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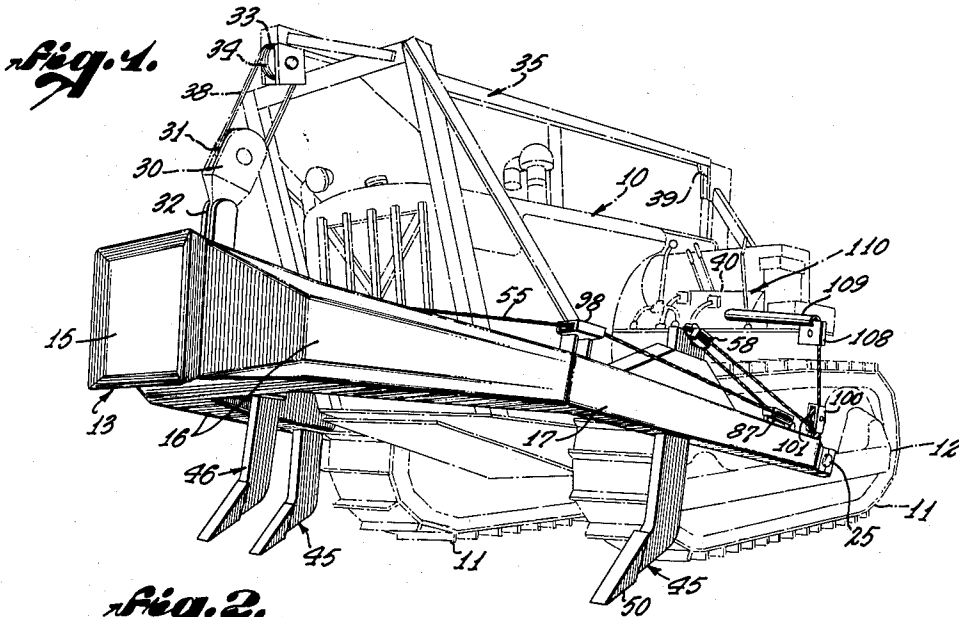
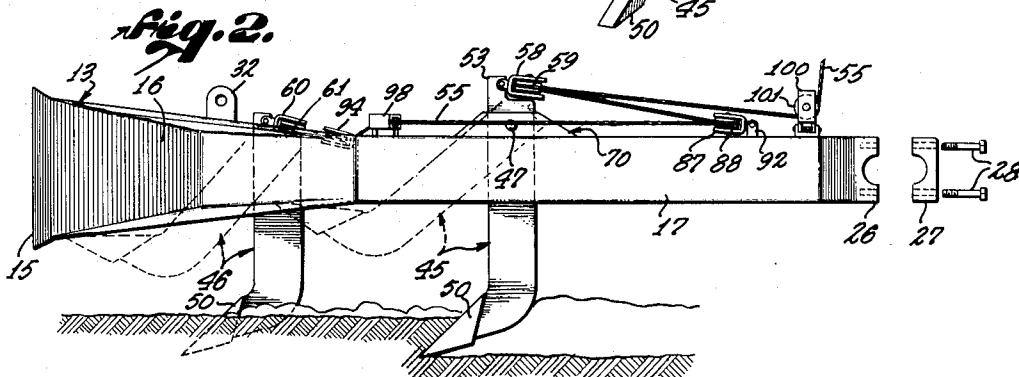
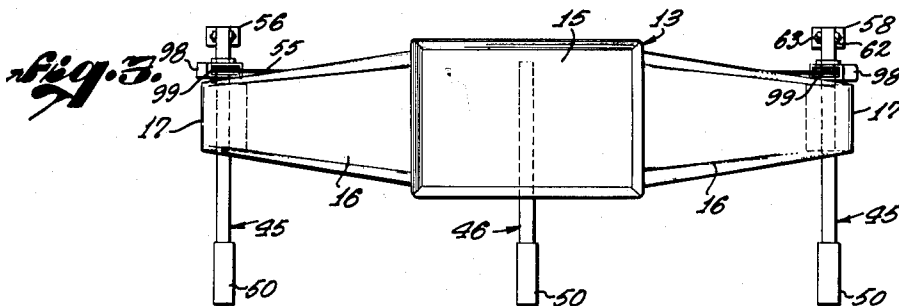
J. J. WOOD

