Aug. 12, 1924.

1,504,495

J. F. M. PATITZ

ROTARY TILLER

Filed May 27, 1918

2 Sheets-Sheet 1

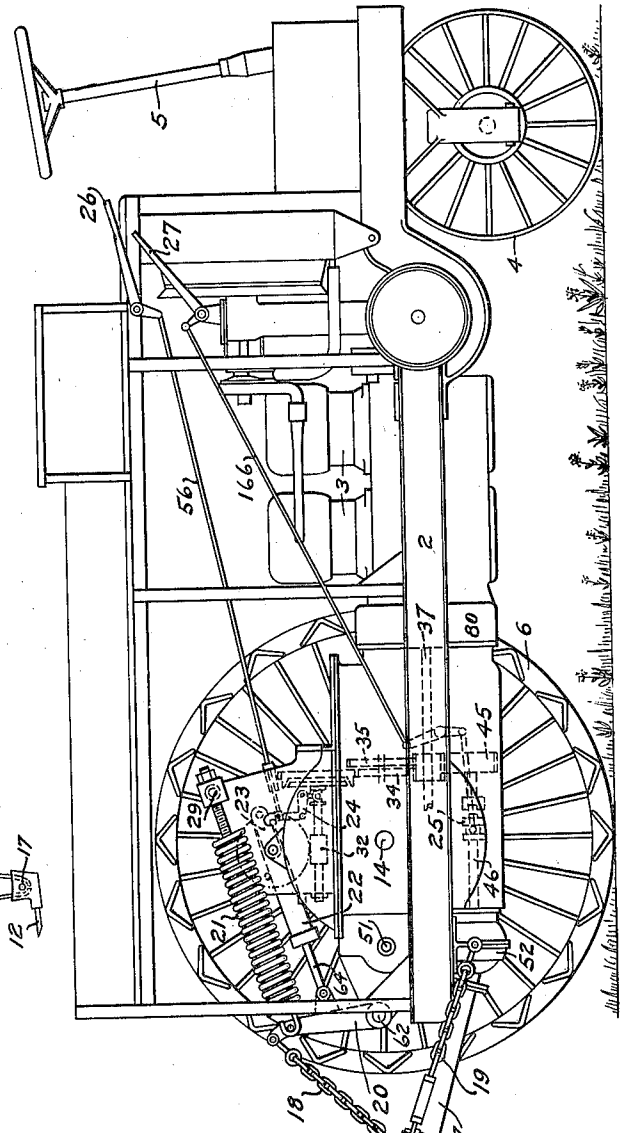


Fig. 1

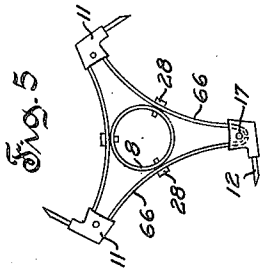


Fig. 5

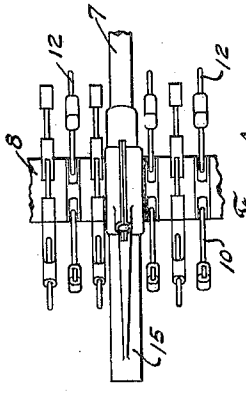
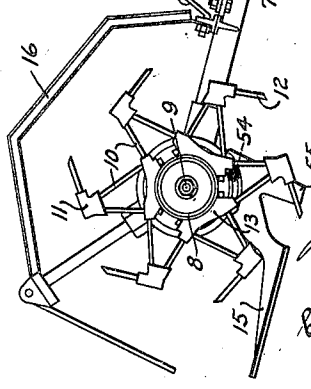


