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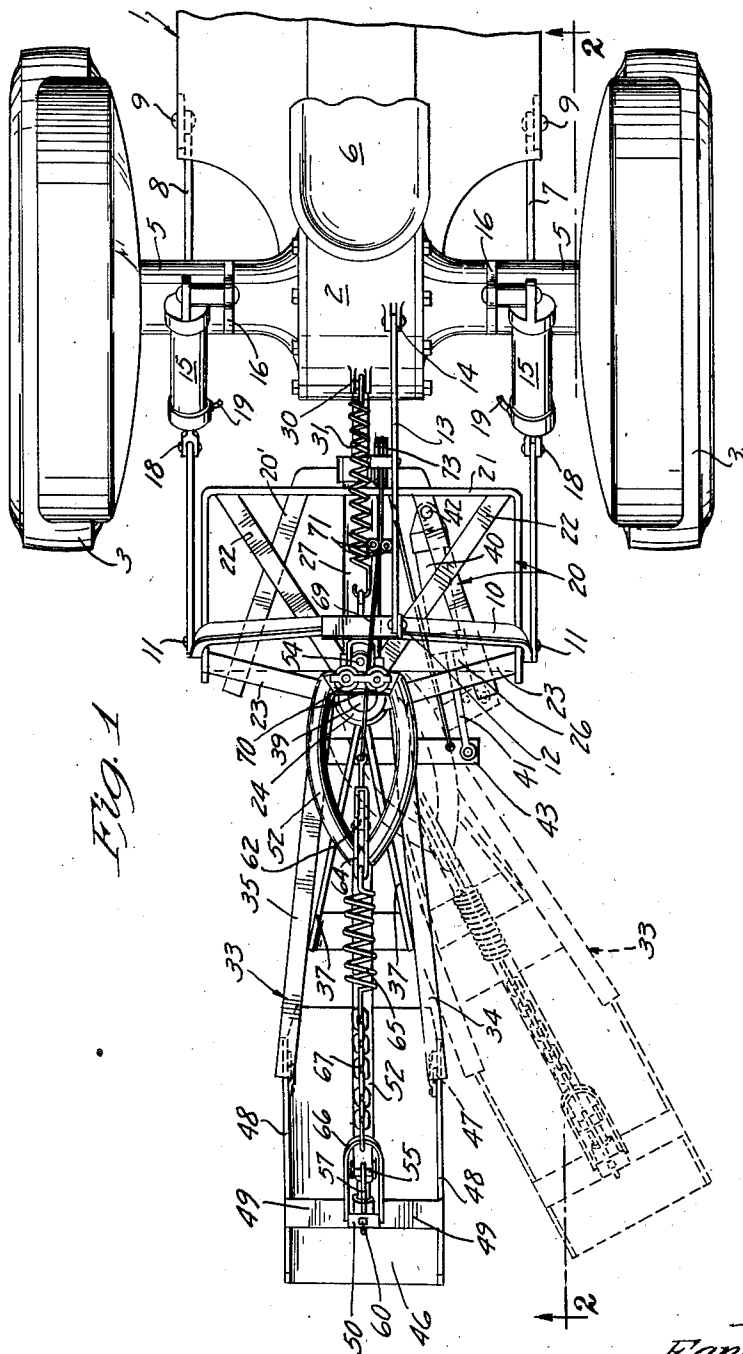
E. J. STUHR