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SCARIFIER APPARATUS

Filed Nov. 27, 1951

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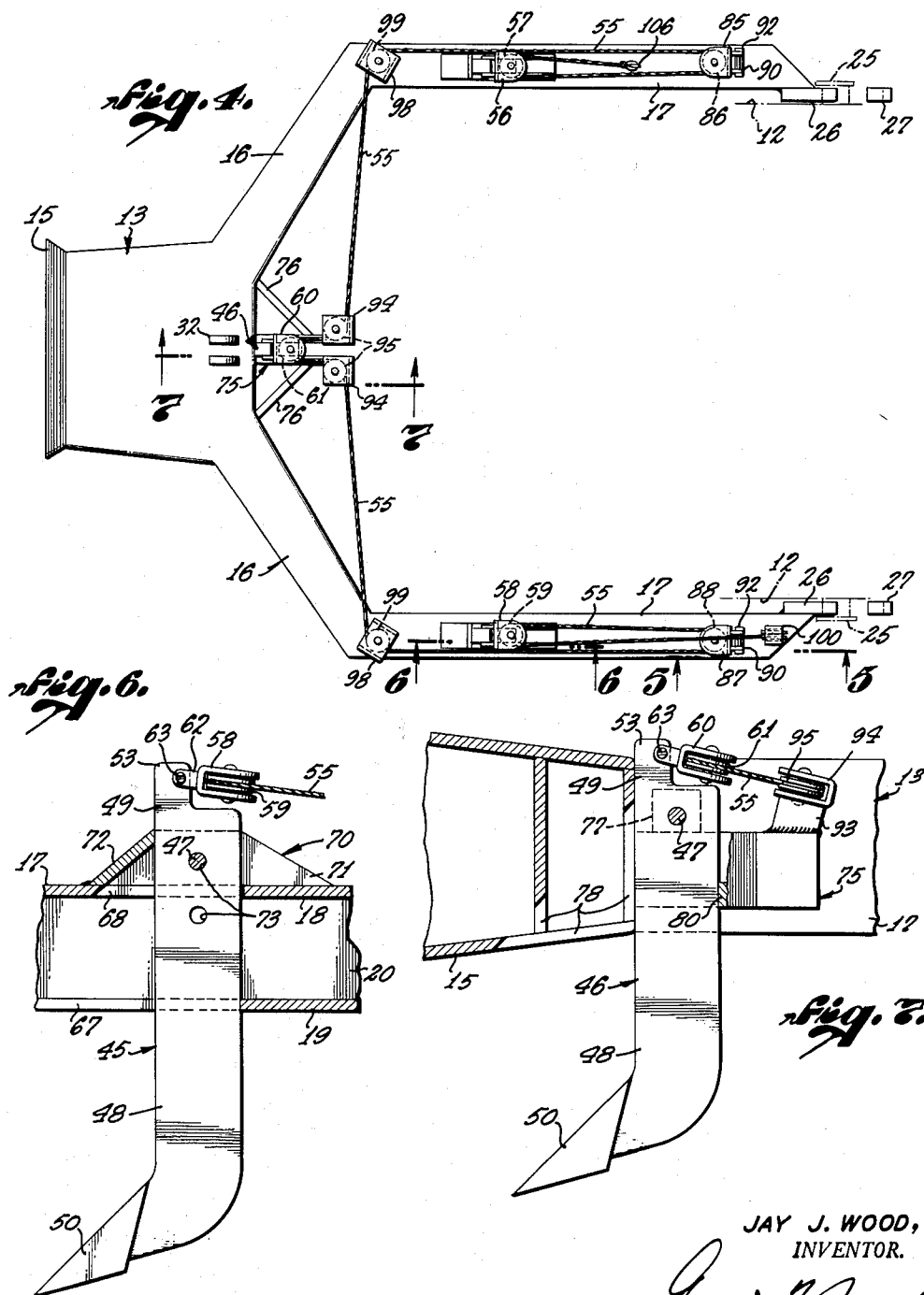
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SCARIFIER APPARATUS