Fig. 4



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ROTARY TILLER

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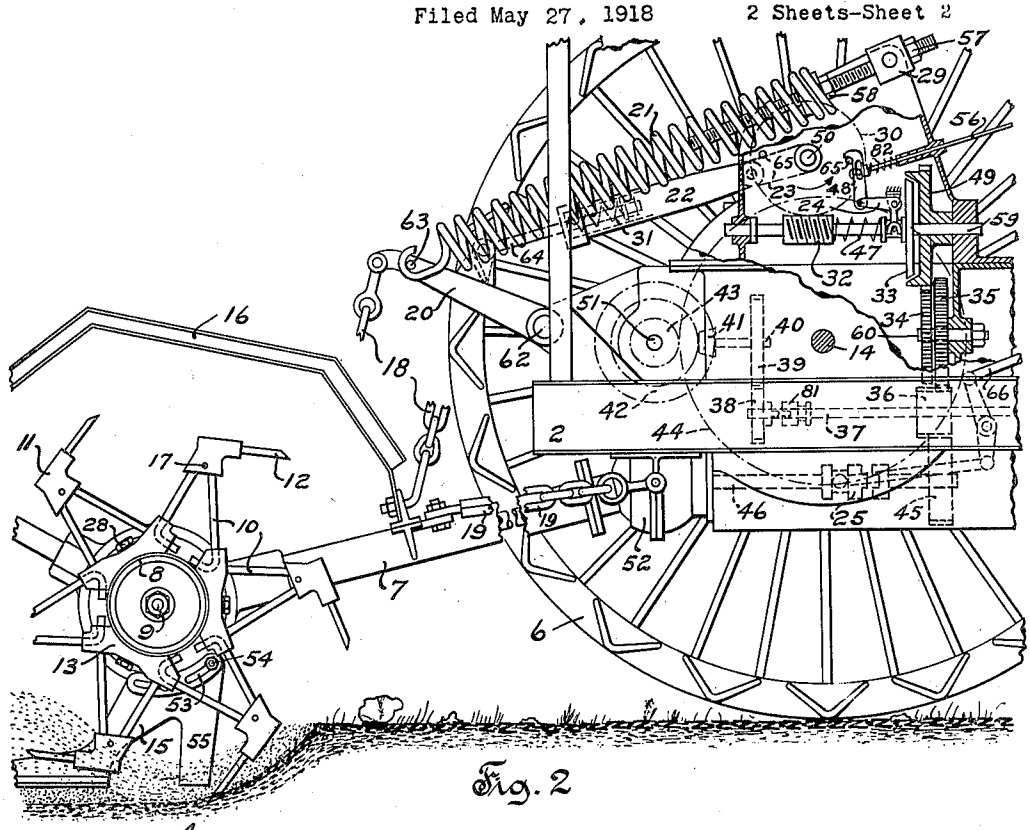


Fig. 2

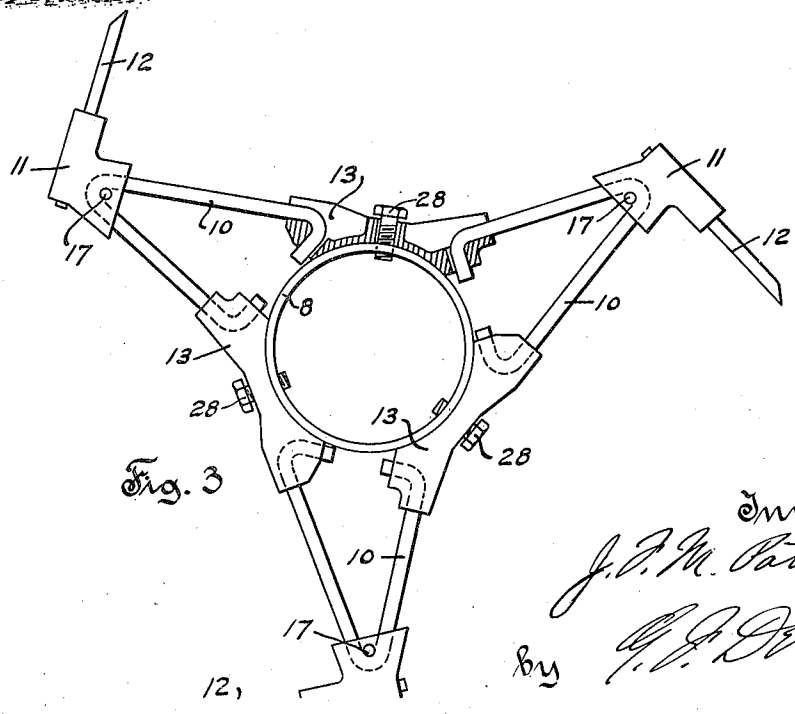


Fig. 3

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Patented Aug. 12, 1924. 1,504,495

UNITED STATES PATENT OFFICE.

JOHANN FRIEDRICH MAX PATITZ, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE.

ROTARY TILLER.

Application filed May 27, 1918. Serial No. 237,359.

