers off the material or the rollers must be lifted off the material at intervals by suitable mechanical devices. To save in length of table and shorten the movement of the carriage, the latter may be bodily raised up a few inches at the end of each stroke, or it may be tilted as shown in the drawings, where the stroke of the pitman 11 which actuates the carriage back and forth

is made long enough to carry one roller beyond the material while the other roller which would still rest upon the material is lifted up a little distance by suitable means such as by providing the carriage with travelers 12 which are adapted to run up, near the ends of the stroke upon suitable inclines 13 secured upon cross bars 10 in front and rear of the carriage. By this means the carriage is tilted up at each end of the stroke of the pitman so that the roller which is not carried far enough to clear the material is lifted up by the tilting of the carriage. If it is desired to save still more in the length of the stroke, the carriage may be lifted up in this manner at both ends to raise both rollers clear of the table. Other means than those described, however, may be easily devised to effect the same result. To compel the roller which is thus temporarily lifted out of mesh with the bars to drop easily into mesh again, the two rollers are preferably geared together in any suitable manner such as by the sprocket chain 14.

The material is fed intermittently at each end of the movement of the carriage; to this end the drawings show a crank 15 on the shaft 16 which imparts movement to the carriage. This crank actuates a vibrating lever 17 by means of a connecting rod 18 which engages with the wrist pin of the crank by means of a slot 19. The vibrating lever actuates two feed pawls 20 which engage on opposite sides of the toothed wheel 21, which turns the shaft 22, on which are the sprocket wheels around which the carrier chains pass. By this means an intermittent feed is imparted to the carrier chains 3 during the interval when the breaking rollers are not in contact with the material and the degree of movement may be regulated by means of the adjustable head 23 on the vibrating lever 17. The material after being subjected to the action of the breaking rollers is now delivered to the scutching devices. To this end the machine is provided with two large carrier wheels 25 arranged one behind the other, but not directly in line, the arrangement being preferably such as to place them near to but on opposite sides of the longitudinal center of the machine. These carrier wheels are secured upon shafts 26 journaled transversely of the frame and are preferably driven by connection with the driving shaft 22, whereby they revolve at the same rate of speed as the carrier chains 3. The drawings show to this end a drive chain 27 passing around a sprocket wheel 28 on the shaft 22 and over two sprocket wheels 29 placed respectively upon the shafts 26 of the carrier wheels.

Each carrier wheel is provided upon its periphery with a groove 30 adapted to receive gripping cables and on each side of the groove are formed serrated or toothed flanges 24. Separate wire cables 31, 32, engage in the grooves on the top side of the carrier wheels, then pass around the under side of two grooved guide wheels 33, 34, placed respectively in front and rear of each of the carrier wheels and directly in line therewith, and then over a guide wheel 35 arranged directly above each carrier wheel. The wheel 33 in front of each carrier wheel has also serrated teeth, but the wheel 34 in the rear of such carrier wheels is preferably unprovided with such teeth.

The cables in connection with the carrier wheels 25 form a grip which is adapted to strongly bind and hold the material at or near the middle while it is being carried through the machine. To this end the first wheel 33 is placed directly at the rear end of the breaking table in such position that its teeth will take up the material the moment the carrier chains leave it; it will then be carried up the grooved guide bar 36 into the teeth of the first carrier wheel 25, the revolution of which will carry it under the gripping cable which engages into the upper side of said wheel, and thereby carry the material while it is firmly gripped over the top half of said wheel. Then as the gripping cable leaves the rear side of the first carrier wheel and passes under the wheel 34 the material is also released from the carrier wheel 25 and taken up by the teeth of the wheel 33 in front of the second carrier wheel. Underneath this wheel is also a grooved guide bar 37 which compels the material to be taken along by the teeth of that wheel and delivered between the teeth of the second carrier wheel 25 which carry it by the intermittent feed motion given to said wheel, over the top half of said wheel under the gripping cable which passes over the same. As the cable 32 then leaves the rear side of said second carrier wheel by passing onto the grooved wheel 34, the material is released and falls to the ground, or onto a receiving carrier 51. Thus the two sets of wheels in connection with the two cables form two carrier devices which carry the material in identically the same manner over the top portion of each of the large carrier wheels 25, with this difference only that the two sets of wheels and cables are a few inches out of line with each other. The object of this arrangement is to change the point at which the material is gripped by the first set of wheels to another point, for the purpose which will appear more fully hereinafter. While the material is thus carried around on top of the carrier wheels the operation of scutching the material takes place; to this end revolving scutchers are provided on opposite sides of the carrier wheels to act against that portion of the material which is hanging loosely outside the gripping cables.

The scutchers are of the nature of revolving beaters mounted upon inclined shafts 40 which are journaled in suitable bearings 41 supported by suitable standards and the beaters which are secured to heads 42 are formed of light steel blades preferably provided at the rear edges with combs or teeth to assist in opening out and loosening the material.