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3 Sheets-Sheet 2



**JAY J. WOOD,
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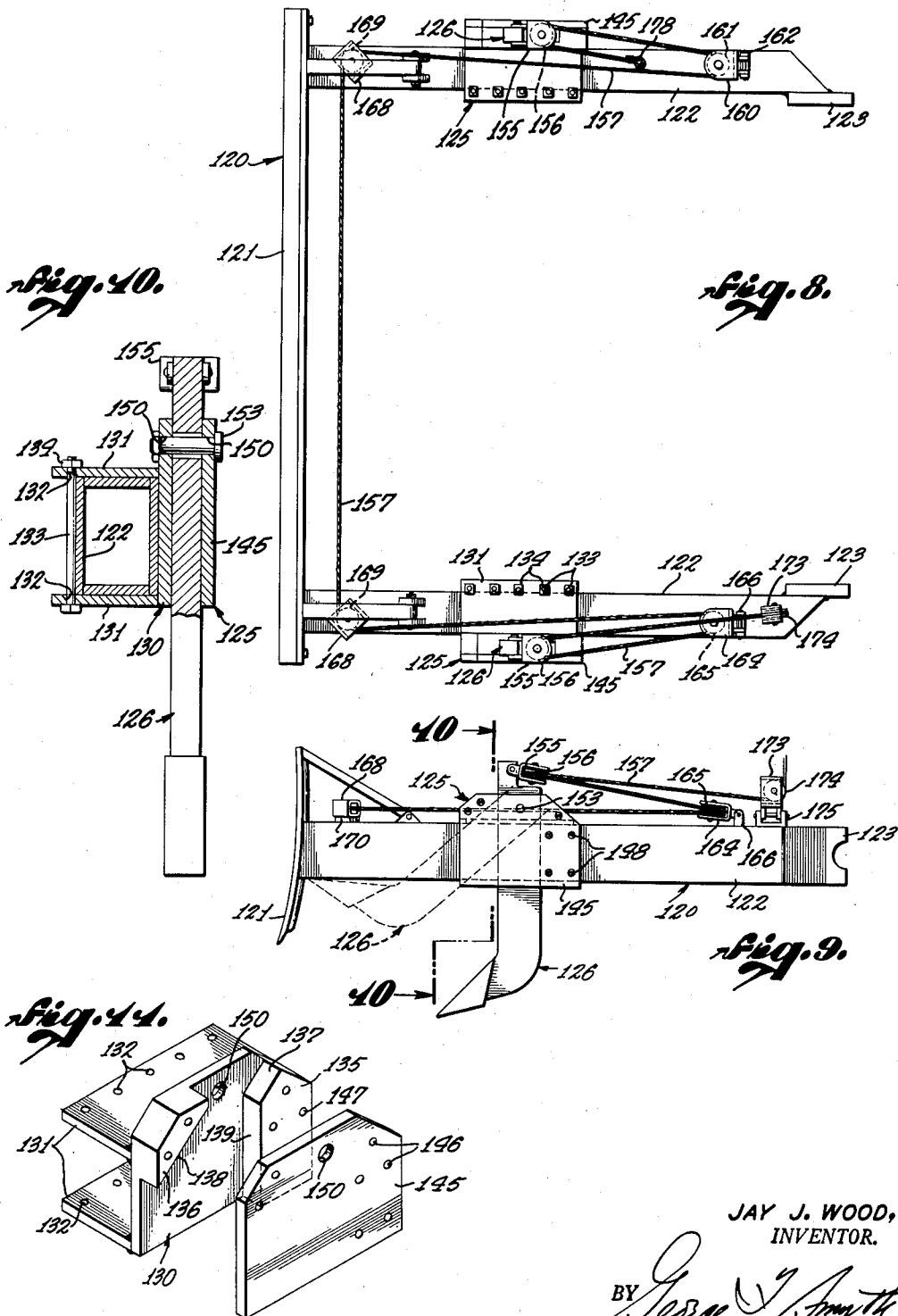
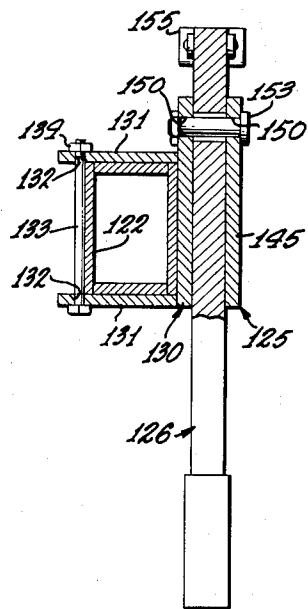
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SCARIFIER APPARATUS

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3 Sheets-Sheet 3



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2,732,196

SCARIFIER APPARATUS

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13 Claims. (Cl. 262—8)

This invention relates to earth-working machines, with special reference to scarifiers, and is directed to the problem of equipping certain pusher-type and bulldozer-type equipment with auxiliary scarifier members or ripper teeth for loosening earth.

The type of equipment to which the invention pertains comprises essentially a tractor-type vehicle on which is mounted what may be termed a U-shaped pusher frame that extends around the front and sides of the vehicle. The rearwardly extending legs of the pusher frame are pivotally mounted on the main frame of the vehicle and suitable power means is provided to raise and lower the front end of the pusher frame by swinging movement about the pivot axis. To carry out the primary function of the vehicle the front end of the pusher frame may be equipped with a pusher head or may be equipped with the familiar curved blade or bowl that characterizes a bulldozer. The problem is to equip such a piece of equipment for the additional function of loosening or scarifying earth.

I am aware that various suggestions have been advanced heretofore for providing such equipment with earth-ripping teeth. In general, the difficulty is to provide such teeth without interfering with the normal or primary pusher function of the equipment. One proposed solution is, in effect, to turn the ripper teeth backwards so that the equipment may be moved forward for performing its primary pusher function and then may be moved backwards for scarifying operation. It has been found, however, that the use of backwardly pointing scarifying teeth is disadvantageous and for many operations entirely impractical. In the first place, the operator cannot clearly view a sufficient area of the earth in the path of the teeth. In the second place, such reverse scarifying movement requires the operator to look in one direction to observe the action of the teeth and to look in the opposite direction for steering the moving equipment and such division of attention is both fatiguing and unsafe. In the third place, since the vehicle must precede the teeth, the vehicle always packs the soil down in the path of the teeth and, moreover, if an obstacle is in the path of the backwardly moving vehicle the vehicle cannot back up to bring the teeth into the area immediately adjacent the obstacle.