To all whom it may concern:

Be it known that JOHANN FRIEDRICH MAX PATITZ, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Improved Rotary Tiller, of which the following is a specification.

This invention relates generally to improvements in the construction and operation of agricultural appliances, and specifically to improvements in soil tilling machines and implements.

An object of the invention is to provide a soil tiller which is simple in construction and efficient in operation.

One of the more specific objects is to provide an improved construction of disintegrating element for rotary tillers, which is simple and compact in construction and which will not be readily damaged by impact with abnormally hard substances in the soil. It has heretofore been proposed to construct a rotary tiller of a plurality of flexible wire hooks secured to a rotating drum and adapted for angular displacement relatively to the drum and around the axis of rotation thereof. With this prior structure, if an abnormally hard substance was encountered by one of the hooks the obstructed hook would swing inwardly toward the drum and around the axis of rotation thereof, in order to permit the rotor to pass over such obstruction. It has been found that in order to provide sufficient stiffness in these wire hooks to effectively till the soil, the hooks must be formed of relatively heavy wire which will not readily submit to distortion by obstructions and which will, in many cases, break rather than bend. In order to overcome the objections of this prior device, it has been proposed to utilize a disintegrating element which, in order to provide sufficient rigidity for tilling, is fixed against angular displacement around the rotor axis, but which will automatically move laterally out of its normal plane of rotation and thus avoid injury to the rotor in case an obstruction is encountered. While this laterally movable device eliminates the objections encountered with the preceding spring hooks, the structure is expensive from a manufacturing standpoint due to the fact that comparatively complicated means are employed for returning the disintegrating elements after displacement. The present invention therefore contemplates an improvement over the laterally movable disintegrating element structure, whereby the cost of construction may be reduced to a minimum without sacrifice of efficiency.

Another specific object of the invention is to provide simple and efficient means whereby the disintegrating member may be driven directly by the engine or motor which normally transports the tiller. It has heretofore been proposed to connect the disintegrating member to the engine which normally transports the tiller, through the vehicle transmission mechanism. By thus connecting the tiller to the engine, it is necessary to reenforce the transmission gearing and to make the same heavier than would normally be required, due to the additional load transmitted therethrough in driving the disintegrating member. The present invention contemplates elimination of this undesirable feature of the prior art by connecting the disintegrating element directly to the engine at a point in advance of the transmission mechanism so that the power utilized for driving the tiller rotor is not transmitted through the vehicle transmission mechanism.

A further specific object of the invention is to provide simple, efficient and readily manipulable means for raising and lowering the disintegrating member of a soil tilling machine. This object is accomplished by providing a train of mechanism including an improved lifting and lowering device, which connects the disintegrating element directly with the engine at a point in advance of the vehicle transmission mechanism. Elevation of the disintegrating member is thus effected by the engine while the lowering is effected by gravity.

Still another specific object is to provide means for accurately and readily gaging the depth of tillage. It has heretofore been proposed to utilize a gaging shoe eccentrically pivoted to the tiller rotor at a medial

portion thereof. The shoe of this prior device was provided with a leading edge inclined upwardly and rearwardly away from the ground similar to the ordinary plowshare. It has been found that this prior device while providing efficient gaging means was objectionable in that it collected and carried large quantities of débris along the surface of the soil, thus interfering with the adjacent tilling hooks. The present invention contemplates elimination of this objectionable feature of the prior art device by providing a gaging shoe adjustable to different positions around the axis of the rotor as a center and having a cutting member in advance thereof which disintegrates the débris and thus prevents accumulation. The gaging shoe itself has a leading edge which is inclined downwardly and rearwardly toward the ground, whereby débris is forced into the tilled soil as the machine advances.

Another specific object is to provide various improvements in details of tiller structure whereby a tiller of maximum capacity results and one which is readily controlled by a single attendant. Some of the novel features of soil tiller construction disclosed but not specifically claimed herein, form the subject of a divisional application for Letters Patent, filed June 3, 1921, Serial No. 474,712.

A clear conception of an embodiment of the invention may be had by referring to the drawings accompanying and forming a part of this specfication in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a side elevation of a rotary motor driven soil tiller having one of the rear driving wheels omitted therefrom in order to permit clearer disclosure of other details of construction.

Fig. 2 is an enlarged fragmentary side elevation of the tiller mechanism.

