Dec. 18, 1951 H. VAN DONSELAAR 2,579,025

TRENCHING MACHINE

Filed May 31, 1947 4 Sheets-Sheet 1

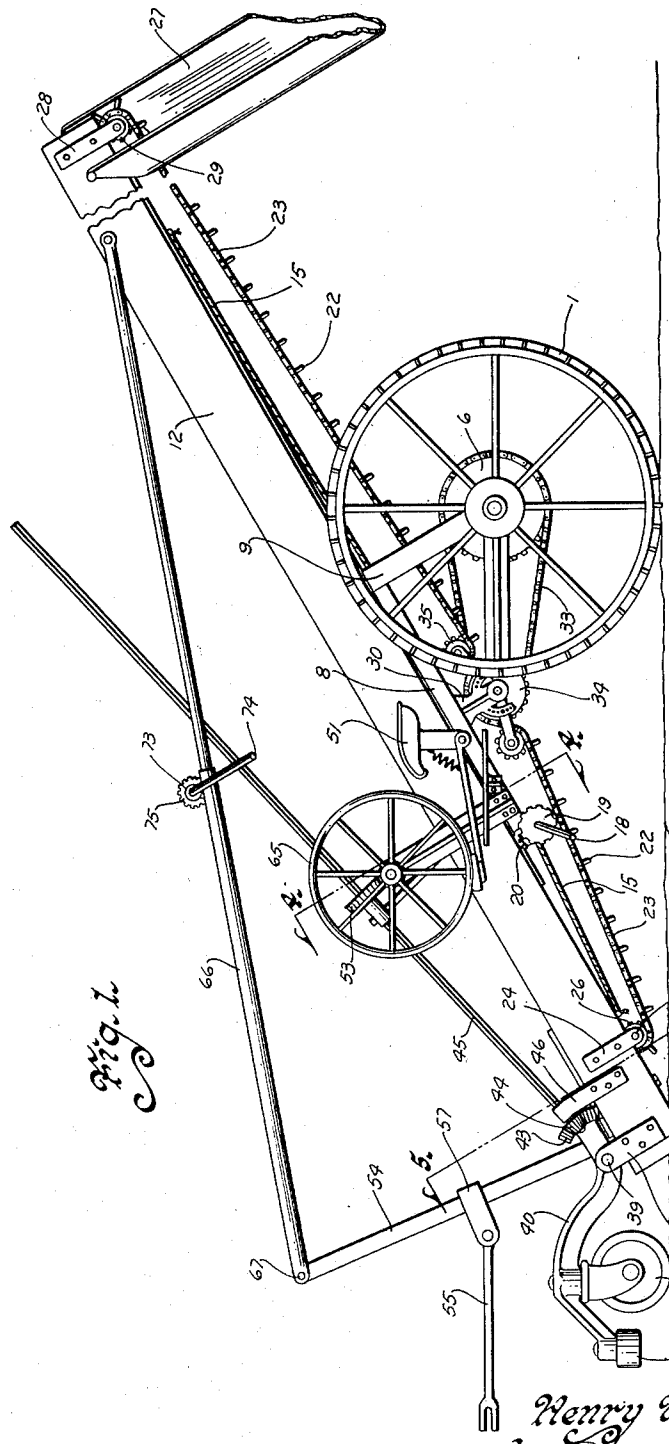


Fig. 1.