A further troublesome difficulty in the use of scarifying teeth with pusher-type equipment is to avoid the inconvenience and loss of time required for manually shifting the teeth between operative positions for earth working and inoperative positions where the teeth will not interfere with normal pusher operations of the equipment. One suggestion for avoiding this difficulty is to mount the teeth backwards in a pivotal manner so that the teeth will merely float over the surface of the ground when the equipment pushes forward. To keep the teeth inoperative when the equipment moves backwards, however, it is necessary to raise the pusher frame and, of course, there are other objections to backwardly pointed teeth as pointed out above.

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The present invention meets these various problems and difficulties by using forwardly directed ripper teeth and by further providing power actuated means under remote control by the operator to shift the ripper teeth between operative and inoperative positions.

To achieve this end it is necessary to solve the further problem of providing a satisfactory actuating system for shifting the positions of the ripper teeth. Such an actuating system must be applicable to a hinged pusher frame without interfering with or being disturbed by the pivotal movement of the pusher frame. The actuating system must also be adaptable to the power facilities on pusher type equipment and should be of simple and rugged construction.

A feature of the invention is the concept of employing an actuating cable with the cable passing from the vehicle to the pusher frame near the hinge axis of the pusher frame. With the cable extending to the pusher frame near its axis of movement the swinging movement of the frame has no significant effect on the cable and, conversely, the cable does not interfere with the swinging movement of the pusher frame.

A further feature of the preferred practice of the invention is the employment of a plurality of sheaves in combination with the cable so that the cable may be looped between sheaves for multiplying the force applied by the cable to the ripper teeth. In the preferred embodiment of the invention the problem of actuating the ripper teeth is further simplified by so mounting the teeth as to cause them to gravitate to one of their two positions so that cable actuation is required in only one direction.

Another feature of the invention, as will be explained, is that it may be embodied in a set of attachments for adapting an existing conventional type of pusher equipment for scarifying operations. The set of attachments includes ripper teeth together with brackets that may be readily attached to existing pusher frames for pivotal mounting of the ripper teeth thereon. An advantage of the cable system for actuating the ripper teeth is that remote control of the teeth may be provided merely by including in the set of attachments suitable sheaves for mounting on the pusher frame.

The above and other features and advantages of the invention may be readily understood from the following detailed description taken with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative,

Figure 1 is a perspective view of a presently preferred embodiment of the invention incorporated in a pusher-type earth-working machine;

Figure 2 is a side elevation of the pusher frame in Figure 1 showing how the ripper teeth are pivotally mounted thereon;

Figure 3 is a front elevation of the pusher frame of Figure 2;

Figure 4 is a plan view of the same pusher frame;

Figure 5 is a sectional detail taken as indicated by the line 5—5 of Figure 4;

Figure 6 is an enlarged section taken as indicated by the line 6—6 of Figure 4.

Fig. 7 is a similar sectional view taken as indicated by the line 7—7 of Figure 4;

Figure 8, relating to a second practice of the invention, is a plan view of a pusher frame of a bulldozer showing attachments applied thereto to adapt the pusher frame for scarifying operation;

Figure 9 is a side elevation of the pusher frame of Figure 8;

Figure 10 is a section taken as indicated by the broken line 10—10 of Figure 9; and

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Figure 11 is a perspective view of two parts of a bracket for mounting a ripper tooth on the bulldozer pusher frame.

The first form of the invention is shown in Figures 1 to 7. Figure 1 shows in dotted lines a vehicle generally designated 10 of the tractor type commonly used for earth working and earth moving operations. The vehicle 10 which is mounted for traction on the usual endless treads 11 has a main frame 12 on which is mounted a U-shaped pusher frame 13. The pusher frame 13 extends around the front and two sides of the vehicle. The particular pusher frame shown in the drawings is of a familiar construction having a pusher head 15, two diagonal front members 16 and two rearwardly extending legs 17, the head, diagonal members, and legs being fabricated as one unitary frame structure. Preferably this structure is of hollow construction, the two legs 17 having top and bottom walls 18 and 19, respectively, and side walls 20 as may be seen in Figure 6.

The pusher frame 13 is adapted to be pivotally mounted on trunnions 25 (Figures 1 and 4) on opposite sides of the vehicle frame 12 and for this purpose a pair of trunnion blocks 26 and 27 may be provided at the rear end of each leg 17. As best shown in Figure 2, the pusher block 26 is unitary with the leg 17 of the pusher frame and the mating trunnion block 27 is attachable thereto by suitable bolts 28.