Fig. 3 is an enlarged side elevation partly in section, of a set of three disintegrating elements secured to the rotor drum.

Fig. 4 is a fragmentary top view of the medial portion of the tiller rotor.

Fig. 5 is a side elevation of a set of three disintegrating elements of modified construction.

While the invention is disclosed herein as applied to a motor driven traction engine, it will be obvious that at least some of the features thereof are not limited to such specific embodiment. The motor driven tractor which transports the soil tilling or disintegrating element, comprises a main frame 2 mounted upon a pair of rear traction wheels 6 and one or more front steering wheels 4. The rear traction wheels 6 are associated with rear axles 14 of usual construction and are drivingly connected to the main motor or engine 3 through transmission mechanism and clutches of ordinary formation. The front steering wheel 4 is controllable by means of a hand wheel and steering gear 5 which is operable from the operator's seat. Associated with the rear of the vehicle is a rotor supporting column 7, one end of which is pivotally connected to the frame 2 by means of a universal coupling 52, and the opposite swingable end of which supports the tiller disintegrating element or rotor.

The form of tiller rotor disclosed in Figs. 1 to 4 inclusive, comprises a centrally divided carrier or drum 8 drivingly connected to a concentric drive shaft 9 which is in turn drivingly connected at its medial portion through suitable bevel gearing and shafting not shown, to a drive shaft 46. The carrier or drum 8 has a plurality of disintegrating hooks or elements mounted thereon which are shown in detail in Fig. 3. Each of the disintegrating elements comprises a substantially triangular spring arm 10, a head 11, locked to the spring arm 10 by means of transverse locking pins 17 and a renewable point 12 fitting a tapered hole in the head 11. The ends of the spring arm 10 adjacent the drum 8 are bent inwardly and engage aligned openings in adjacent brackets 13. The brackets 13 are loosely detachably secured to the drum 8 by means of cap screws 28. These brackets 13 are capable of swinging to a limited extent, about the retaining cap screws 28 as pivots, thereby permitting lateral displacement of the disintegrating elements, when these elements engage abnormal obstructions, the brackets 13 of each annular series however, being normally retained in a plane perpendicular to the axis of the drum 8 and in contact with the drum, by the pressure exerted against the brackets by the spring arms 10. It will be noted that during sidewise displacement of one of the hooks of a series, the other two hooks of that series will also be slightly displaced due to the interconnection of the three hooks. The effect of this displacement is however immaterial and all of the three hooks of the series are automatically returned to their normal position as the obstructed hook is released.

The form of tiller rotor disclosed in Fig. 5, comprises a carrier or drum 8 with which a plurality of interconnected disintegrating hooks of modified form are associated. Each disintegrating implement of this modification comprises a pair of leaf springs 66 having bent ends, a head 11 locked to the spring ends by means of a transverse locking pin 17, and a renewable point 12 fitting a tapered hole in the head 11. Each of the leaf springs 66 is common to two of the hooks, these leaf springs having their mid portions

loosely connected to the drum 8 by means of cap screws 28 and having their bent ends loosely fitting the heads 11 so as to permit the desired lateral displacement of the individual hooks upon engagement of an abnormal obstruction.

The tiller actuating, adjusting and transporting power is furnished by the common motor or engine 3, see Figs. 1 and 2, this power being delivered to the tiller actuating and adjusting mechanisms and to the vehicle transmission mechanism through a main clutch 80 and main shaft 37 of ordinary construction, the details of these elements not being shown. From the main shaft 37, the power for propelling the vehicle is transmitted to the rear axles 14 through the vehicle transmission mechanism which comprises coacting spur gears 38, 39, a countershaft 40, coacting bevel gears 41, 42, a countershaft 51, coacting spur gears 43, 44 and a differential mechanism of ordinary construction not shown. A clutch 81 associated with the spur gear 38 and with the shaft 37, controls the connection of the transmission mechanism to the main shaft 37, this clutch being manipulable from the operator's seat. From the main shaft 37, the power for operating the tiller rotor, is transmitted through a main pinion 36 associated with the shaft 37 at a point between the clutch 81 and the main clutch 80, a spur gear 45 engaging the pinion 36, a clutch 25 manipulable from the operator's seat by means of linkage 166 and a lever 27, a tiller operating shaft 46, a universal joint housed within the coupling 52, shafting and gearing housed within the supporting column 7, and the transverse rotor driving shaft 9. It will thus be observed that both the vehicle transmission mechanism and the tiller rotor actuating mechanism have independent connections to the engine 3. By providing each of these mechanisms with a clutch located beyond the pinion 36, either of the mechanisms may be connected to or disconnected from the engine 3 independently of the other. By connecting the tiller rotor actuating mechanism directly to the engine 3 at a point in advance of the vehicle transmission mechanism, it is unnecessary to reinforce the transmission gearing and to make the same heavier than is necessary to transmit the vehicle transporting power, as would be the case if the rotor actuating power were transmitted through the vehicle transmission mechanism.