2,622,749

DITCH DIGGING ATTACHMENT FOR TRACTORS

Filed May 8, 1950

4 Sheets-Sheet 1



Inventor
Earl J. Stuhr
By his Attorneys
Merchant & Merchant

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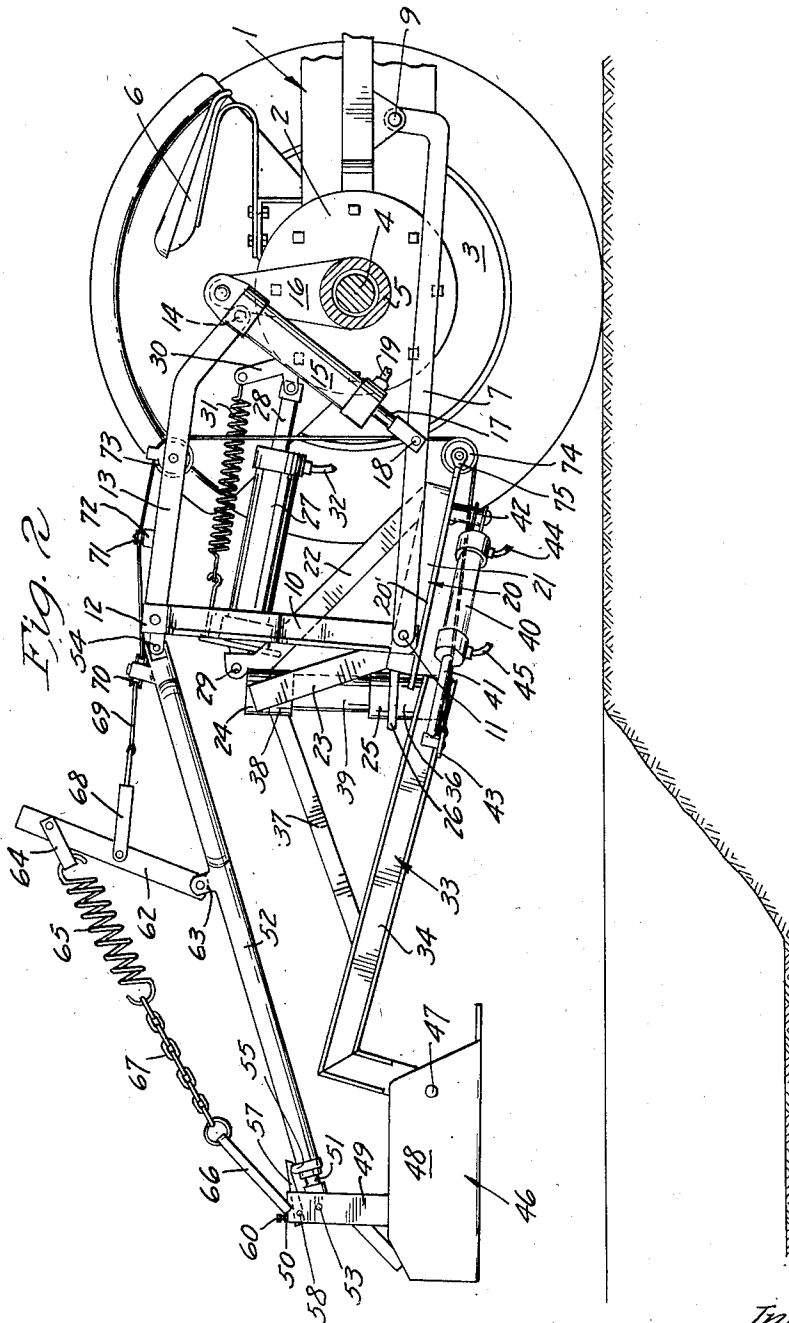
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Merchant & Merchant

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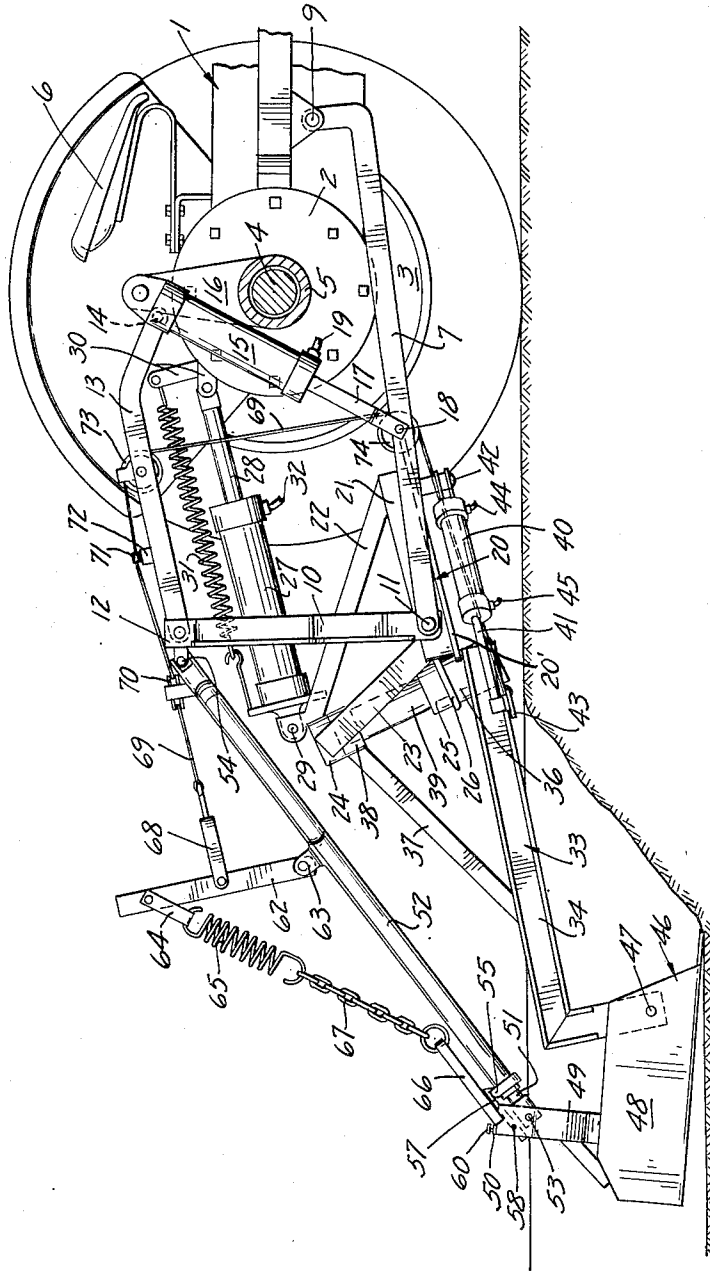
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Fig. 3



