

No. 749,475.

PATENTED JAN. 12, 1904.

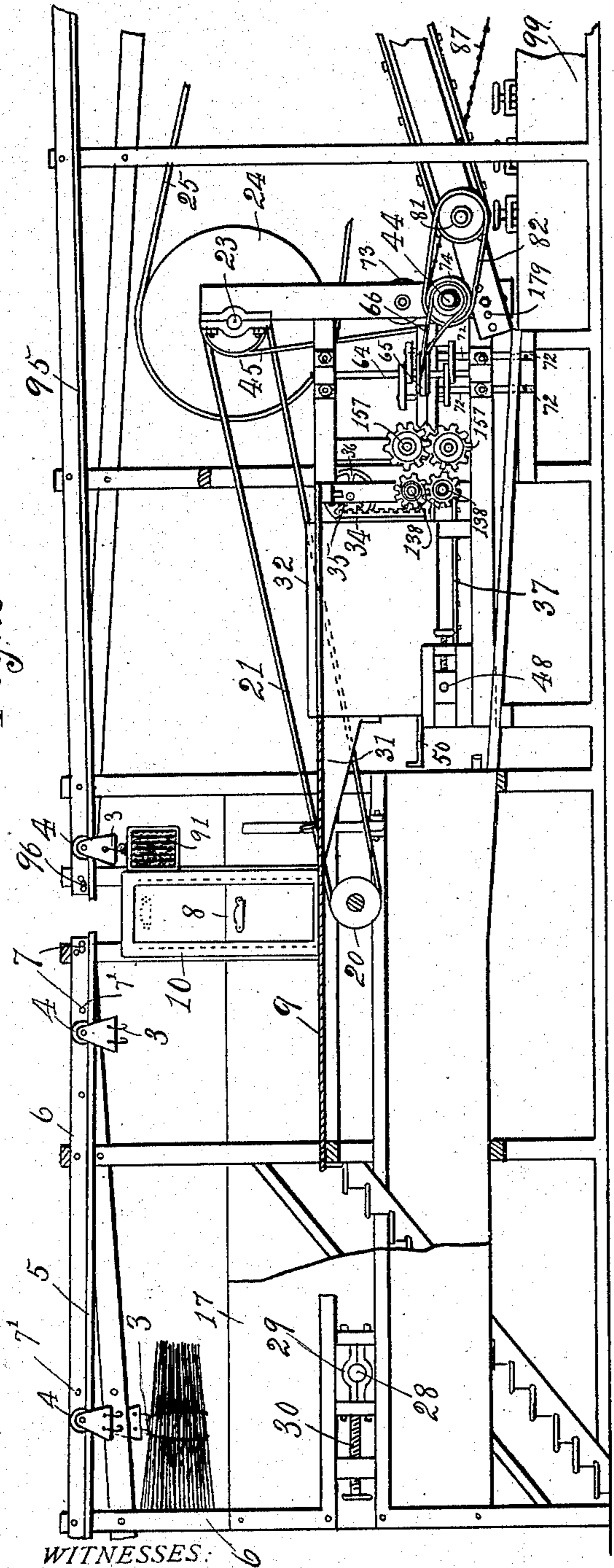
H. A. CLIFFORD.
DECORTICATING MACHINE.

APPLICATION FILED MAY 24, 1901.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 2.



WITNESSES:

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M. J. Begley.

Fig. 5.

