H. E. ELLIS.

CRUSHER AND SHREDDING MACHINE.

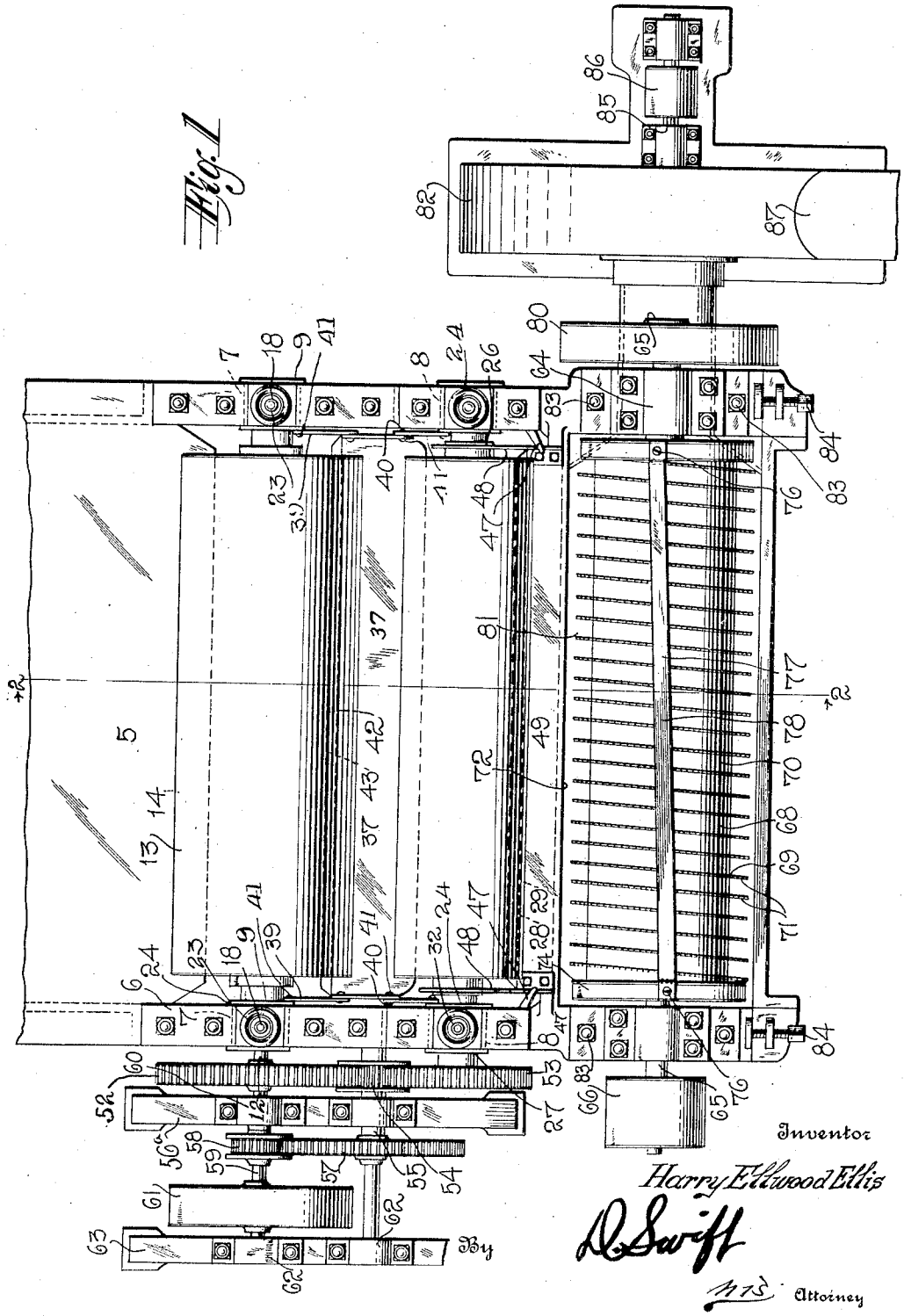
APPLICATION FILED DEC. 29, 1919.

1,358,302.

Patented Nov. 9, 1920.