Inventor
Earl J. Stuhr
By his Attorneys
Merchant & Merchant

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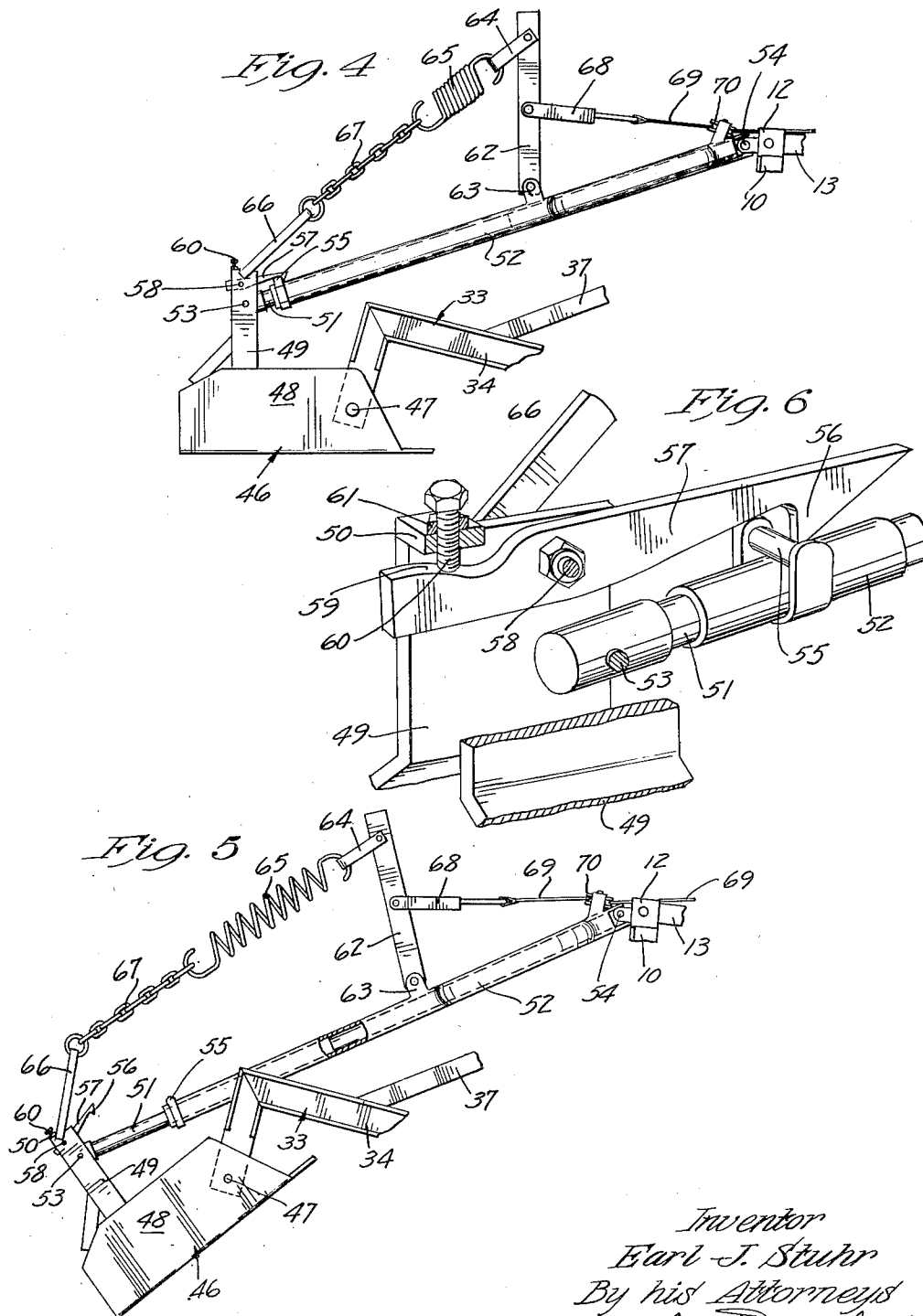
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Inventor
Earl J. Stuhr
By his Attorneys
Merchant & Merchant

UNITED STATES PATENT OFFICE

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DITCH DIGGING ATTACHMENT FOR
TRACTORS

Earl J. Stuhr, Maple Lake, Minn.