The pusher frame 13 is adapted to be raised and lowered under control of the operator of the equipment in a well-known manner. In the particular construction shown in the drawings, a sheave block 30 having a plurality of sheaves 31 is pivotally mounted on a bracket 32 on the front end of the pusher frame 13 and a second sheave block 33 with a plurality of sheaves 34 is mounted on the front end of an overhead frame 35 on the vehicle 10. A suitable cable 38 having one end anchored to the overhead frame 35 has a plurality of loops around the sheaves 31 and 34 and extends rearwardly along the overhead frame to a rear sheave 39 from which the cable extends downwardly to a power means 40 on the vehicle 10. In a well-known manner the power means 40 includes a suitable winch (not shown) around which the cable 38 is wound so that the cable may be reeled in to raise the pusher frame and reeled out to lower the pusher frame.

The invention relates to the mounting of ripper or scarifier teeth on the pusher frame 13 with provision for remote control to shift the teeth between operative and inoperative positions. In the present form of the invention, as illustrated by Figures 1 to 7, the pusher frame 13 is fabricated especially for the practice of the invention.

As best shown in Figures 2 and 3 the pusher frame 13 is equipped with three ripper teeth, there being a single ripper tooth, generally designated 45, mounted on each leg 17 of the frame and a third ripper tooth, generally designated 46, mounted centrally back of the pusher head 15. Any number of such ripper teeth may be provided as desired. It is also to be understood that the ripper teeth may be mounted in various ways and actuated in various ways in different practices of the invention.

In the present embodiment of the invention the ripper teeth 45 and 46 are in the form of levers having intermediate fulcrums or pivot points, each of the ripper teeth being mounted on a pivot pin 47 and having a lower arm 48 and an upper arm 49. Each of the lower arms 48 of the ripper teeth is of angular configuration with its lower end directed forward and is provided at its lower end with a suitably hardened point element 50. The upper arm 49 of each ripper tooth is preferably cut away to provide a reduced upper end 53 on which is mounted a suitable sheave for cooperation with an actuating cable 55. For this purpose, as may

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be seen in Figure 4, the left side ripper tooth 45 is equipped with a pivoted sheave block 56 carrying a sheave 57; the ripper tooth 45 on the right side of the pusher frame carries a similar pivoted sheave block 58 having a sheave 59; and the forward ripper tooth 46 carries a pivotally mounted sheave block 60 having a sheave 61. Each of the three sheave blocks is hingedly mounted by a pair of ears 62 on a suitable hinge pin 63 providing a substantially horizontal pivotal axis.

In the present construction each of the side ripper teeth 45 extends through a slot 67 in the bottom wall 19 of the hollow leg 17 of the pusher frame and through a shorter slot 68 in the top wall 18. The pivot pin 47 for the ripper tooth is mounted in a bracket generally designated 70 that is unitary with the top wall 18. The bracket 70 encloses the upper slot 68 and comprises a pair of side walls or plates 71 interconnected by an inclined forward wall 72, as best shown in Figure 6.

It will be noted in Figure 6 that the two slots 67 and 68 as well as the inclined forward wall 72 of the bracket are so arranged as to permit the ripper tooth 45 to swing forward to an inoperative position, the inoperative position being indicated in dotted lines in Figure 2. It will also be noted in Figure 6 that when a ripper tooth 45 is in operative position the lower arm 48 of the tooth abuts the bottom wall 19 of the pusher frame at the rear end of the slot 67 so that the pusher frame provides a stop to limit rearward swing of the ripper tooth. The inclined wall 72 of the bracket 70 may cooperate in the same manner with the upper arm 49 of the ripper tooth but a stop means cooperating with the lower arm of the tooth is preferred. The stop resists the tendency of the ripper tooth to rotate counter-clockwise in reaction to moments created by the resistance of the earth being dislodged and displaced by the forward movement of the tooth.

Preferably each of the two ripper teeth 45 is adjustable with respect to the relative lengths of the two arms 48 and 49. For this purpose each ripper tooth has a plurality of spaced holes 73 any one of which may be employed to mount the tooth on the pivot pin 47.

The forward ripper tooth 46, which is preferably somewhat shorter than the other two teeth, is mounted in the same general manner between the two walls of a bracket, generally designated 75, that is braced by two bars 76. The pivot pin 47 for this forward tooth is mounted in a pair of upward extensions or ears on the bracket shown in dotted lines at 77 in Figure 7. The hollow structure of the pusher head 15 is cut away to form slots 78 to permit the ripper tooth 46 to swing forward to an inoperative position. The bracket 75 is formed with a stop 80 that abuts the lower arm of the tooth when the tooth is in its operative position, as heretofore described.

As best shown in Figure 4, a sheave block 85 carrying a sheave 86 is mounted on the pusher frame 13 rearward from the right hand ripper tooth 45 and a similar sheave block 87 having a sheave 88 is mounted on the frame rearward from the left hand ripper tooth 45. As best shown in Figures 4 and 5, each of the sheave blocks 85 and 87 has a pair of ears 90 by means of which it is hingedly mounted on a pivot pin 91 carried by a fixed bracket 92.