4 SHEETS—SHEET 1.

Fig. 1



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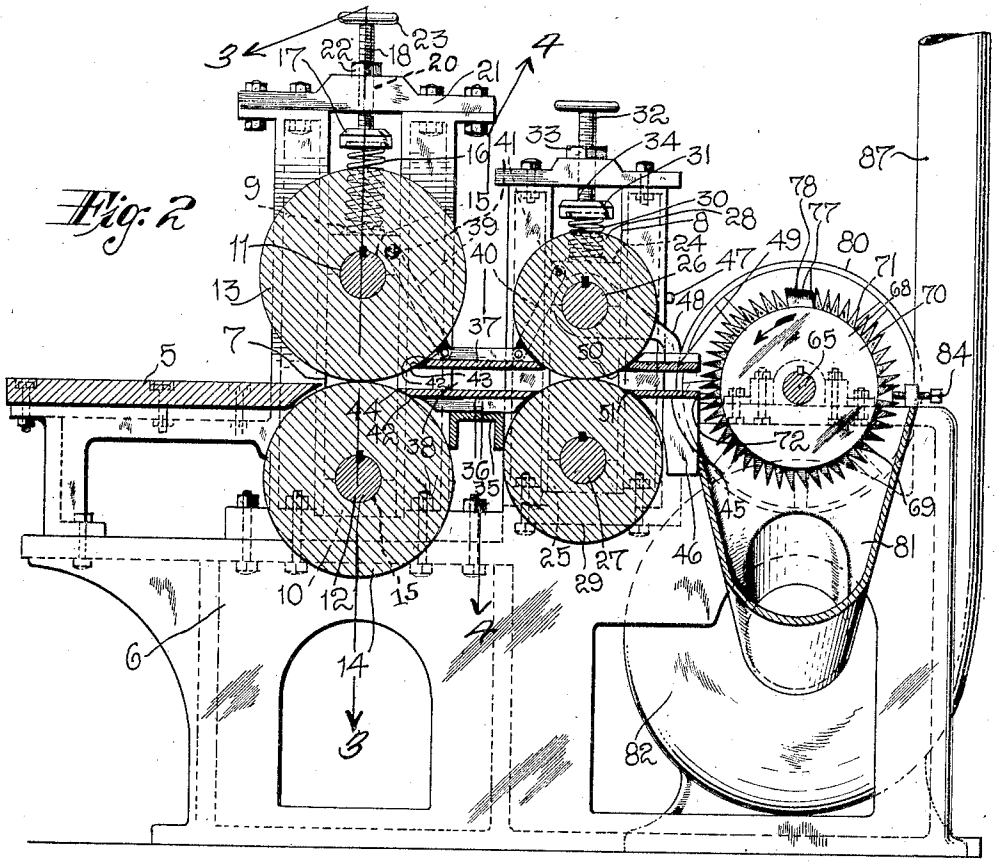
4 SHEETS—SHEET 2.

Fig. 2



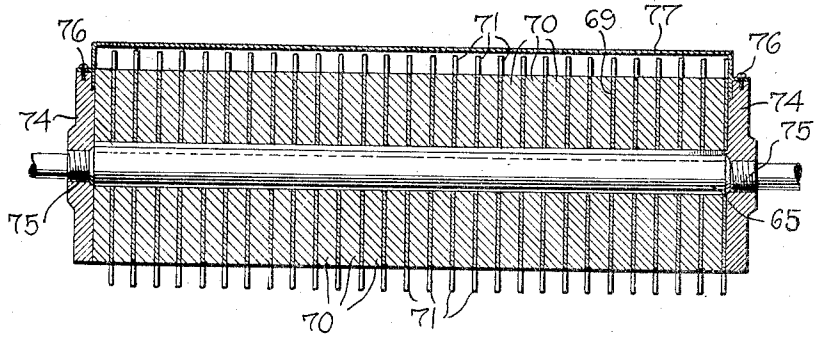


Fig. 6.