Application May 8, 1950, Serial No. 160,601

7 Claims. (Cl. 214-132)

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My invention relates generally to excavating machinery and more specifically to a ditch digging attachment for use with tractors and the like.

Heretofore, when it has been desired to dig ditches for drainage of water from low lying fields, swamps, and the like, or for other reasons, the major difficulty has been the provision of means for accomplishing this end with a minimum of time and expense involved. Inasmuch as conventional excavating machinery is expensive, and the digging of ditches manually is a laborious and time-consuming operation, much otherwise valuable swamp area remains useless.

An important object of my invention is the provision of a ditch digging attachment which may be quickly and easily attached to a conventional tractor and of means whereby said attachment may be controlled by the operator of the tractor.

Another object of my invention is the provision of a ditch digging attachment for tractors as set forth, which is relatively inexpensive to produce, which is extremely efficient in operation, and which is durable in use.

Still another object of my invention is the provision of a ditch digging attachment which utilizes the pulling power of a tractor for a portion of its operation.

A still further object of my invention is the provision of a device as set forth which will automatically unload excavated material a predetermined uniform lateral distance from the ditch being dug.

Another object of my invention is the provision of a digging scoop pivotally moveable from a digging position to a material unloading position, and means for automatically returning said scoop to its digging position when the material dug thereby has been unloaded therefrom.

Other highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims, and attached drawings.

Referring to the drawings wherein like characters indicate like parts throughout the several views:

Fig. 1 is a fragmentary view in plan of a ditch digging attachment built in accordance with my invention and attached to the rear end of a tractor;

Fig. 2 is a view partly in side elevation and partly in section as seen from the line 2-2 of Fig. 1;

Fig. 3 is a view corresponding to Fig. 2 but

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showing a different position of some of the parts;

Fig. 4 is a fragmentary view corresponding to Fig. 2 but showing a still different position of some of the parts;

Fig. 5 is a view corresponding to Fig. 4 but showing the scoop of my ditch digging attachment in a material dumping position; and

Fig. 6 is a fragmentary view in perspective of a latch means of my invention and release mechanism therefor, some parts being broken away and some parts being shown in section.

Referring with greater particularity to the drawings, the numeral 1 indicates the rear end portion of a conventional tractor having a transmission and differential gear housing 2, and pneumatic tire equipped drive wheels 3 connected by an axle shaft 4 extending laterally outwardly from the housing 2 through tubular axle casings 5. The conventional operator's seat is indicated by the numeral 6.

My novel ditch digging attachment is adapted to be detachably secured to the tractor 1 by means of a frame structure comprising a pair of laterally spaced generally parallel arms 7 and 8, the forward ends of which are pivotally secured to the tractor 1 on aligned axes as indicated at 9. By reference to Fig. 1 to 3 inclusive, it will be seen that the arms 7 and 8 are disposed on opposite sides of the gear housing 2 and below the axle housings 5 and extend rearwardly in a generally horizontal direction. At their rear ends, the arms 7 and 8 are pivotally secured on aligned axes to the opposite lower ends of a generally vertically disposed U-shaped link member 10 as indicated at 11. The upper intermediate portion of the link 10 is provided with a bracket 12 to which is pivotally secured one end of an arm 13 which extends forwardly therefrom and has its opposite end pivotally mounted to the gear housing 2 as at 14. By reference to Figs. 2 and 3 it will be seen that the arm 13 is vertically spaced from the arms 7 and 8 and that the pivotal connection 14 is upwardly and rearwardly spaced from the aligned pivotal connections 9. The above mentioned pivotal connections permit swinging movements of the arms 7, 8, and 13 in a vertical plane. Swinging movements may be imparted to the said arms by any suitable means, but as shown, the movements thereof are controlled by a pair of fluid pressure cylinders 15 mounted for swinging movements to brackets 16 fast on the axle housings 5, and piston-equipped plunger rods 17 connected one each to the intermediate portion of one of the arms 7 and 8 as indicated at 18. The above described

frame is gravity biased toward its position of Fig. 3 and is raised toward its position of Fig. 2 by fluid under pressure introduced to the lower end of the cylinders 15 through conduits 19 from a suitable pump mechanism, not shown, but which may be assumed to be located on the tractor and driven by the mechanism thereof.