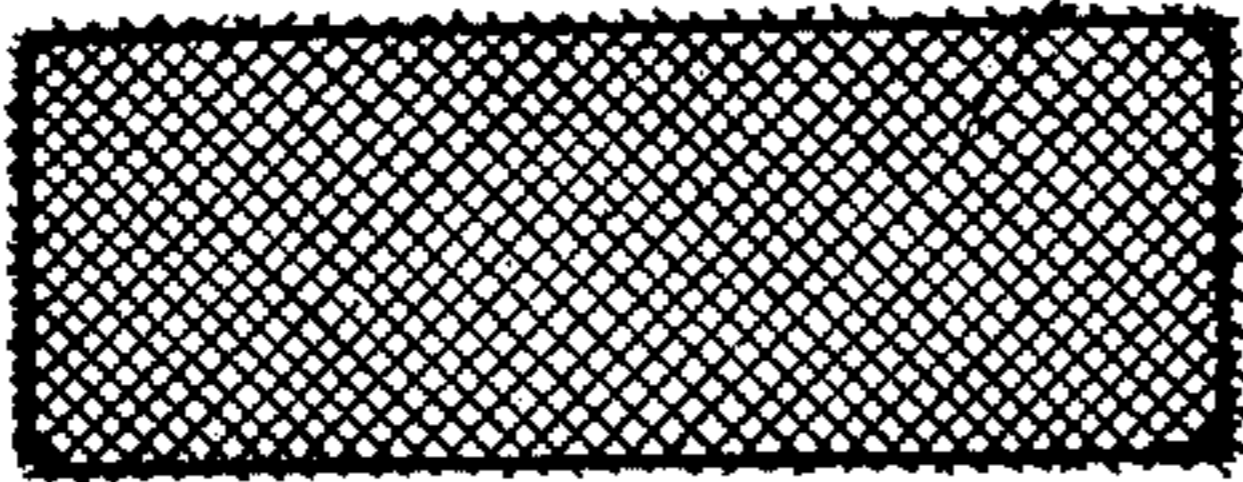


Fig. 6.

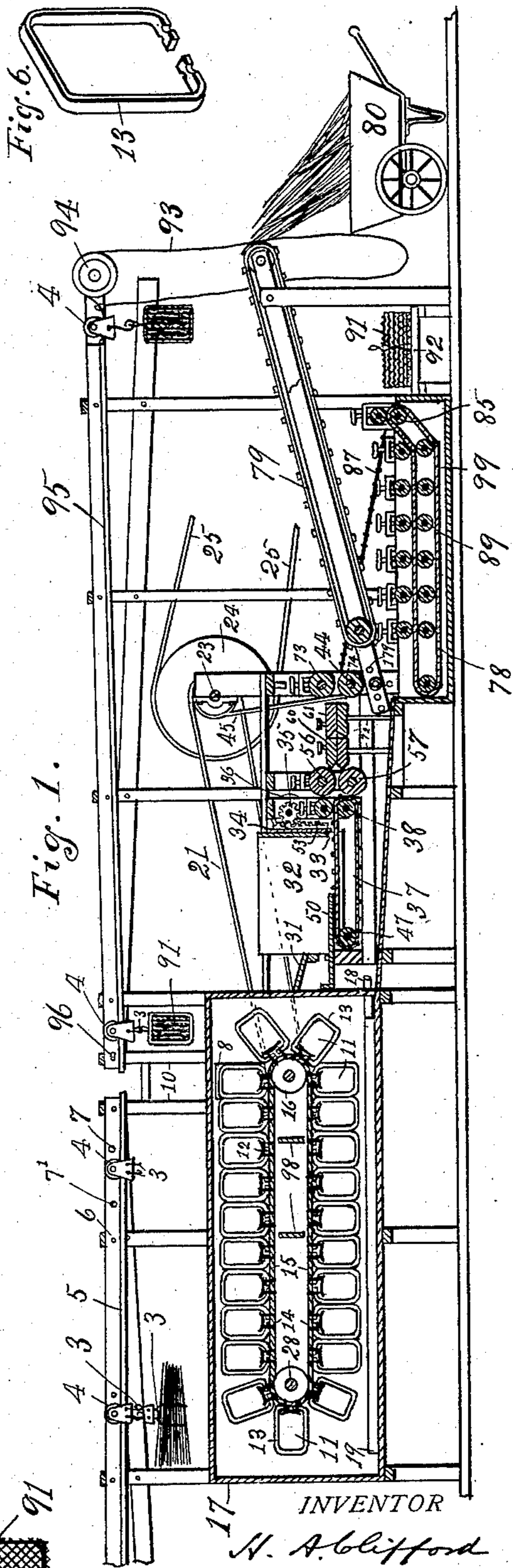


Fig. 1.