For cooperation with the cable 55 in the shifting of the forward ripper tooth 46, the bracket 75 carrying the forward ripper tooth is provided with a pair of upwardly extending arms 93 on the rear end of the bracket, each arm rigidly carrying an inclined sheave block 94 having a sheave 95.

For a change in direction of the cable 55 to make the run of the cable conform to the configuration in plan of the pusher frame 13, two suitable sheave blocks 98 having sheaves 99 are mounted at the forward corners, respectively, of the pusher frame as best shown in Figure

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4. Finally, a sheave block 100 is mounted on the left leg 17 of the pusher frame close to the trunnion blocks 26 and 27. As shown in Figure 5, the sheave block 100 with a sheave 101 has a pair of ears 102 by means of which it is hingedly mounted on a hinge pin 103 carried by a fixed bracket 104. The hinge axis of the sheave block 100 extends in a generally longitudinal direction with reference to the pusher frame.

One end of the cable 55 is anchored to a suitable fixed bracket 106 on the left leg 17 of the pusher frame and the described arrangement of sheaves on the pusher frame permits the following arrangement of the cable. From its point of anchorage at the fixed bracket 106, the cable 55 extends forward to the sheave 57 on the left hand ripper tooth 45 and forms a loop around both the sheave 57 and the rear sheave 86 in the rear sheave block 85. From the rear sheave 86 the cable extends forward to make a turn in direction around one of the sheaves 99.

From sheave 99 the cable is carried to the rear of the central pusher head 15 of the pusher frame where the cable is formed by the two sheaves 95 into a loop around the sheave 61 on the forward ripper tooth 46. The cable then makes a change in direction around the second fixed sheave 99 at the second corner of the pusher frame and extends rearward to the sheave 88 in the sheave block 87. The cable then makes a loop around the sheave 88 and the sheave 59 on the right hand ripper tooth 45.

From the sheave 59 the cable passes under the sheave 101 near the pivot axis of the pusher frame and then, as shown in Figure 1, passes upward to a sheave block 108 on the end of a tubular arm 109 on the vehicle 10. The cable passes over a sheave (not shown) in the sheave block 108 and then extends through the tubular arm 109 to a suitable power-driven cable actuating means 110. The cable actuating means 110 includes a suitable winch (not shown) around which the cable is wound.

The operation of this form of the invention may be readily understood from the foregoing description. When the three ripper teeth are in their operative positions, the pusher frame 13 may be lowered to cause the teeth to dig into the ground as indicated in Figure 2. If less deep penetration is desired, the required adjustment may be accomplished in part by shifting the pivot pins 47 of the two side teeth 45 to lower pivot holes 73. The rest of the adjustment is accomplished by slightly elevating the pusher frame. It is not necessary to change the pivot points of the forward ripper tooth 46 for such decrease in its depth of penetration, since it is lifted to the desired extent by the elevation of the pusher frame relative to the ground.

When it is desired to shift the teeth 45 and 46 to their ineffective or inoperative positions shown in dotted lines in Figure 2 so that the pusher frame 13 may be used for its primary pusher function without interference by the ripper teeth, the operator merely sets the cable actuating means 110 into operation to reel in the cable 55. As the cable 55 is taken up by the cable actuating means 110 all three of the ripper teeth 45 and 46 move in unison to their inoperative positions shown in dotted lines in Figure 2 where they are out of the way to avoid interfering with normal operation of the pusher frame 13.

Figure 8, illustrating a second practice of the invention, shows a conventional U-shaped pusher frame, generally designated 120, of the type commonly used on bulldozers. The pusher frame comprises a forward transverse blade or bowl 121 and a pair of rearwardly extending legs 122 each of which terminates in the usual trunnion block 123. This second practice contemplates the provision of a set of accessories or fittings by means of which the pusher frame 120 may be adapted for scarifying operations in addition to its primary function in pusher operations.

Such a set of accessories may, for example, comprise

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a pair of brackets generally designated 125 suitably adapted for attachment to the two legs 122 respectively of the pusher frame, two ripper teeth 126 adapted to be pivotally mounted in the two brackets 125 respectively, and a plurality of sheaves adapted for mounting on the pusher frame 120 to control the ripper teeth 126 in the general manner heretofore described.

The two brackets 125 are alike but one is built as a right hand device and the other as a left hand device. The construction may be understood by considering the right hand bracket, the two parts of which are shown in Figure 11.

The bracket construction shown in Figure 11 includes what may be termed an inner member in the form of a plate 130, integral with which are two spaced flanges or wings 131 having bolt holes 132 along their outer edges. The two wings 131 are spaced and dimensioned to a round hollow structure of a leg 122 of the pusher frame in the manner shown in Figure 10. When the inner plate is thus mounted on a leg 122 of the pusher frame, a series of bolts 133 are placed in the matched pairs of bolt holes 132 and held in place by nuts 134, thus anchoring the inner plate firmly to the pusher frame leg.