A frame 20 comprises a generally U-shaped frame member 21 having its opposite end portions pivotally connected to the rear end of the arms 7 and 8 and the opposite ends of the link 10 on an axis common to the horizontal pivot axes 11 whereby the frame 20 is capable of swinging movements thereabout. The frame 20 includes frame members 22 and 23, the former of which have their forward ends welded or otherwise secured to the intermediate portion of the U-shaped member 21 and which converge upwardly and rearwardly, having their rear ends rigidly secured to a bearing boss 24. The frame 20 further comprises a generally U-shaped frame member 20' welded or otherwise secured at its rear intermediate portion to the intermediate portion of the frame member 21. The frame members 23 have their lower ends welded or otherwise secured to the opposite end portions of the frame member 21 and converge upwardly and rearwardly toward the bearing 24, to which they are welded or otherwise rigidly secured. A second bearing boss 25 is disposed in axial alignment with the bearing 24 and is mounted fast to the intermediate portion of a transverse frame member 26 having its opposite ends secured by welding or the like to the opposite end portions of the U-shaped frame member 21. With reference to Figs. 2 and 3 it will be seen that the axis of the bearing bosses 24 and 25 is perpendicular to the aligned axes 11 for a purpose which will hereinafter become apparent. Pivotal movement of the frame 20 about the axis of the pivot connections 11 is accomplished by fluid pressure operated means including a fluid pressure cylinder 27 and a piston-equipped plunger rod 28, the former of which is pivotally secured to the converging upper ends of the frame members 22, as indicated at 29 and the latter of which has its free end pivoted to a bracket 30 welded or otherwise secured to the gear housing 2. A tension spring 31 has one end anchored to the bracket 30 and its other end associated with the opposite end of the cylinder 27 whereby to bias the frame 20 in one direction of pivotal movement about the aligned pivot axes 11. Fluid under pressure is supplied to the cylinder 27 from the aforementioned pump, not shown, through a conduit 32.

A rearwardly extending boom 33 comprises a pair of rearwardly diverging members 34 and 35 which are welded or otherwise secured to a bearing boss 36, and a pair of brace members 37 having their rear ends one each rigidly secured to the intermediate portion of one of the members 34 and 35 and their front ends welded or otherwise secured to a bearing boss 38. The bearing bosses 36 and 38 are axially aligned and underlie respective bearing bosses 25 and 24. A shaft 39 extends through the several aligned bearing bosses and may be assumed to be affixed to any one of said bosses to retain same in place whereby to support the boom 33 on the frame 30 for swinging movement of the boom 33 in a generally horizontal plane or perpendicular to the plane of swinging movement of the frame 20. Swinging movements are imparted to the boom 33, with respect to the frame 20, by fluid pres-

sure operated means including a fluid pressure cylinder 40 and a cooperating piston-equipped plunger rod 41. The closed end of the cylinder 40 is pivotally secured to the intermediate portion of the U-shaped frame member 20' as indicated at 42, and the free end of the plunger rod 41 is pivotally secured to the outer end of a crank acting arm 43 projecting laterally outwardly from the boom 33 adjacent the front end thereof. Fluid under pressure is introduced to one end of the cylinders 40 from the pump and valves, not shown, through a conduit 44 to cause swinging movement of the boom 33 in one direction, and to the opposite end of the cylinder 40 through a conduit 45 to cause swinging movement of the boom 33 in the opposite direction.

Mounted to the rear end of the boom 33 for swinging movements about a horizontal axis, is a digging scoop or the like 46. Said scoop 46 is in the nature of an open ended channel and is pivotally mounted to the boom 33 adjacent its front end as indicated at 47, one each of the arms 34 and 35 being pivotally secured to an opposite side wall 48 of the scoop. A pair of rigid upstanding members 49 are one each welded or otherwise rigidly secured to an opposite side wall 48 adjacent the rear end of the scoop 46 and terminate in closely spaced relationship at their upper ends where they are connected by a cross bar 50. The upper end portions of the upstanding members 49 are connected to the upper intermediate portion of the link 10 by a pair of telescoping arms 51 and 52, the former of which has its rear end provided with a pair of laterally outwardly projecting trunnions 53 which are journaled in opposite ones of the upstanding members 49. As shown, the arm 51 is telescoped within the arm 52 for extending and retracting movements with respect thereto. The forward end of the arm 52 is connected for compound vertical and lateral swinging movements to the upper intermediate portion of the U-shaped link 10 by a compound pivot connection 54. At its rear end portion, the arm 52 is provided with a latch detent 55 which is adapted to be engaged by the hooked end 56 of a latch 57 pivotally mounted to the upper ends of the upstanding members 49 by a pivot pin or the like 58. The rear end portion of the latch 57 underlies the cross bar 50 and is adapted to have its upper surface 59 engaged by the lower end of an abutment in the nature of a machine screw 60 having threaded engagement with the cross bar 50. A lock nut or the like 61 is utilized to prevent accidental movement of the screw 60 with respect to the bar 50.