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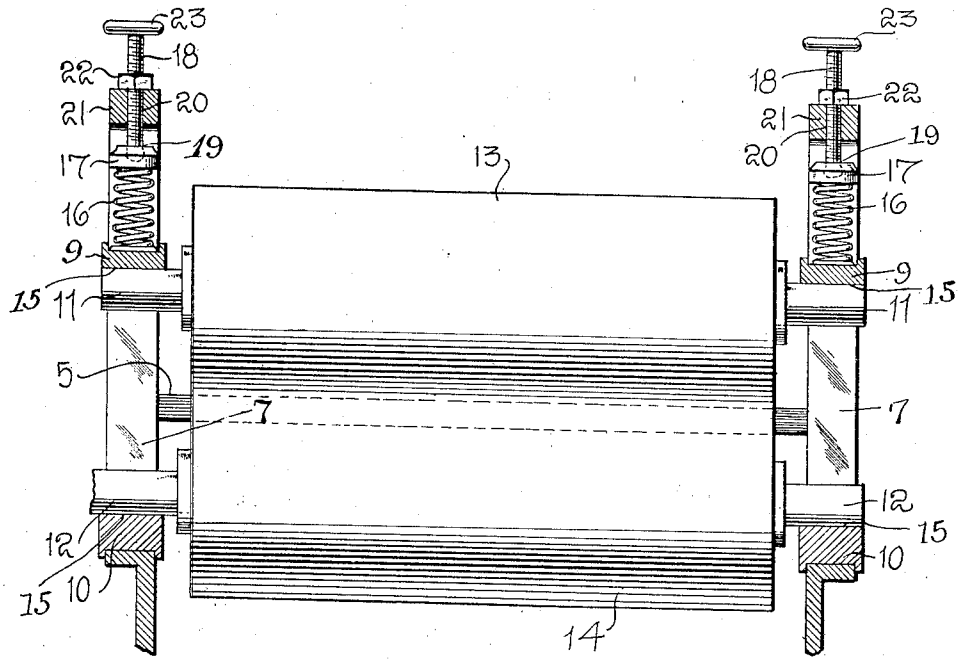
4 SHEETS—SHEET 3.