The tiller supporting column which is pivotally mounted upon the trailing end of vehicle frame 2, is restrained against excessive movement out of a vertical plane, by means of guide chains 19 secured to a medial portion of the column 7 and to the side beams of the vehicle frame 2. A protecting hood 16 is also associated with the column 7 at the point of attachment of the chains 19 thereto, this hood extending rearwardly over the tiller rotor so as to prevent material from being thrown by the hooks against the mechanism which is mounted upon the vehicle. A chain 18 is also connected to the column 7 adjacent to the point of attachment of the chains 19 and hood 16 thereto, this chain 18 extending upwardly and having its upper extremity pivotally connected to the extreme outer end of an adjustable lever 20 which is swingably mounted upon a pivot 62 carried by the vehicle frame 2. The lever 20 is provided at a point intermediate its ends, with a laterally projecting pin 63 to which is secured one end of a coil spring 21. The opposite end of the coil spring 21 is adjustably secured by means of a nut 58, to a screw-threaded connecting rod which is in turn adjustably secured by means of a nut 57 to a swivel block 29 pivotally mounted upon the vehicle frame 2. A connecting rod 64 is pivotally connected to the lever 20 at a point between the pin 63 and the pivot 62, this connecting rod 64 being provided with a nut and washer coacting with one end of a helical compression spring 31. The spring 31 is located within a tubular connection 22 and has its end engaging an end of the connection 22 in such a manner that the spring 31 may be compressed by moving the connection 64 to the right longitudinally of the tubular connection 22. The end of the connection 22 remote from the spring 31 is pivotally connected to a crank 23 which is rotatably secured to a cross shaft 50 to which is attached a worm wheel 30. The worm wheel 30 has a pair of diametrically opposite laterally projecting pins 65 which during rotation of the worm wheel, revolve in a circular path. The worm wheel 30 meshes with a worm 32 secured to a countershaft 59 which is supported in bearings in the frame 2. A floating latch 48 which is pin-and-slot connected to a manipulating rod 56 and is normally urged toward the path of revolution of the pin 65 by means of a compression spring surrounding the latch manipulating rod 56, is capable of being withdrawn from the adjacent pin 65 by means of a control lever 26 associated with the rod 56. The latch 48 is pin connected with the latch connecting crank 24 which is pin-and-groove connected to one element 33 of a friction clutch. The other element 49 of the friction clutch is provided at its periphery with an external spur gear which coacts with a spur gear 34 mounted upon the countershaft 60. The clutch element 33 is normally urged toward the clutch element 49 by means of a helical compression spring 47 engaging an end of the worm 32, but is prevented from drivingly engaging the element 49 by the rod 56 which holds the latch 48 in engagement with an adjacent pin 65.

The spur gear 34 is drivingly connected to a spur gear 35 which meshes with the main pinion 36, the interconnected spur gears 35, 36 being rotatably mounted upon a stub shaft 60. It will thus be noted that the mechanism for controlling the lowering of the tiller rotor is also connected directly to the engine 3 and is operable independently of the vehicle transmission mechanism and the rotor actuating mechanism.

The drum 8 is provided at its medial portion with a flange projection to which is adjustably secured a downwardly depending depth gaging shoe 15, see Figs. 2 and 4. The depth gaging shoe 15 is provided with several elongated curved slots 53 which permit adjustment of the shoe about the axis of the drum 8 and relatively to the shoe clamping bolts 54. The leading end of the shoe 15 is provided with a downwardly depending projection or cutter 55 which serves to form a fissure in the soil in advance of the shoe 15. It will be noted by referring to Fig. 4, that the shoe 15 and shaft column 7 are located between two annular series of disintegrating elements and occupy approximately the same space measured longitudinally of the drum 8, as is occupied by one set of disintegrating elements.