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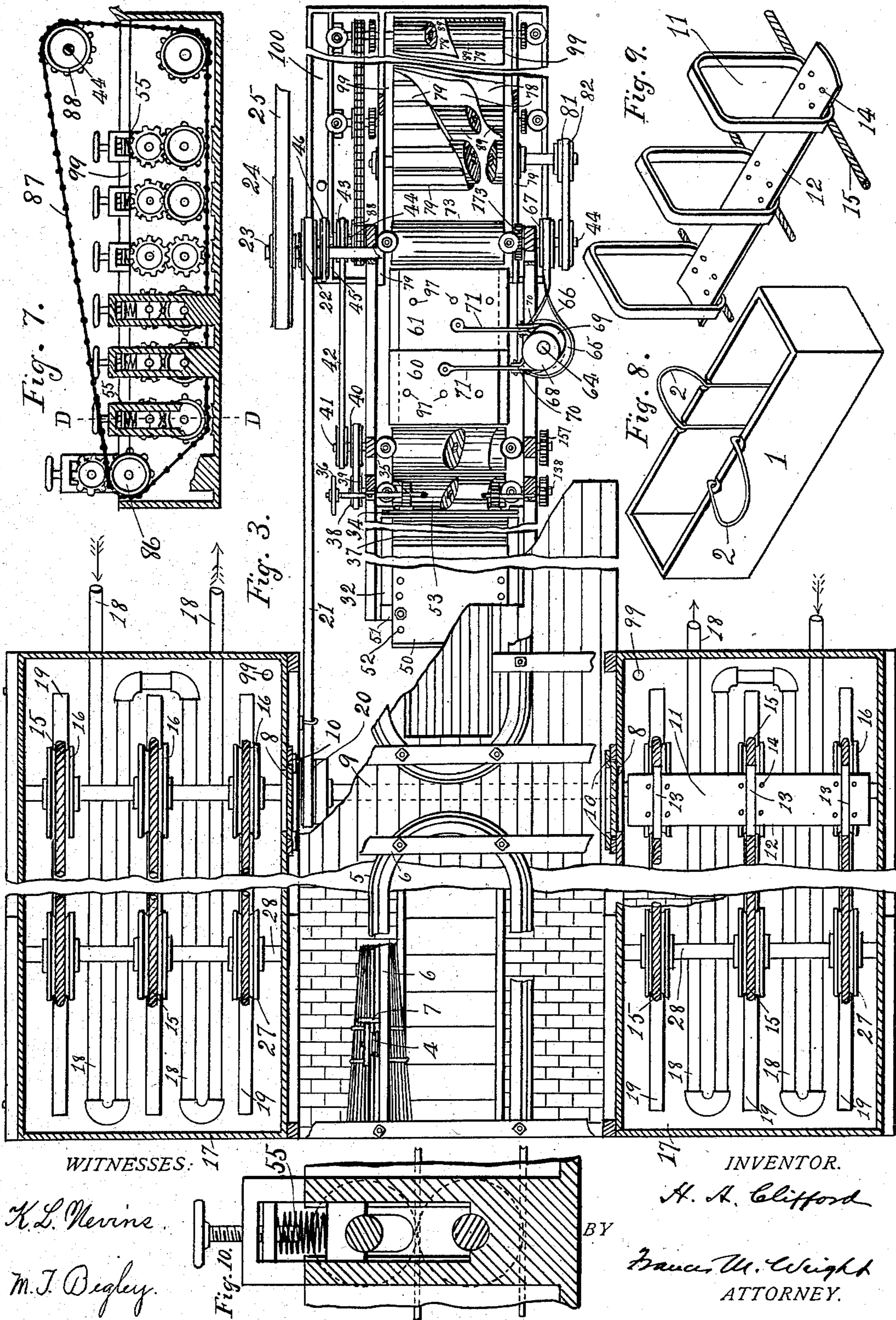
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3 SHEETS—SHEET 2.



WITNESSES:

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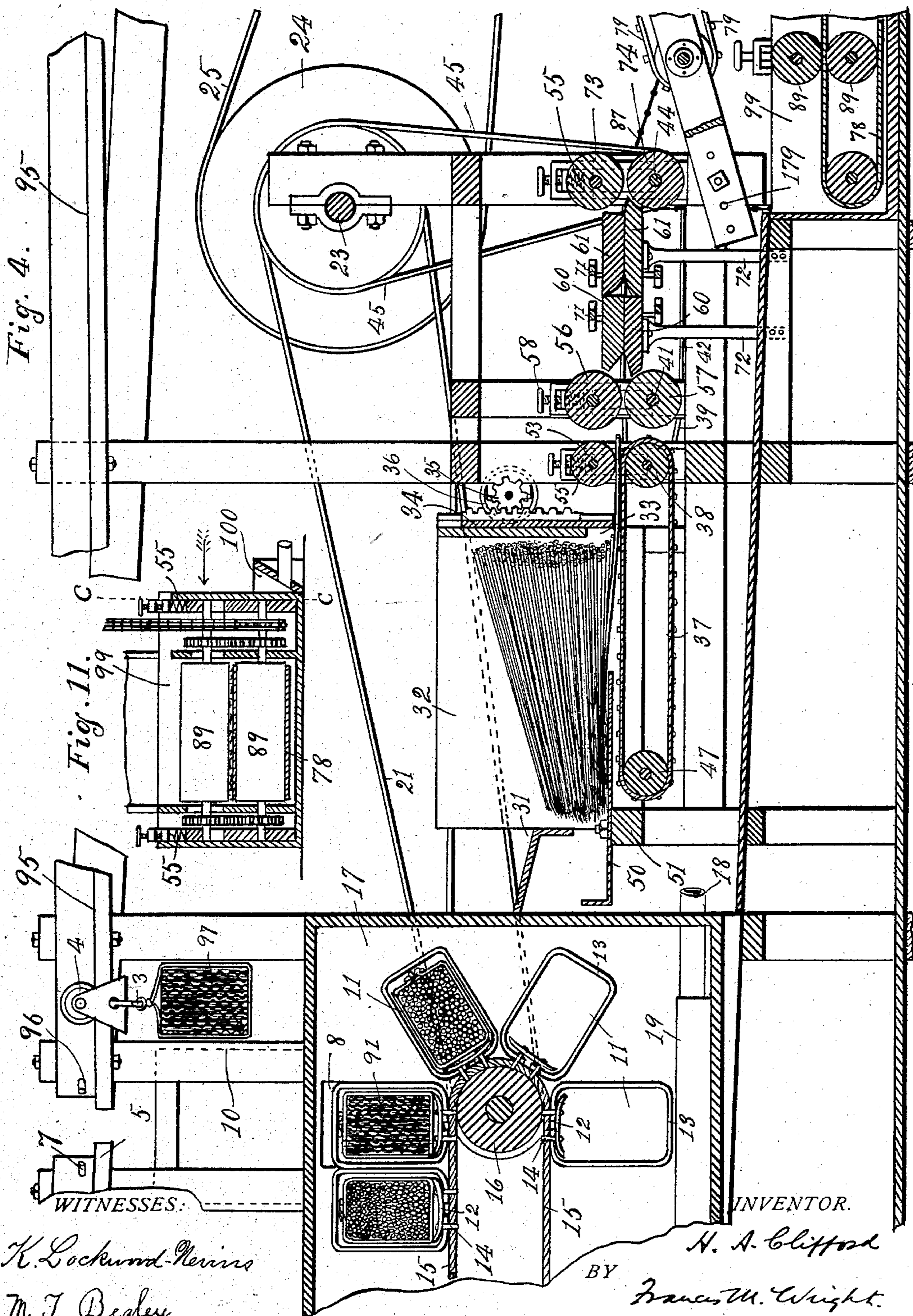
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NO MODEL.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

HERSEY A. CLIFFORD, OF SAN FRANCISCO, CALIFORNIA.

DECORTICATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 749,475, dated January 12, 1904.

Application filed May 24, 1901. Serial No. 61,801. (No model.)

To all whom it may concern:

Be it known that I, HERSEY A. CLIFFORD, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Decorticating-Machines, of which the following is a specification.

My invention relates to improvements in apparatus for removing fiber from hemp, ramie, and other vegetable products of like character having fibers which can be used for industrial purposes.

The object of my invention is to provide an apparatus of this character which will do the work more effectually than has heretofore been possible. The method which I employ to remove the fiber from the stalk in connection with this apparatus is as follows: I first subject the stalk or plant containing the fiber to the action of water and steam at a temperature sufficiently high and for a sufficient length of time to liquefy the gum, which secures to the stalk the lining composed of the fiber which it is desired to obtain. In this vat the fiber is also subjected to the scouring action of sand, a small quantity of which is added to the water in the vat. After the stalks or plants have been subjected to the action of heat and a scouring agent in this manner they are next deposited upon a draper, which carries the same in small portions at a time first beneath a guide-roller to guide and force the material between a pair of crushing-rollers. From the crushing-rollers the material is passed between two pairs of rubbing-plates, which rub the stalks with a twisting action in opposite directions to each other. By this time the fiber is almost wholly separated from the stalks, and the material now passes between finishing-rollers, which complete the separation and carry the stalks forward. When the stalks and fiber are separated, the fiber drops from the stalks upon a draper, which travels in a vat filled with hot water, and in its passage on said draper through said vat the gum of the fiber is dissolved by the action of the water and is squeezed out of the fiber by rollers in said vat. The fiber is then deposited by said draper upon a platform, upon

which is placed a suitable perforated screen, so that said fiber is distributed in an even manner thereon. When a sufficient quantity of fiber has been so placed upon said screen, a second screen is placed upon the top of the fiber, and a quantity of fiber is placed upon said second screen, and so on until a sufficient number of such screens have been filled or covered. A top screen is then laid on the top of the last layer of fiber. Said screens are then bound together in a bundle and are raised and attached to a pulley which runs upon a track, and thus conveys the fiber to the same or another vat, in which it is again subjected to the action of heat and the scouring action of sand and water. The fiber is now thoroughly washed and is then immersed in a saline solution, the effect of which is to retard the drying of the fiber and maintain it soft and pliable and preserve the fiber. This completes the operation. The stalks or waste material separated from the fiber are carried forward by means of a draper and are discharged into any suitable receptacle or vehicle by means of which they can be removed to a distance.