A lever arm 62 has its lower end hinged to a bracket 63 on the intermediate portion of the arm 52 for swinging movements longitudinally of the arm, and its upper end provided with a clevis 64 to which is hooked one end of a coil tension spring 65, the other end of which is connected to the extreme upper end of the upstanding members 49 by means of a strap 66 welded or otherwise secured thereto, and a link chain 67 connecting the strap 66 and the spring 65. A second clevis 68 is hingedly secured to the intermediate portion of the lever 62 and has connected thereto a flexible cable 69 which runs between guide pulleys 70 on the forward end of the arm 52, a second pair of horizontally disposed pulleys 71 mounted on a bracket 72 secured to the arm 13, over a vertically disposed pulley 73 journaled on the intermediate portion of the arm 13 and a second vertically disposed pulley

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74 journaled in a bracket 75 on the front intermediate portion of the U-shaped frame member 21. The other end of the cable 69 is secured fast to the outer end portion of the laterally projecting arm 43 of the boom 33. The cable 69 is of a length to move the lever 62 to a position wherein the spring 65 is in a stretched condition when the boom 33 is in its full line position of Fig. 1. When the boom 33 and parts moveable therewith are moved to their dotted line position of Fig. 1, resultant slack in the cable 69 is taken up by contraction of the spring 65 as indicated in Fig. 4.

When it is desired to utilize my novel attachment for the digging of a ditch or the like, the same is attached to a tractor as above indicated with the necessary fluid pressure connections being hooked up to the fluid pressure pump and valve system, not shown. Fluid under pressure is then caused to be introduced into the cylinders 15 and 27 until the structure is positioned as shown by full lines in Fig. 1 and in Fig. 2. The device is then transported to the desired location and the fluid released from the cylinders 15 and 27 in the desired amount to bring the scoop 46 into contact with the ground for digging. The tractor 1 is then moved forwardly sufficiently to cause the scoop 46 to become filled with material, after which fluid under pressure is again introduced into the cylinders 15 and 27 to raise the scoop 46 to the position of Fig. 2. When this has been accomplished, fluid under pressure is introduced to the cylinder 40 through conduit 45 whereby to cause the boom 33, scoop 46, and telescoping arms 51 and 52 to swing about the axis of the shaft 39 as indicated by dotted lines in Fig. 1. When the boom 33 and parts associated therewith have been laterally swung to a predetermined point about the axis of the shaft 39, the cable 69 is automatically slackened to a degree which permits downward swinging movement of the scoop 46 sufficient to cause the abutment 60 to engage the surface 59 of the latch 57. Downward pressure of the abutment 60 upon the free end portion of the latch 57 causes the latch hook 58 to become disengaged from the detent 55. When this occurs, the extensible and retractable arm 51 is permitted to longitudinally slidably move in a direction rearwardly with respect to its cooperating arm 52 whereby to permit the scoop 46 to tip further about the axis of its pivotal connection 47 to discharge its load rearwardly outwardly thereof as indicated in Fig. 5. The bias of the spring 65, and the length of the cable 69 is such, that when the load is discharged from the scoop 46 the arm 51 will be drawn by the spring tension forwardly with respect to the arm 52 until the latch hook 58 again engages the detent 55. This action is enhanced by swinging movement of the boom 33 and parts associated therewith in the direction of the full line position of Fig. 1, said swinging movement being caused by introduction of fluid to the opposite end of cylinder 40 through the conduit 44 and simultaneous evacuation of fluid from the cylinder 40 through the conduit 45. When the boom 33 again reaches its full line position of Fig. 1, the scoop 46 is in a position to be again lowered. The arrangement of the several arms and their pivotal connections above described, causes the scoop 46 to be disposed in a substantially horizontal position except when the same is in contact with the ground for digging, at which point the forward end thereof is slightly below the level of the rear end thereof, and when the same is in a load discharging

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position. The amount of swinging movement to which the boom 33 and parts carried thereby is subjected before load discharging movement is imparted to the scoop 46, is determined by the setting of the latch engaging abutment forming screw 60 with respect to the cross bar 59 and the surface 59 of the latch 57.