Fig. 3



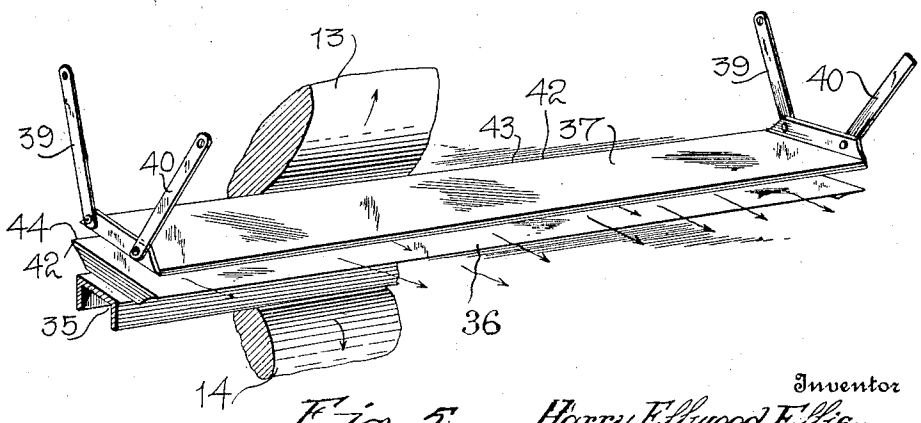


Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 4

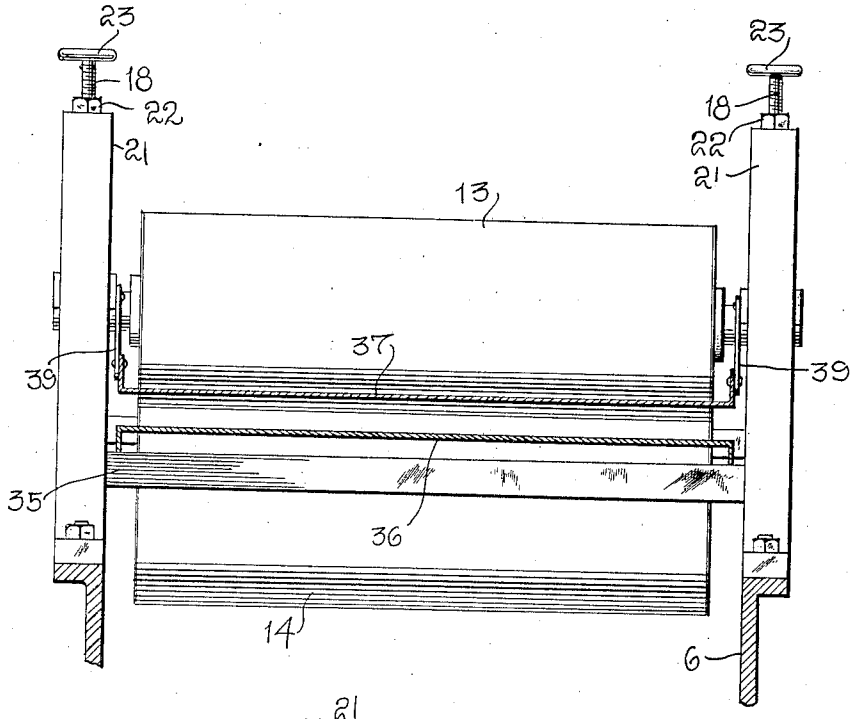
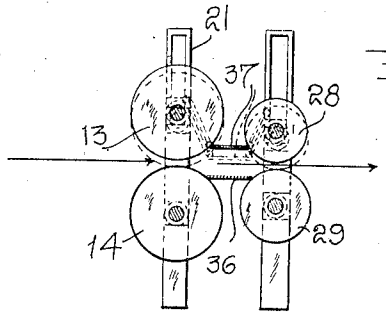


Fig. 7



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UNITED STATES PATENT OFFICE.

HARRY ELLWOOD ELLIS, OF LEESBURG, FLORIDA.

CRUSHER AND SHREDDING MACHINE.

1,358,302. Specification of Letters Patent. Patented Nov. 9, 1920.

Original application filed February 7, 1919, Serial No. 275,661. Divided and this application filed December 29, 1919. Serial No. 347,928.

To all whom it may concern:

Be it known that I, HARRY ELLWOOD ELLIS, a citizen of the United States, residing at Leesburg, in the county of Lake, State of Florida, have invented a new and useful Crusher and Shredding Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to crushing and shredding machines particularly adapted for use in the connection with manufacture of papers from fibrous materials, such for instance as white mangrove, bamboo, bagasse, wild cane and like grass weeds or other products that grow in swampy lands of tropical and semi-tropical countries. Also various woods of the temperate zone, may, by means of shredder and crusher be reduced to a condition whereby the same may be easily treated and reduced to a pulp. The present application is a divisional application of my application filed February 7th, 1919, Serial No. 275,661, apparatus and process for producing pulp.

A further object is to provide a crusher and shredder comprising resiliently supported rollers between which the material passes and is fed into a casing in which a drum is located, on which drum a series of shredding teeth are disposed so that the material will be thoroughly shredded after the same has been crushed between the rollers, also to provide a cutter bar tangentially disposed in relation to the teeth of the shredder and provided with a cutting edge for coöperating with a second cutting edge for cutting the material as it leaves a passage between the adjacent crushing rollers and the shredding drum.

With the above and other objects in view, the invention resides in the combination and arrangements of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:—

Figure 1 is a plan view of the crusher and shredder.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2, showing the rollers in elevation.

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a detail perspective view of one of the doctor plates and its link connections.

Fig. 6 is a longitudinal sectional view through the shredding roller.

Fig. 7 is a detail view partly in section taken transversely through the doctor plate and showing the adjacent rollers for operating the same.

Referring to the drawings, the numeral 5 designates a table on which the material to be crushed and shredded is disposed, by means of a conveyer or any other suitable mechanism. The machine comprises a frame 6 on which the bed plate or table 5 is mounted. This frame is provided with pairs of opposite guides 7 and 8, which are upright. Mounted in the guides 7 are the upper and lower bearing blocks 9 and 10, the blocks 9 being superimposed in relation to the blocks 10. The shafts 11 and 12 on which the upper and lower crushing rollers 13 and 14 are keyed have their ends engaging the semi-circular bearings 15 of said blocks 9 and 10, the upper blocks 9 acting as followers. The material passes between and is crushed by the upper and lower rollers 13 and 14, there being springs 16 bearing with sufficient pressure upon the upper blocks, (which are dove-tailed in the guides) in order to provide sufficient pressure for upper roll. The lower bearing blocks are also dove-tailed in the guides. The springs 16 are engaged on their upper ends by the followers 17, to which the screws 18 are swivelly connected as at 19. The screws are threaded at 20 into the heads 21 of the guides, and by loosening the lock nuts 22 the screws may be adjusted by grasping the hand wheels 23, for increasing or decreasing the tension of the springs. Mounted in the guides 8 are bearing blocks 24 and 25, the blocks 24 being superimposed with relation to the blocks 25. Both blocks are similar to the bearing blocks 9 and 10. Upper and lower shafts 26 and 27 have their ends mounted in bearings of the blocks 24 and 25. Auxiliary crushing