In the accompanying drawings, Figure 1 is a longitudinal vertical section of my improved apparatus, taken through one of the vats and then centrally through the remainder of apparatus. Fig. 2 is an enlarged broken longitudinal section through the center of the apparatus. Fig. 3 is an enlarged broken plan view of the apparatus. Fig. 4 is a still more enlarged vertical section of the central portion of the apparatus. Fig. 5 is a detail showing the grating or screen upon which the fiber is deposited to be carried back to the vat. Fig. 6 is a perspective view of the band forming part of the carrier for the stalks. Fig. 7 is a vertical section on the line C C of Fig. 11 looking in the direction of the arrow. Fig. 8 is a perspective view of one of the boxes or measures for determining the quantity of the stalks proper to be placed in the carrier. Fig. 9 is a similar view of a carrier for carrying said stalks. Fig. 10 is an enlarged partial cross-section on the line C C of Fig. 11. Fig. 11 is a cross-section on the line D D of Fig. 7.

It will be convenient to describe the oper-

ation of this apparatus at the time that the description is given of the several parts thereof.

The stalks of ramie, hemp, or other vegetables from which the fiber is to be separated 5 or decorticated are placed in a suitable measuring-box 1, which measures the amount of stalks or plants to be taken up in a single bundle in order to obtain bundles of uniform size. Said box is also of such shape that the 10 stalks or plants laid therein will be parallel with each other and will not require further handling to straighten out the same. In the box are first placed the wire bands 2, and the stalks are laid upon the top of said band, so 15 that when said bands are drawn out of the box one looped end of the band is passed through the other looped end thereof and is hung upon hooks 3, carried by pulleys 4, running on a track 5, said track being supported 20 by suitable framework 6. Said track is of an elonged-U-shaped form and slopes downward from the rear at one end to the middle portion thereof, so that when the bundles of stalks or plants are placed upon the pulley- 25 block at the rear end and released said pulleys will by gravity run to the middle portion of said track, where they will be arrested by means of a pin 7, when they are unhooked and dropped upon a platform 9. The operator at the same 30 time removes a pin 7 from a hole 7' in the upright member of the track, thereby permitting the pulley to run around the curve and back by the lower portion of the track to a position near to where it started from in position to 35 carry another bundle of stalks. The operator will now raise the door 8, which slides in vertical ways 10, and will thrust the bundle of stalks through said door into one of the carriers 11, formed of a base 12 and bands 13, 40 clamped by clamps 14 to the cables 15. Said cables run on pulleys 16 in a vat 17, said vat having a sufficient quantity of water therein to cover and saturate the bundles during their rearward progress. The water in said vat is 45 heated by means of steam-pipes 18, and in order to prevent the outer sides of the bands 13 scraping against the bottom of the vat there are provided rails or ribs 19, warding off said clamps from said bottom. Sand or 50 other scouring material is deposited in the vat, and by reason of the motion of the carriers and bundles through said vats the water therein is continually agitated, preventing the sand from sinking to the bottom and enabling 55 the particles of sand to penetrate the interstices between the stalks in the bundles. Thus the motion of said bundles and stalks, the high temperature of the water, and the scouring agent scour and clean from the stalks the 60 outer cuticle thereof. The heat of the water also has the effect of softening or liquefying the gum which lies between or surrounding the fiber and the stalk, and the softening of this gum loosens the fiber and permits it to

be readily separated from the stalk, which is 65 done in the manner now to be described.

Referring to Fig. 3 of the drawings, it will be observed that there are provided two such 70 vats as I have described. Each vat is sufficiently long to permit of a large number of carriers each containing a bundle of stalks to travel therein, and in order that the scouring action of the hot water and sand may have 75 full opportunity to do its work I provide that in each vat the carriers and cables shall travel through a large number of revolutions while the carriers in the other vat are being unloaded of their bundles and reloaded with fresh 80 bundles. For instance, supposing that it occupies one minute to take out of a carrier the bundle which has been operated upon by the hot water and sand and to replace a fresh bundle in said carrier and supposing that 85 there are thirty carriers in each vat, it will occupy thirty minutes to complete the changes in all the carriers in that vat. In the meantime the cable and carriers in the other vat will be revolving continuously and will have 90 made a large number of revolutions, partly in the scouring material and water and partly in the steam. The number of revolutions will depend upon the rapidity with which the carriers are driven. The cables 15 are driven 95 by means of a pulley 20, operated by means of a belt 21 from a pulley 22 on a shaft 23, said shaft being driven by means of a pulley 24 and belt 25 from any suitable source of power. Said cables 15 also run around idle 100 pulleys 27 on shafts 28, and for the purpose of taking up any slack in the cables the bearings 29 of said shafts 28 are adjustable by means of screws 30, as shown in Fig. 2.