Integral with the inner plate 130 on its face opposite from the two wings 131 is a pair of blocks 135 and 136 which form a space to receive the corresponding ripper tooth 126. The block 135 has an upper inclined face 137 and the lower side of the block 136 is inclined in the same manner as indicated at 138 so that the two blocks will permit the ripper tooth to be tilted forward to an inoperative position shown in dotted lines in Figure 9. The forward face 139 of the block 135 serves as a stop to limit rearward swinging movement of the tooth 126 when the tooth is in the operative position shown in full lines in Figure 9.

The bracket 125 is completed by an outer member 145 in the form of a plate adapted for attachment to the inner member 130. For this purpose the outer plate 145 has a plurality of bolt holes 146 and the two blocks 135 and 136 of the inner member 130 have similar holes 147 that are tapped to receive suitable bolts or cap screws 148. The two members 130 and 145 of the bracket are also provided with a pair of holes 150 to receive a pivot pin 153 for the ripper tooth 126.

Each of the two ripper teeth 126 is of the same general construction as heretofore described as indicated by the use of corresponding numerals to indicate corresponding parts. Each tooth 126 is provided at its upper end with a pivoted sheave block 155 having a sheave 156 for co-operation with an actuating cable 157.

A sheave block 160 having a sheave 161 is hingedly mounted on a bracket 162 that is adapted to be bolted to the right hand leg 122 of the pusher frame rearward from the right hand ripper tooth 126. The set of accessories also includes a second sheave block 164 that has a sheave 165 and is hingedly mounted on a bracket 166. The bracket 166 is suitably adapted to be bolted to the top of the left hand pusher frame leg 122 in the same relative position as bracket 162. The set of accessories further includes a pair of sheave blocks 168 that have sheaves 169 and are fixedly mounted on brackets 170 suitably adapted for bolting at forward positions on the pusher frame 120 as shown in Figure 8. Finally, the set of accessories includes a sheave block 173 that has a sheave 174 and is hingedly mounted on a bracket 175. The bracket 175 is adapted to be bolted or otherwise attached to the right leg 122 of the pusher frame near the trunnion block 123 as shown in Figures 8 and 9.

The cable 157 is intended to be anchored to the right hand leg 122 of the pusher frame by a suitable bracket 178. From the bracket 178 the cable forms a loop around the two sheaves 156 and 161 and then extends forward to pass around the two sheaves 168. The cable then extends rearward along the left hand frame leg 22 to form

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a loop around the two sheaves 156 and 165. Finally, the cable passes under the sheave 174 to extend upward to suitable cable actuating means as heretofore described.

When the set of accessories is mounted on the pusher frame in the manner described, the two ripper teeth 126 may be maintained at normal inoperative or ineffective positions shown in dotted lines as heretofore described. 5
The bulldozer may be operated in the usual manner for pusher operation. Whenever it is desired to use the bulldozer to rip and loosen earth the operator merely causes the power means on the bulldozer to reel out the cable 157 thereby to permit the two ripper teeth 126 to swing by gravity to their operative positions as shown in full lines in Figure 9. The ripper teeth then extend sufficiently below the level of the bulldozer blade 121 to permit effective penetration into the soil. 15

To resume normal bulldozer operation, the operator merely causes the power means to reel in the cable 157 to return the ripper teeth to their inoperative positions. Thus the ripper teeth may be shifted freely from one position to the other without requiring the operator to leave his seat on the bulldozer. 20

Although the now preferred embodiments of the present invention have been shown and described herein, it is to be understood that the invention is not to be limited thereto, for it is susceptible to changes in form and detail within the scope of the appended claims. 25

Having described my invention, I claim:

1. In an earth working machine having a main frame and a U-shaped pusher frame extending around the front and sides of the main frame with rearwardly extending legs pivoted to the main frame, the combination of: a plurality of ripper teeth, each of said teeth being pivotally mounted intermediate the ends thereof on said U-shaped pusher frame, said ripper teeth having forwardly directed earth penetrating points on their lower ends, the center of gravity of each tooth being located between said pivotal mounting and said point whereby the teeth tend to swing by gravity into effective earth ripping positions; stop means on said U-shaped frame to hold said teeth in said effective earth ripping positions in opposition to moments created by forward movement of the teeth against the earth; a sheave mounted to the end of each tooth opposite said earth penetrating point; and power means under control of the operator of the machine, including a cable engaging each of said sheaves, to rotate said teeth between said effective positions and ineffective positions away from said stop means. 30

2. An earth working machine as set forth in claim 1 which includes a sheave anchored on one leg of said pusher frame near the pivotal axis of the frame and in which said cable extends from said power means around said anchored sheave with the end of the cable anchored to the other leg of the pusher frame. 35