rollers 28 and 29 are keyed to the shafts 26 and 27, and between which the material passes after passing from between the rollers 13 and 14. The upper bearing blocks 24 as well as the bearing blocks 25 are dove-tailed in their guides. Suitable springs 30 engage the bearing blocks 24, there being followers 31 engaging the upper ends of the springs. By adjusting the screws 32, subsequently to having loosened the nuts 33, the tension of the springs may be increased or decreased, as may be required whereby the upper roll 28 may coöperate with sufficient pressure with the lower roll for crushing the material. The screws 32 are swiveled at 34 in the followers 31. Mounted on a support 35 which is secured in any suitable manner between the sets of guides is a scraper plate 36, which is sometimes termed "a doctor." A second scraper plate or doctor 37 is superimposed with relation to the scraper or doctor 36 and spaced therefrom, thereby providing a throat 38 through which the material may pass, when passing from the main crushing rolls to and between the auxiliary crushing rolls. This second scraper plate or doctor has pivoted thereto the links 39 and 40, which are in turn pivoted at 41 to the upper bearing blocks 9 and 24. It is apparent that as the upper crushing rollers 13 and 28 yield incident to the material passing therebetween, the upper scraper plate or doctor will move therewith. These scraping plates or doctors 36 and 37 have their corresponding portions 42 beveled so as to form sharp scraping edges 43 and 44, which coöperate with the circumferences or peripheral surfaces of the upper and lower rollers 13 and 14, for scraping the material from the rolls, thereby preventing the same from moving around with the rolls and keeping the faces of the rolls clear for additional material. A scraper plate or doctor 45 has its depending parts 46 secured in any suitable manner to the sides of the frame 6, adjacent the lower roll 29. Pivotally suspended on the ends of the shaft 26 and limited in their upward pivotal movement by the lugs 47 are the arms 48, to which arms is connected a scraper plate or doctor 49, which is superimposed with relation to the scraper plate 45. It is obvious that the scraping plate 49 will move with the upper roll 28, as it raises and lowers incident to the material passing between the rolls 28 and 29. These scraping plates or doctors 45 and 49 also have sharp steel cutting edges 50 and 51, for coöperating with the peripheral faces of said upper and lower rolls 28 and 29, for scraping the material therefrom, and preventing the same from adhering to the surfaces of the rolls. The corresponding ends of the lower shafts 12 and 27 are provided with gears 52 and 53, which are in mesh with a pinion 54, of a countershaft 55, which is mounted in a bearing 56 of one end of the frame 56ª. This shaft 55 has a gear 57 meshing with a pinion 58 on a countershaft 59, which is also mounted in a bearing 60 of the frame. A pulley 61 is carried by the shaft 59, and this shaft and the shaft 55 is mounted in additional bearings 62 of the standard 63. By means of power being transmitted as will be hereinafter set forth to the pulley 61, motion will be imparted to the lower rolls 14 and 29. The series of crushing rolls are designed to have smooth faces and are to be constructed of any suitable material, preferably chilled cast iron. Also mounted in bearings 64, which are adjustable as will be hereinafter set forth, is a shaft 65 provided with a pulley 66 at one end. Keyed upon the shaft 65 is a shredding roll 68. This shredding roll comprises a series of circular saw blades arranged at spaced intervals, and interposed between said saw blades 69 are circular wood or other fiber fillers 70, which are of such diameters as to leave the teeth of the saw blades projecting beyond. These teeth may be of any desired pitch, preferably as shown, and are designed to coöperate with the edge portion 72 of the scraper plate or doctor, for shredding the material as it leaves the passage 73 formed by the scraping plates or doctors 45 and 49. The saw teeth are constructed of tempered steel preferably of a coarse pitch, and are beveled to a sharp edge. These circular saw blades and their intermediate fillers of wood are clamped and held in place on the shaft 65 by means of circular cast iron heads 74, which are threaded by right and left threads 75 on the shaft 65. Bolted or otherwise secured at 75 on the head plates is a cutter bar 77, which arches the saw teeth. This cutter bar is arranged slightly tangential with relation to the teeth, and is provided with a sharp cutting edge 78, for coöperation with the cutting edge 72, said cutter bar and cutting edge 72 forming means whereby the material after it is shredded is cut into lengths. The shredding and cutting actions take place as the crushed material leaves the passage or space 73. As the crushed material leaves the space 73 it is shredded by the teeth of the shredding roller and the fibrous ends of the crushed material, which has been shredded, will project over the cutting edge 72 so that the cutter bar 77 as it rotates downwardly, the fibrous shredded ends projecting beyond the cutting edge 72 will be sheared off so that fiber will be cut in lengths. This cutter bar is constructed of tempered steel, and owing to its angle with relation to the shredding roller, that is to the axial bearing of the shredding roller, as shown in Fig. 3, the cutting bar makes a shearing cut against the cutting edge 72 of the scraper, doctor or bed plate 45. On an inspection of the drawings it will be seen that the saw blades are arranged at