The beater or scutcher blades are curved,

as shown, whereby in the revolution the so-called scutcher blades will strike with their whole length simultaneously against that portion of the material upon which they are to operate. As will be seen two scutchers operate on opposite sides of the first carrier wheel as the material is carried up, and two scutchers operate against the material while it is being carried downward by the first carrier wheel.

The second carrier wheel may be provided only on the side shown with two scutchers; the first pair on the first carrier wheel revolving in a direction to beat against the under side of the material and the second pair to beat against the top side, the motion in each instance being in an outward direction so as to throw the wooden and cellular débris in an inclined direction outwardly and away from the machine.

The two scutching wheels on the second carrier wheel operate one on top, and the other against the under side of the material and their object is mainly to remove that portion of the débris which has been held fast by the gripping cable of the first carrier wheel. If desired, however, scutchers may be provided on both sides of the wheel. These scutchers are revolved very rapidly by suitable drive connection with the main shaft 44 with the machine. To this end the drawings show two transverse shafts 45 journaled on top of the frame and deriving their motion from the shaft 44, by means of intermeshing bevel gears 46 and 47. These shafts 45 communicate their motion to the shafts of the scutchers by means of the intermeshing gear wheels and pinions 48 49.

It will be seen that no provision is made for imparting movement to the gripping cables 32 as it is intended to drive them by the frictional contact with the carrier wheels 25. However, if desired they may be positively driven by suitable connection with the feed mechanism and as these cables are intended to hold the material firmly while acted on by the scutchers suitable tighteners 50 are provided.

I will now proceed to explain the advantages which I claim to derive from my construction.

A principal feature of my machine is the manner in which I break the material. This operation in the present machines I have found from long experience is most too harsh and destroys a great deal of fiber, as it will be understood that any operation in which the dry woody stems of flax, hemp or like fibrous plant are violently broken and bent at sharp angles must necessarily break and tear many good fibers. The expedient of rolling the material with one or more fluted or grooved rollers while lying crosswise on a table constructed of bars in the form of a grating and preferably presenting rounded corners everywhere gives no chance of tearing the fibers; the weight of the rollers and carriage can be easily regulated and adjusted by means of adding or subtracting dead weight, so as to produce a thorough crushing of the stems and loosen the woody substance in small bits by compelling it to follow the sinuous path of the loosely intermeshing parts of the roller and grating. Inequalities in the thickness of the layer of material on the table will make little difference as the whole carriage with the rollers is free to rise and fall vertically. By making the rollers cigar shaped as shown, the material will pass under the rollers and is not likely to be displaced by the movement of the rollers. The proportion between the length of the rollers and the amount of feed given to the material is preferably such that the rollers pass over the material a number of times before the latter leaves the rollers. By using two rollers the material is better held against displacement and it permits of weighting one end of the carriage more than the other so as to bring more crushing weight upon the butt ends of the material.

The scutching in my machine is done by revolving beaters which produce a kind of whipping action while the material is passing up and down in a slanting direction; this is much superior to the old way of holding it in a horizontal position, besides the débris is now thrown outwardly and away from the machine, and at the same time the material is opened out by the first pair of scutchers which operate against the under side of it while being carried upward in a slanting direction.

The expedient of holding and forwarding the material by the large grooved carrier wheels and gripping cables while operated on by the scutchers is also very simple and efficient; the material is held very firmly without being kinked or liable to become entangled and it is carried forward without rubbing and tearing it in contact with stationary parts of the machine. The length of the machine may also be considerably less than it would have to be with a straight carrier.

By arranging the scutchers in pairs on opposite sides and revolving them both in a direction to pull the fibers in the direction of their length, the tendency of the pair of scutchers to pull the material away is neutralized and thus the cable need not grip very firmly.

I have used the word "longitudinal" referring to the direction of the feed, to mean that the straw is fed in the direction of the length of the bars forming the table, the stalks or material being laid across such bars.

What I claim as my invention is—

1. The combination with a breaking table provided with longitudinal slots, a carrier arranged to hold the material at right angles to the slots and adapted to feed it in the direction thereof, and a breaking roller adapted to move transversely said table, substantially as described.

2. The combination of a grated table pro-

vided with a carrier adapted to feed the material in the longitudinal direction of said table, and a transversely moving fluted or grooved roller upon said table, substantially as described.

3. The combination of a longitudinally grated table, a carrier adapted to feed the material in the longitudinal direction of said table, and a transversely moving carriage containing a roller bearing upon said table and provided with a surface adapted to intermesh with said table, substantially as described.

4. The combination of a longitudinally grated table, a carrier adapted to feed the material in the longitudinal direction of said table, and a fluted or grooved traversing roller bearing upon said table provided with a reduced front end, substantially as described.

5. The combination of a longitudinally grated table, endless carrier chains arranged longitudinally of said table, and a transversely reciprocating carriage provided with one or more fluted rollers adapted to intermesh with said table, substantially as described.