98 represents plates provided for the purpose of opposing the escape of the steam in 105 the vat through the door 8 when the latter is opened.

99 represents drain-holes for draining off the water from the vats when desired.

The bundles that are removed from the carriers after the immersion in the vat and scouring action therein, as thus described, are 110 dropped from the platform 9 down a chute 31 into a feed-box 32. Said box is opened at its rear end and closed at its sides and front end, except for an opening 33 in the bottom of the 115 latter end, said opening being adjustably closed by means of a gate 34, having a rack operated by a pinion 35, said pinion being operated by a hand-wheel 36 (see Fig. 4) in the usual manner. By this means the gate 34 120 may be lowered to reduce the size of the opening to any desired extent to permit, preferably, a single layer of stalks to pass there-through. For the purpose of advancing said 125 layer there is provided a conveyer 37, operated by means of a pulley 38, driven by means of a belt 39 and pulley 40 on the shaft 41, the latter being driven by means of a belt

42 from a pulley 43 on the shaft 44, driven by means of a belt 45 from a pulley 46 on the before-mentioned shaft 23. The conveyer 37 also passes around an idle pulley 47, which is provided with means, as shown at 48, for taking up the slack in the same manner as were the cables 15. It is desirable that the stalks of ramie, hemp, or other fiber be moved forward by means of their thicker or larger ends, and it is therefore necessary to arrange said stalks so that said thicker ends are in advance, as is shown in Fig. 1. In order to prevent the conveyer 37 acting upon the thinner and weaker ends of said stalks, which would bend said thin ends and tangle the stalks in the feed-box 32, the rear ends of said stalks are raised out of contact with the conveyer 37 by means of a plate 50, which is adjustably supported upon the frame 51, and can be adjusted forward or backward by means of a series of holes 52 in order to conform to the different sizes of stalks or material and to the pressure upon the conveyer. The conveyer 37 moves underneath a roller 53, (driven from the roller 38 by gear-wheels 138,) so that the stalks are carried between said roller 53 and the conveyer, said roller 53 being pressed down upon said conveyer by means of a tension-spring 55. (Shown in Fig. 4.) By this means the stalks are fed between crushing-rollers 56 57, adjustable by means of the screws 58, the lower roller 57 being mounted upon the shaft 41, driven in the manner already described, and the upper roller being driven from the roller 57 by means of gear-wheels 157. The crushing-rollers effect the partial separation or loosening of the fiber from the stalks, and the said stalks with the fiber partly loosened are then passed between two pairs of rubbing-plates 60 and 61, the plates of each pair moving in opposite directions at the same time in a direction transverse to the movement of the stalks, so as to produce a rubbing or twisting motion thereon, and the two pairs making their twisting movements alternately with each other—that is to say, when the top plate of the rear pair is moved to the left and the bottom plate to the right the top plate of the front pair will be moving to the right and the bottom plate of the front pair will be moved to the left. Thus while the front part of the stalk will be twisted in one direction the rear part will be twisted in the opposite direction, and this twisting will be rapidly reversed as the stalk advances between the plates, thereby separating the fiber from the stalk. In order to produce the above movements of the plate there is provided a vertical shaft 64, driven by means of a pulley 65, belt 66, and pulley 67 on the shaft 44, and on said shaft 64 are mounted two pair of eccentrics 68 69. Around each eccentric is passed a strap 70, which is connected by a link 71 to one of the plates 60 or 61. As the eccentrics revolve they will re-