angles to the axial line of the shredding roller shaft, as shown in Fig. 3, thereby providing an eccentric cut or shredding action on the material as it leaves the passage 73. The opposite end of the shredding roller shaft has a pulley 80, and it is obvious that belting may be connected either to this pulley 80 or to pulley 66. If to the latter the shredding roller may be operated at a greater rate of speed and if to the former the speed may be decreased. The material after being cut and shredded by the roller, empties into the hopper 81, which is in communication with the exhaust fan 82. The bearings of the shaft 65 of the shredding roller are connected by slot and bolt connections 83 to the frame 6, and by means of the screws 84 which are swiveled to said bearings, the bearings may be adjusted whereby the shredding roller may be adjusted toward and from the cutting edge of the bed plate 45. The shaft 85 of the fan is provided with a pulley 86, to which power may be transmitted for operating the fan, for creating a suction, for drawing the material into the fan casing and forcing the same through the conduit 87.

From the above it will be seen that a crushing and shredding machine is provided wherein the material will be thoroughly crushed by the crushing rollers and then thoroughly shredded by the shredding drum.

The invention having been set forth what is claimed as new and useful is:—

1. In a machine for crushing and shredding swamp growths, the combination with a frame, of upper and lower crushing rolls mounted in guides of said frame and arranged in pairs, the upper rolls being yieldable, means for tensioning the upper rolls, a throat for carrying the fiber as it leaves from between one pair of rolls toward and between the other pair of rolls, said throat comprising upper and lower plates, the lower plate being stationary, and the upper plate being movable with the upper rolls.

2. In a machine for crushing and shredding swamp growths, the combination with a frame, of upper and lower crushing rolls mounted in guides of said frame and arranged in pairs, the upper rolls being yieldable, means for tensioning the upper rolls, a throat for carrying the fiber as it leaves from between one pair of rolls toward and between the other pair of rolls, said throat comprising upper and lower doctors, the lower doctor being stationary, and the upper doctor being movable with the upper rolls, said upper and lower doctors having means for scraping and keeping clean the cylindrical surfaces of one pair of rolls.

3. In a machine for shredding swamp growths, the combination with a frame, of upper and lower crushing rolls mounted in guides of said frame, the upper roll being movable, tensioning means for the upper roll, means for regulating the tensioning means, a shredding roll, and a throat to receive the crushed growths as they leave from between the crushing rolls for conveying the growths toward the shredding roll, said throat comprising upper and lower doctors, the lower doctor being stationary, and the upper doctor having connection and being movable with the upper roll.

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

HARRY ELLWOOD ELLIS.

Witnesses:

RUTH BOURLAY,

CHRISTINE B. MACKENZIE.