When it is desired to operate the tiller or to transport the same, and assuming the rotor to be in its uppermost position of adjustment as shown in Fig. 1 with the clutches 25, 80 and 81 disengaged, it is first necessary to start the engine 3 and to drivingly connect the main shaft 37 thereto by manipulation of the clutch 80. After the clutch 80 has been thrown in, either the vehicle transmission mechanism, the tiller rotating mechanism, or the tiller elevating and lowering mechanism may be independently connected to the main shaft 37.

In order to connect the vehicle transmission mechanism to the engine 3, it is necessary to throw in the clutch 81. Upon throwing in the clutch 81 rotation of the shaft 37 is transmitted through the gears 38, 39, shaft 40, bevel gears 41, 42, shaft 51, gears 43, 44 and the differential mechanism to the axles 14. The rotary motion of the axles 14 is transmitted to the driving wheels 6 thereby causing the vehicle to advance along the ground.

In order to cause the tiller rotor to revolve, it is necessary to swing the lever 27 in a clockwise direction as viewed in Fig. 1, thereby throwing the clutch 25 into effective position and transmitting rotary motion from the main shaft 37 through the pinion 36, gear 45, clutch 25 and shaft 46 to the tiller drive shaft 9. The motion transmitted to the tiller drive shaft 9 in this manner causes the tiller 8 to rotate in a clockwise direction as viewed in Figs. 1 and 2.

If it is desired to lower the tiller rotor toward the ground from the position shown in Fig. 1, this may be done by swinging the lever 26 in an anti-clockwise direction so as to withdraw the locking latch 48 from the adjacent pin 65 and to compress the spring 82. Upon withdrawal of the latch 48 from this pin 65, the crank 24 is released and the spring 47 becomes effective to force the clutch element 33 into engagement with the clutch element 49. As the spring 47 urges the clutch element 33 toward the right, the crank 24 is rotated about its stationary pivot and pulls the latch 48 downwardly, the slot in the latch permitting such downward motion. Upon engagement of the clutch elements 33, 49 motion is transmitted from the main shaft 37 through the gears 36, 35, 34, shaft 55, worm 32 and worm wheel 30 to the crank 23 causing this crank to revolve in an anti-clockwise direction as viewed in Fig. 1. The motion of the crank 23 toward the left is transmitted through the connection 22 to the lever 20 which swings about the pivot 62 in an anti-clockwise direction and exerts a pull upon the spring 21. The weight of the tiller rotor is then sufficient to cause the rotor to move toward the ground, this downward motion of the rotor being cushioned by the spring 21 which may be adjusted to produce the desired cushioning effect by manipulation of the nuts 57, 58.

In order to elevate the tiller rotor away from the ground, it is necessary to again swing the manipulating lever 26 in an anti-clockwise direction as viewed in Fig. 2, thereby withdrawing the latch 48 from the adjacent pin 65, compressing the spring 82, and permitting the compression spring 47 to force the clutch element 33 into engagement with the adjacent clutch element 49 and to swing the crank 24 in an anti-clockwise direction. As the crank 24 swings to the right, the latch 48 drops relatively to the rod 56, the slot in the latch permitting it to move downwardly. The clutch element 49 is being constantly rotated from the main shaft 37 through the gears 36, 35, 34 so that when the clutch elements 33, 49 are brought into engagement, the crank 23, shaft 50, worm wheel 30 and pins 65 are rotated by the worm 32 which is connected to the clutch element 33 by the shaft 59. After the pin 65 which has just been released, has passed the latch 48, the lever 26 and rod 56 are again released whereupon the compression spring 82 adjacent the end of the rod 56 forces the latch 48 toward the left and into the path of the revolving pins 65, the latch 48 during this motion swinging about the left hand end of the crank 24. This swinging motion of the latch 48 does not however affect the position of the clutch element 33 which maintains its engagement with the clutch element 49. As

the crank 23 revolves in an anti-clockwise direction and approaches the position shown in Fig. 1, the pin 65 adjacent the crank gradually engages the hook of the latch 48 and raises the latch, thereby swinging the crank 24 in a clockwise direction about its stationary pivot, automatically disconnecting the clutch element 33 from the element 49 and compressing the spring 47. This interruption of the power transmitting connection through the clutch causes the crank 23 to stop as the pin 65 adjacent to the crank raises the hook of the latch 48. The tiller rotor is then positively locked in its uppermost position of adjustment as shown in Fig. 1, by means of the worm 32, worm wheel 30 latch 48 and the engaged pin 65. The adjustable spring 21 coacting with the lever 20 serves to partially balance the weight of the tiller rotor when the same is elevated, thereby somewhat relieving the transmitting connections from this burden.