6. The combination of a longitudinally grated table, endless carrier chains arranged longitudinally of said table, a transversely reciprocating carriage provided with one or more fluted rollers adapted to bear upon said table and revolve by intermeshing therewith, and means for lifting or tilting the carriage, substantially as described.

7. The combination of a longitudinally grated table, endless carrier chains arranged longitudinally of said table, a transversely reciprocating carriage supported upon said table and carrying one or more rollers adapted to bear upon said table and intermesh therewith and fixed inclines adapted to lift the carriage at each end of the stroke, substantially as described.

8. The combination of the longitudinally grooved spreading table, the breaking table adjacent thereto and formed of longitudinal bars placed at intervals, the carrier chains running in the longitudinal direction of said tables and provided with upwardly projecting spurs for carrying the material, the adjustable intermittently operating feed devices for said chain carrier, the reciprocating traversing carriage provided with a pair of fluted breaking rolls adapted to bear upon and intermesh with the bars of the breaking table, and travelers on the carriage adapted to engage with fixed inclines to tilt or lift the carriage at the ends of its travel, substantially as described.

9. The combination with the grated breaking table and carrier chains for feeding the material in the longitudinal direction of said table, of the transversely reciprocating carriage freely supported upon said table, the fluted breaking rolls longitudinally journaled in said carriage and adapted to intermesh with said table, the fixed inclines on the frame, the travelers on the carriage adapted to engage with said inclines to tilt the carriage at the ends of its travel, and the intermediate gearing connecting the two rollers, substantially as described.

10. In a breaking and scutching machine the combination with a carrier wheel and means for holding the fiber on the wheel, of revolving, obliquely arranged scutchers parallel with the path of the fiber, and means for actuating the scutchers, substantially as described.

11. The combination in devices for scutching, of a carrier wheel provided with a cable adapted to grip the material centrally of its length upon the periphery of said wheel, of two pairs of revolving scutchers, one pair arranged on opposite sides of the ascending slanting portion of the periphery of the upper half of said wheel and the other pair on the corresponding descending slanting portion thereof, substantially as described.

12. The combination in devices for scutching, of a carrier wheel provided with a cable to grip the material centrally of its length upon the periphery of said wheel, of one or more revolving scutchers mounted in proximity to the periphery of said wheel and provided with curved blades adapted to strike the material in the curved path in which the material is carried, substantially as described.

13. The combination with the revolving scutchers, of a peripherally toothed carrier wheel, an endless gripping cable engaging into a peripheral groove of said wheel and passing around a portion of said wheel and means for feeding the material between the periphery of said wheel and the gripping cable, substantially as described.

14. The combination with revolving scutchers, of two like carrier wheels peripherally provided with carrying teeth and arranged one behind the other in planes parallel to each other on opposite sides of a central plane, a gripping cable for each wheel engaging in a peripheral groove of said wheel and arranged to pass around the upper half of the wheel and means for feeding the material to the first wheel and from said wheel to the second wheel, substantially as described.

15. The combination of two like carrier wheels peripherally provided with carrying teeth and arranged one behind the other in planes parallel to each other on opposite sides of a central plane, a gripping cable for each wheel engaging in a peripheral groove of the wheel, and arranged to pass around the upper half of the wheel, means for feeding the material to the first wheel and from said wheel to the second wheel and revolving scutchers arranged to operate upon the material while held in a slanting position upon said wheel, substantially as described.

16. The combination with the revolving scutchers, of a carrier wheel having peripheral carrying teeth, an endless gripping cable engaging into a peripheral groove of said

wheel, and cable guides to carry said cable around the upper portion of said wheel, substantially as described.

17. The combination with the carrier, of the breaking devices, of two peripherally toothed carrier wheels arranged one behind the other in rear of said carrier and in proximity to it, but on opposite sides of a central vertical longitudinal plane through said carrier, an endless gripping cable for each carrier wheel passing around a set of cable guide wheels arranged to hold said cable in engagement with the upper portion of the periphery of said carrier wheel, and intermediate carrier devices formed by curved guide bars arranged beneath the cable guide in front of each carrier wheel and of carrying teeth on said cable guides, substantially as described.

18. In a machine for breaking and scutching fibrous plants, the combination of a longitudinally grated table provided with a carrier for carrying the material in the longitudinal direction of said table, one or more fluted traversing rollers intermeshing with said grated table, two peripherally toothed carrier wheels arranged in different parallel planes, one behind the other and in rear of the carrier of the grated table, an endless gripping cable for each carrier wheel passing around a set of cable guides arranged to hold said cable in traveling engagement with the upper portion of the periphery of said carrier wheel, intermediate carrier devices between the carriage of the grated table and the first carrier wheel and between the first and second carrier wheel, and revolving scutchers in slanting position in proximity to the slanting portions of the peripheries of the carrier wheels substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER MORISON.

Witnesses:
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JAMES WHITTEMORE.