From the above it should be obvious that ditches may be excavated with a minimum of time and effort with the use of my novel attachment. Moreover, my invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of all of the objectives set forth; and while I have shown and described a commercial embodiment of my novel device, it will be understood that the same is capable of modification without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. In a device of the class described, a frame, means detachably securing said frame to the rear end of a tractor for pivotal movements on a horizontal axis; a boom, means mounting the forward end of the boom to said frame for pivotal movements about an axis perpendicular to the axis of pivotal movement of said frame, a scoop mounted adjacent one of its ends to the free end of said boom for pivotal movements about a horizontal axis, an upstanding member adjacent the other end of said scoop, a pair of downwardly and rearwardly projecting telescoping arms, means for connecting the free end of the forward one thereof to the tractor for universal pivotal movements, the free end of the rearward of said arms being pivotally secured to the upstanding member for telescopic extending and retracting movements upon pivotal movements of said scoop with respect to said boom, a latch hook pivotally mounted on said upstanding member, a latch detent on the rear end of said forward arm in latching engagement with said latch hook when the rear arm is in its retracted position, an abutment on said upstanding member engageable with said latch hook under pivotal movements of said scoop with respect to said boom to release the same from said detent, and flexible connections including a tension spring connecting a portion of said boom and said upstanding member, said spring normally biasing said abutment in a direction away from said latch hook, said spring being released when said boom is moved to a predetermined position about its pivot axis, whereby to permit the abutment to engage and release said latch hook and subsequent pivotal movement of said scoop to its unloading position.

2. The structure defined in claim 1 in further combination with fluid pressure operated means for imparting pivotal movements to said frame, said means comprising a fluid pressure cylinder and a cooperating piston plunger, one thereof associated with said frame and the other thereof adapted to be connected to said tractor, and fluid pressure operated means for pivotally moving said boom, said last mentioned means comprising a fluid pressure cylinder and cooperating piston plunger, one thereof associated with said frame and the other thereof with said boom.

3. In a device of the class described, a frame, means for detachably mounting said frame to the rear end of a tractor, said means comprising vertically spaced arms pivotally secured at their front ends to said tractor for swinging movements in a vertical plane and pivotally connected

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at their rear ends to spaced portions of a generally vertically disposed rigid link, said frame being secured to one of said arms and said link for pivotal movements in a vertical plane about the axis of the pivotal connection between said arm and link, a boom, means mounting the forward end of the boom to said frame for pivotal movements about an axis perpendicular to the axis of pivotal movements of said frame, a scoop mounted adjacent one of its ends to the free end of said boom for pivotal movements about a horizontal axis, an upstanding member adjacent the other end of said scoop, a pair of downwardly and rearwardly projecting telescoping arms, means for connecting the free end of the forward one thereof to said link for universal pivotal movements, the free end of the rearward of said arms being pivotally secured to the upstanding member for telescopic extending and retracting movements upon pivotal movements of said scoop with respect to said boom, a latch hook pivotally mounted on said upstanding member, a latch detent on the rear end of said forward arm in latching engagement with said latch hook when the rear arm is in its retracted position, an abutment on said upstanding member engageable with said latch hook under pivotal movements of said scoop with respect to said boom to release the same from said detent, and flexible connections including a tension spring connecting a portion of said boom and said upstanding member, said spring normally biasing said abutment in a direction away from said latch hook, said spring being released when said boom is moved to a predetermined position about its pivot axis, whereby to permit the abutment to engage and release said latch hook and subsequent pivotal movement of said scoop to its unloading position.

4. In a device of the class described, a frame, means for detachably mounting said frame to the rear end of a tractor, said means comprising a pair of spaced parallel arms adapted to be pivotally secured at their front ends to said tractor on aligned axes, an upper arm vertically spaced from said first mentioned arms and having its front end adapted to be pivotally secured to said tractor in upwardly and rearwardly spaced relation to the pivotal connection of said first mentioned arms, and a generally vertically disposed inverted U-shaped link pivotally secured at its upper intermediate portion to the rear end of said upper arm and at its lower opposite end portions to the rear ends of said first mentioned arms on aligned axes, said frame being secured to said first mentioned arms and said link for pivotal movements in a vertical plane about the axis of the pivotal connection between said first mentioned arms and said link, a boom, means mounting the forward end of the boom to said frame for pivotal movements about an axis perpendicular to the axis of pivotal movement of said frame, a scoop mounted adjacent its front end to the free end of said boom for pivotal movements about a horizontal axis, a rigid upstanding member adjacent the rear end of said scoop, a pair of downwardly and rearwardly projecting telescoping arms, means for connecting the free end of the forward one thereof to the upper intermediate portion of the U-shaped link for universal pivotal movements, the free end of the rear one of said telescoping arms being pivotally secured to the upstanding member for telescopic extending and retracting movements upon pivotal movements of said scoop with respect to said