ciprocate the links 71, and therefore also reciprocate the plate 60 or 61, as the case may be. The links 71 are pivoted to the strap 70, so as to permit the plates 60 and 61 to be raised when necessary. It is understood that precisely the same construction is applied to the lower plates 60 and 61, and said lower plates rest upon supports 72, which are formed of spring metal, permitting the lateral or transverse movements of the supports to a limited extent. The holes 97 in the upper plates 60 and 61 are sockets to receive additional weights for increasing the pressure between the plates. The stalks and fibers will now be passed through a pair of rollers 73 74, the latter being mounted upon the shaft 44, already mentioned, and the roller 73 being driven from the roller 74 by means of gear-wheels 173. On emerging from the rollers 73 74 the fiber, which will have been completely separated from the stalk, will fall onto a conveyer 78, while the stalk itself will be carried forward to a carrier 79, which latter will take the stalk upward and discharge it into any suitable receptacle or vehicle 80, by means of which it can be transferred to a distance or used for fuel to heat the water. The carrier 79 is driven by means of a pulley 81 and belt 82 from the shaft 44, and the conveyer 78 is driven by means of a roller 85, operated by means of a sprocket-wheel 86 and sprocket-chain 87, driven by means of a sprocket-wheel 88 on the main shaft 44, as is shown in Fig. 7. The conveyer 78 travels in a vat 99, into which the water expressed from the stalks during the above process runs, and said conveyer passes between a series of wringing-rollers 89, the tension of which is adjusted and obtained by means of screws and springs, so that the fiber carried on the conveyer has the moisture squeezed out of it by the first pair of rollers and then takes up a fresh supply of moisture while passing to the next roller, so that by this repeated saturation with water and wringing out of the same the gum, which had already been brought to a liquid condition, is sufficiently separated from ordinary fiber. When further cleaning is necessary, as with ramie, the fiber is then deposited upon a wire screen 91, resting upon a platform 92, and when a sufficient amount of fiber has been deposited upon said screen a second screen is laid on top of the fiber and other fiber is added, and then another screen is superposed, and so on until sufficient number of screens, each carrying a layer of fiber, are collected together, when an additional screen is placed on the top to form a covering for the last layer. The whole is then bound together in any desired manner and is attached to a pulley-block 4, which is raised by means of a cord 93, running around a pulley 94, and then said pulley-block is raised to a track 95 and is deposited upon said track. The pulley-block is

then released and the bundle of screens and fibers carried thereby move by gravity on the track 95 to a point near the door 8, where the bundle is arrested by a pin 96 and is then removed from the block and placed in one of the vats 17, where it is again subjected to the scouring and cleaning action of sand and hot water in the same manner as before, by which means it is cleaned to the desired fineness.

When it is taken out of the vat a second time, it is first dipped into clean water and is then dipped into a solution of salt water, the effect of which latter is to maintain the fiber in a soft and pliable condition and also to act as a preservative.

The vat 99 is higher on one side than on the other, so that the overflow of water from said vat can run down on one side and also carry away any falling chips or pieces of stalk which may have fallen through with the fiber, and the waste water and chips are carried off by the V-trough 100.

I claim—

1. In an apparatus of the character described, the combination of a vat, means for heating water in said vat, a belt traveling in said vat in a circuit, holders for holding stalks from which the fiber is to be removed, said holders being positively attached to said belt whereby they travel below said belt in the lower part of the path of the latter, and above said belt in the upper part, and a door opening into the upper part of the vat whereby the stalks can be passed into said holders when the latter are above the water-level, substantially as described.

2. In an apparatus of the character described, the combination of a vat, means for heating water in said vat, a belt traveling in said vat, holders attached to said belt, said holders being formed to receive a bundle of stalks, and being entirely open and unobstructed at one end, and a door opening into the upper part of said vat in proximity to which the said open end may be brought by the movement of the belt, substantially as described.

3. In an apparatus of the character described, the combination of a closed vat, means for heating water in said vat, a belt traveling in said vat, holders carried by said belt, said holders being completely free and unobstructed at one end and conformed to receive and carry bundles of stalks, a door opening into the side of said vat above the water-line, and a platform arranged adjacent to said door, substantially as described.

4. In an apparatus of the character described, the combination of a vat, means for heating water therein, means for moving stalks in said vat, a feeder into which the stalks can be deposited when taken from said vat, means for feeding stalks out of said feeder, crushing-rollers between which stalks are so fed, rubbing-plates between which the

stalks are fed from the roller, rollers between which the stalks pass from between said plates, a carrier for removing said stalks, a vat into which the fiber falls from the last-named rollers, squeezing-rollers in said last-named vat, means for transporting said fiber from said vat, and mechanism for operating the movable elements, substantially as described.

5. In an apparatus of the character described, the combination of the vat, means for heating water therein, endless mechanism for transporting stalks therein, said mechanism being provided with means spaced at suitable intervals for holding said stalks in a substantially fixed position relative to said transporting mechanism, means for loosening the fiber from the stalks thus softened in the vat, means for separating the fiber, and means for actuating the above mechanism, substantially as described.

6. In an apparatus for removing fiber from stalks, the combination, with a plurality of belts, of base-plates secured thereon, and bands secured to said base-plates and forming therewith annular carriers, substantially as described.

7. In an apparatus of the character described, the combination of a vat, pulleys in the ends of the vat, cables running on said pulleys, carriers attached to and supported in all positions by said cables, constructed to support the stalks when either above or below said carriers and rails or ribs in the bottom of the vat to prevent contact of said carriers with said bottom, substantially as described.

8. In an apparatus for scouring stalks having a fibrous covering, a vat having means for heating water therein, particles of gritty scouring material in said vat, and means for moving the stalks in said vat, substantially as described.