3. In a vehicle of the character described having a main frame, the combination therewith of a U-shaped pusher frame extending around the front and sides of the main frame with its rearwardly extending legs pivoted to the main frame, the legs of said pusher frame being hollow with upper and lower walls; a plurality of ripper teeth pivotally mounted on said legs, said teeth having forwardly directed points on their lower ends, each of said teeth extending through an upper slot in the upper wall of the leg and a lower slot in the lower wall of the leg, the tooth being pivoted above said lower slot with the rear end of the lower slot serving as a stop to hold the tooth in effective operating position in opposition to moments created by forward movement of the teeth against the earth; and power means under control of the operator of the machine to rotate said teeth between said effective positions and ineffective positions away from said stop means. 40

4. A vehicle as set forth in claim 3 in which the centers of gravity of said teeth are between their pivot points and their earth penetrating points whereby the teeth tend 45

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to swing by gravity from their ineffective positions to their effective positions.

5. A vehicle as set forth in claim 4 in which a sheave is mounted on each of said teeth and said power means is operatively connected to said teeth by a cable passing around each of said sheaves.

6. A vehicle as set forth in claim 3 which includes a central bracket extending rearwardly from the front end of the pusher frame; a ripper tooth pivotally mounted on said bracket, said ripper tooth having a forwardly directed point on its lower end, said ripper tooth being connected to said power means; and a stop to hold said last mentioned ripper tooth in effective earth-ripping position in opposition to moments created by forward movement by the tooth against the earth. 50

7. A vehicle as set forth in claim 6 in which the centers of gravity of said teeth are between their pivot points and their earth penetrating points whereby the teeth tend to swing by gravity from their ineffective positions to their effective positions. 55

8. In an earth working machine having a main frame and a U-shaped pusher frame extending around the front and sides of the main frame with rearwardly extending legs pivoted to the main frame, the combination therewith of: two ripper teeth pivotally mounted on said legs respectively, said ripper teeth having forwardly directed points on their lower ends; stop means on said legs to hold said teeth in effective earth-ripping positions in opposition to moments created by forward movement of the teeth against the earth, the centers of gravity of said teeth being positioned to cause the teeth to rotate against said stop means; a sheave mounted on each of said ripper teeth; a corresponding sheave anchored to each of said legs thereby providing a pair of sheaves on each side of the pusher frame; a cable having one end anchored to one of said legs, said cable having a loop around the pair of sheaves on one side of the pusher frame and a second loop around the pair of sheaves on the other side of the pusher frame; and power means attached to the other end of the cable to reel in the cable and thereby shift said teeth against gravity away from said effective positions to ineffective positions. 60

9. An earth working machine as set forth in claim 8 in which said anchored sheaves are in sheave blocks pivotally mounted on said legs. 65

10. In an earth working machine having a main frame and a U-shaped pusher frame extending around the front and sides of the main frame with rearwardly extending legs pivoted to the main frame, the combination therewith of: two ripper teeth pivotally mounted on said legs respectively, said ripper teeth having forwardly directed points on their lower ends; a central bracket extending rearwardly from the front end of the pusher frame; a third ripper tooth pivotally mounted on said bracket; stop means to hold each of said teeth in effective earth-ripping position in opposition to moments created by forward movement of the teeth against the earth, the centers of gravity of said teeth being positioned to cause the teeth to gravitate to positions against said stops; a sheave mounted on each of said ripper teeth; two sheaves anchored on said legs respectively thereby providing a pair of sheaves on each side of the pusher frame; a third pair of sheaves on said bracket rearwardly of said third tooth; a cable having one end anchored to one of said legs, said cable having a loop around the pair of sheaves on one side of the pusher frame, a second loop around the pair of sheaves on the other side of the pusher frame, and a loop extending forward from said third pair of sheaves around the sheave on said third tooth; and power means to reel in said cable thereby to shorten said loops to shift said ripper teeth against gravity from their effective positions against said stops to ineffective positions. 70

11. An earth working machine as set forth in claim 10 which includes forward sheaves on the legs of the pusher frame for changes in direction of said cable. 75

12. An earth working machine as set forth in claim 10 which includes a sheave on said pusher frame near its pivot axis around which the cable changes direction for extension to said power means.

13. Means to equip the forward pivoted U-shaped pusher frame of an earth working machine for special use as a scarifier, said means including a plurality of brackets adapted to be mounted on the legs of said frame; a corresponding plurality of ripper teeth; means for pivotally mounting a tooth in each bracket, said teeth having forwardly directed points on their lower ends, each of said teeth extending through an upper slot in the upper end of the bracket and a lower slot in the lower end of the bracket, each tooth being pivoted above said lower slot and being weighted to seek positions in effective earth ripping positions relative to said brackets; means carried

by said brackets and engaged by the teeth mounted thereby for holding said teeth in said earth ripping positions in opposition to moments created by forward movement of the teeth against the earth; and means including a cable for operative connection with each of said teeth and with a power means on the machine to move the lower end of the teeth forwardly against the action of gravity into ineffective positions underlying the legs of said pusher frame.

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