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boom, a latch hook pivotally mounted on said upstanding member, a latch detent on the rear end of said forward arm adapted to have latching engagement with said latch hook when the rear arm is in its retracted position, an abutment on said upstanding member engageable with said latch hook under pivotal movements of said scoop with respect to said boom to release the same from said detent, a lever fulcrumed at one end to the intermediate portion of the forward telescoping arm, yielding means connecting the free end of said lever to the upper end of the upstanding member of said scoop, and flexible connections between said lever and a portion of said boom, said yielding means normally biasing said abutment in a direction away from said latch hook, said spring being released when said boom is moved to a predetermined position about its pivot axis, whereby to permit the abutment to engage and release said latch hook and subsequent pivotal movement of said scoop to its unloading position.

5. In a device of the class described, a frame, means detachably securing said frame to the rear end of a tractor for pivotal movements on a horizontal axis, a boom, means mounting the forward end of said boom to said frame for pivotal movements of said frame, a scoop mounted adjacent one of its ends to the free end of said boom for pivotal movements about a horizontal axis, a downwardly and rearwardly-projecting extensible and retractable member operatively associated with said frame and having one end secured to the opposite end portion of said scoop, said member being retracted when said scoop is in a load-supporting position, latch means holding said member in its retracted position, and mechanism for releasing said latch means whereby said scoop will be allowed to pivotally move to an unloading position, said mechanism comprising an abutment engageable with said latch, yielding means biasing said abutment in a direction away from engagement with said latch, and connections between said boom and said yielding means for automatically releasing the bias thereof when said boom is moved to a predetermined position about its axis.

6. In a device of the class described, a frame, means detachably securing said frame to the rear end of a tractor for pivotal movements on a horizontal axis, a boom, means mounting the forward end of said boom to said frame for pivotal movements about an axis perpendicular to the axis of pivotal movement of said frame, a scoop mounted adjacent one of its ends to the free end of said boom for pivotal movements about a horizontal axis, a pair of downwardly and rearwardly-projecting telescoping arms, means for connecting the free end of the forward one thereof to the tractor for universal pivotal movements, the free end of the other thereof being pivotally secured to the opposite end portion of said scoop for telescopic extending and retracting movements upon pivotal movements of said scoop, the rearward one of said arms being retracted when said scoop is in a load-supporting position, latch means associated with said scoop for holding said rear arm telescopically retracted within said forward arm, and mechanism for releasing said latch means, whereby said scoop will be allowed to pivotally move to an unloading position, said mechanism comprising an abutment engageable with said latch, yielding means biasing said abutment in a direction away from engagement with

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said latch, and connections between said boom and said yielding means for automatically releasing the bias thereof when said boom is moved to a predetermined position about its axis.

7. In a device of the class described, a frame, 5 means for detachably mounting said frame to the rear end of a tractor, said means comprising vertically-spaced arms pivotally secured at their front ends to said tractor for swinging movements in a vertical plane and pivotally connect- 10 ed at their rear ends to spaced portions of a generally vertically-disposed rigid link, said frame being secured to one of said arms and said link for pivotal movements in a vertical plane about the axis of the pivotal connection between said 15 arms and link, a boom, means mounting the forward end of said boom to said frame for pivotal movements about an axis perpendicular to the axis of pivotal movement of said frame, a scoop mounted adjacent one of its ends to the free 20 end of said boom for pivotal movements about a horizontal axis, a downwardly and rearwardly-projecting extensible and retractable member operatively associated with said frame and having one end secured to the opposite end portion of said scoop, said member being retracted when said scoop is in a load-supporting position, latch

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means holding said member in a retracted position, and mechanism for automatically releasing said latch means responsive to swinging movements of said boom and scoop about said perpendicular axis, whereby to permit pivotal dumping movements of said scoop, said mechanism comprising an abutment engageable with said latch, yielding means biasing said abutment in a direction away from engagement with said latch, and connections between said boom and said yielding means for automatically releasing the bias thereof when said boom is moved to a predetermined position about its axis.

EARL J. STUHR.

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