9. In an apparatus for removing fiber from stalks, the combination of a vat, means for heating water therein, means for moving stalks through the water in said vat, crushing and rubbing apparatus for separating fiber from the stalks, a second vat for receiving the separated fiber, and washing the gum therefrom, said second vat being lower on one side than on the other, and means for operating the movable elements, substantially as described.

10. In an apparatus of the character described, the combination of a vat, pulleys therein, a belt traveling around said pulleys, carriers positively attached to said belt arranged to carry material either above or below said belt, and means for moving said belt, substantially as described.

11. In an apparatus of the character described, the combination of a vat, pulleys therein, a belt traveling around said pulleys, carriers positively attached to said belt arranged to carry material either above or below said belt, means for moving said belt, and

screens carried by said carriers at right angles to said belt, and containing the material therebetween, substantially as described.

12. In an apparatus for removing fiber from stalks, a feeder, a conveyer traveling in the bottom of said feeder, and a plate in the bottom of said feeder above the conveyer at its rear end to raise the rear end of the stalks out of contact with said conveyer, said conveyer being free and unobstructed above the front end thereof to permit the material to rest freely and wholly at its front end upon said conveyer, substantially as described.

13. In an apparatus for removing fiber from stalks, a feeding device having an opening at the bottom of the front end, means for adjusting said opening, a conveyer traveling in the bottom of said device, a plate in the bottom of said feeding device at its rear end above the conveyer to raise the rear end of the stalks out of contact with said feeding device and means for adjusting said plate, substantially as described.

14. In an apparatus for removing fiber from stalks, the combination of a feeder having an adjustable opening in the bottom of its front end, a conveyer forming part of the bottom of said feeder, means for holding the material out of contact with the rear part of said conveyer in said bottom, while permitting it to come in contact with the front portion thereof, a roller in front of the front end of said feeder and a roller beneath said front roller around which said conveyer travels, substantially as described.

15. In an apparatus for removing fiber from stalks, the combination of a feeder, a chute leading thereto, said feeder having its front end closed except for the opening in the bottom thereof, means for adjusting said opening, a conveyer in the bottom of the feeder to support the stalks therein, an adjustable plate forming the rear part of the bottom of the feeder, a roller in front of the front end of the feeder, and a roller beneath said first-mentioned roller, around which said conveyer passes, substantially as described.

16. In an apparatus of the character described, the combination of a feeding device, arranged to maintain the stalks substantially parallel with each other, means for feeding said stalks in the direction of their length, rollers 38, 53, for advancing said stalks, rollers 56, 57, for flattening the stalks, means for applying friction to said stalks to loosen the fiber, and means for separating the fiber from the stalks, substantially as described.

17. In an apparatus of the character described, the combination of a feeder, means whereby the bottom layer of stalks is advanced in said feeder, rollers for directing the stalks, means for flattening the stalks, means for

loosening the fiber by friction, and means for separating the fiber from the stalks, substantially as described.

18. In an apparatus for removing fiber from stalks, the combination of a vat, means for heating water therein, means for moving stalks through the water in said vat, crushing and rubbing apparatus for separating fiber from the stalks, and a second vat for receiving the separated fiber, and washing the gum therefrom, substantially as described.

19. A feeder, means whereby a layer of stalks is advanced in said feeder, means for holding a portion of said stalks out of contact with said means for advancing the stalks, means for crushing the stalks, means for loosening the fiber from the stalks, means for separating the fiber from the woody part of the stalks, substantially as described.

20. In an apparatus for removing fiber from stalks, the combination, with means of removing fiber from the stalks, of a vat for receiving the fiber so loosened, said vat being adapted to contain water, a series of pairs of upper and lower rollers in said vat, the lower portion of the upper roller lying beneath the lowest point of the top of the vat, means for adjusting the pressure between each pair, an endless conveyer passing in one direction between said pairs of rollers, means for feeding fiber upon said conveyer between said rollers under water whereby the fiber is alternately saturated and squeezed to remove the gum therefrom, and positive means for driving each roller, substantially as described.

21. In an apparatus for removing fiber from stalks, the combination of a pair of rubbing-plates, a shaft, eccentrics thereon, straps on said eccentrics, links connecting said upper straps with said plates, and a support for the lower plate formed of spring metal to permit the lateral movement of the support, substantially as described.

22. In an apparatus of the character described, the combination, with means for feeding the stalks, of two pairs of rubbing devices between which the stalks are fed, the upper and lower devices of each pair moving in opposite directions at the same time, and the upper devices of both pairs moving in opposite directions at the same time, whereby torsional friction is applied to two parts of the stalk in opposite directions at the same time and means for so moving said devices, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

H. A. CLIFFORD.

Witnesses:

F. M. WRIGHT,
M. T. BEGLEY.