The depth of tillage is controlled by the position of the depth gaging shoe 15 relatively to the drum 8. As the tiller rotor is lowered toward the ground, and the transporting vehicle moves forward, the shoe 15 will always assume a position approximately parallel to the ground surface. This will be apparent from the fact that with the flat portion of the shoe 15 dragging through the soil substantially parallel to the ground surface, the shoe offers less resistance as it advances through the soil than it does in any other position. By loosening the adjusting bolts 54, swinging the gaging shoe 15 about the axis of the drum 8 as a center and refastening the bolts 54, it will be apparent that the depth of the cut may be readily varied. By inclining the leading edge of the shoe downwardly and rearwardly relatively to the tiller rotor, débris accumulated by the leading edge of the gaging shoe will be urged downwardly and forced under the surface of the tilled soil. The cutting projection 55 serves to provide a fissure or groove through which the gaging shoe may readily pass. The front edge of this projection is also preferably slightly inclined downwardly and rearwardly in order that débris engaging the same will be forced under the soil. It will be noted that by bringing the tiller hooks on opposite sides of the gaging shoe as near as possible to this shoe 15, and providing the shoe with a cutter 55, all of the soil within the limits of the tiller rotor is effectively disintegrated.

The disintegrating hooks will readily move transversely of the rotor if abnormally hard substances are encountered and will automatically return to their normal positions after the obstruction has been passed. If an obstruction is of such size so that the hooks cannot move sufficiently to clear the same, the entire rotor will be lifted by the obstructed hook or hooks and will again assume its normal operating position when the obstruction has been passed. The disintegrating hooks are of relatively simple construction and may be readily replaced when necessary.

It should be understood that it is not desired to limit the invention to the exact details of construction herein shown and described for various modifications may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In a tiller, a vehicle, an engine for transporting said vehicle, a tiller rotor associated with said vehicle and adjustable relatively to the ground surface, and mechanism between said rotor and said engine for adjusting the position of said rotor, said mechanism comprising a pair of revolving members and locking means engageable with the same for locking said rotor in a predetermined position, means for releasing said locking means, and means for drivingly connecting the rotor adjusting means to said engine.

2. In a tiller, a vehicle, a tiller rotor pivotally supported from said vehicle, motor driven means for effecting swinging movement of said rotor about said pivot, a revolving element, and latch means automatically engageable with said element upon partial revolution thereof.

3. In a tiller, a vehicle, a tiller rotor pivotally supported from said vehicle, an engine, a train of mechanism between said engine and said rotor for swinging the latter about its pivot, a pair of diametrically opposite revolving pins, and a latch engageable with said pins to hold said rotor in predetermined positions.

4. In a tiller, a vehicle, an engine for transporting said vehicle, a tiller rotor pivotally supported from said vehicle, a train of mechanism connecting said engine and said rotor for swinging said rotor about its pivot, means for locking said rotor in an adjusted position, and resilient means for constraining swinging of said rotor upon release of said locking means.

5. In a tiller, a vehicle, a tiller rotor pivotally supported from said vehicle means for effecting swinging movement of said rotor about its pivot relatively to said vehicle, a pair of diametrically opposite revolving pins, and a latch engageable with said pins to hold said rotor in predetermined positions.

6. In a tiller, a vehicle, a tiller rotor movably supported from said vehicle, means for effecting movement of said rotor relatively to said vehicle, a pair of diametrically opposite revolving pins, and a latch engageable with said pins to hold said rotor in predetermined positions.

7. In a tiller, a vehicle, a tiller rotor swingably supported from said vehicle, means for effecting swinging movement of said rotor relatively to said vehicle, a pair of diametrically opposite revolving pins, a latch engageable with said pins to lock said rotor in predetermined positions, and resilient means for constraining swinging of said rotor upon release of said locking means.

In testimony whereof, the signature of the inventor is affixed hereto.

JOHANN FRIEDRICH MAX PATITZ.