Witness
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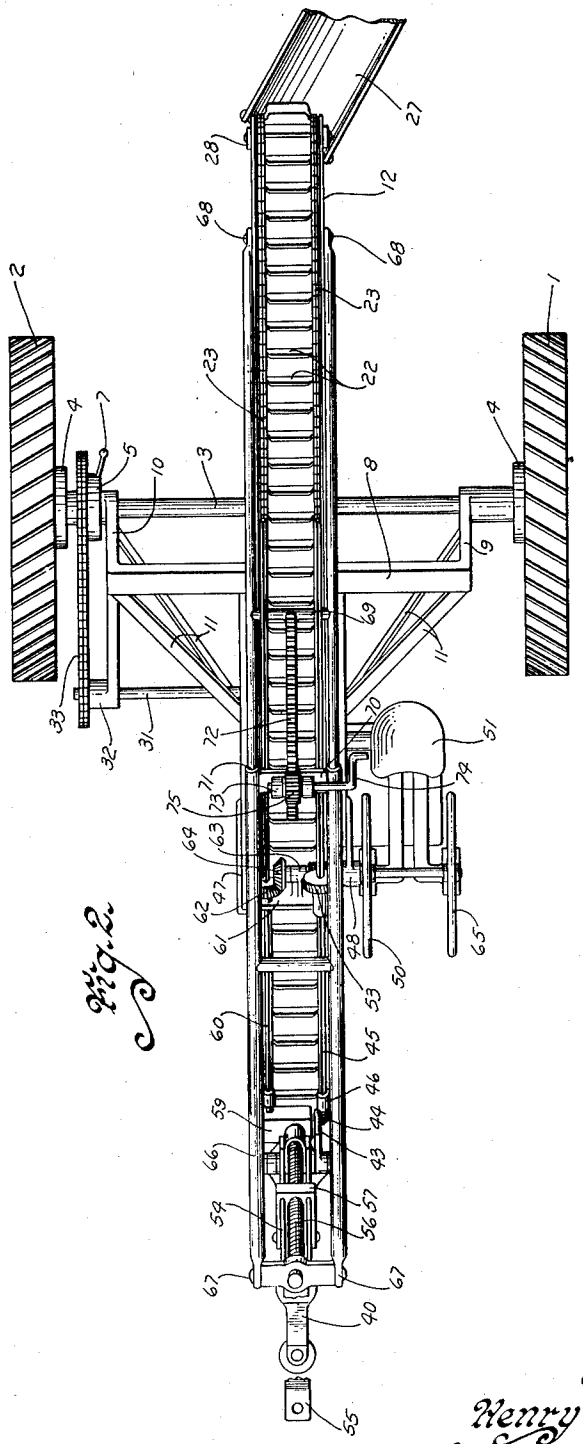


Fig. 2.

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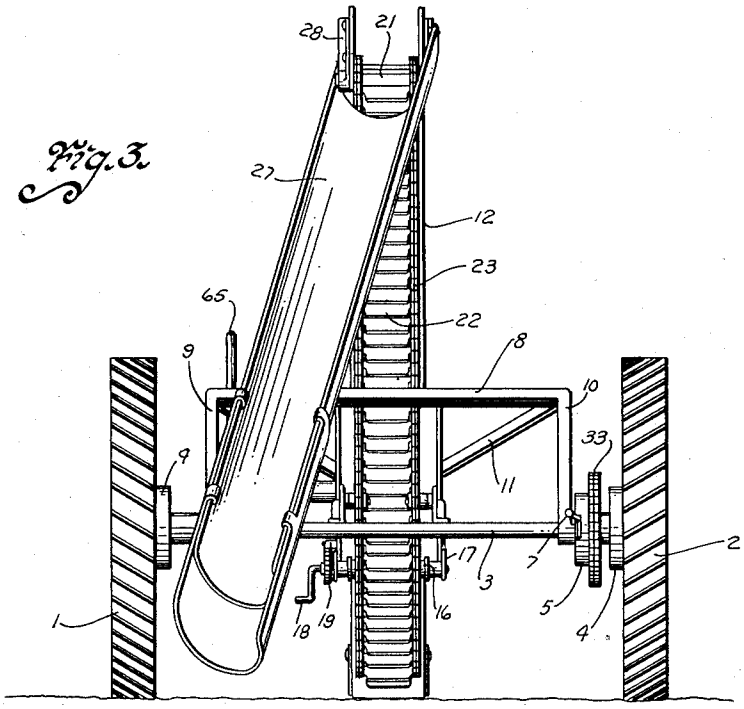
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TRENCHING MACHINE

Filed May 31, 1947 4 Sheets-Sheet 3

Fig. 3.



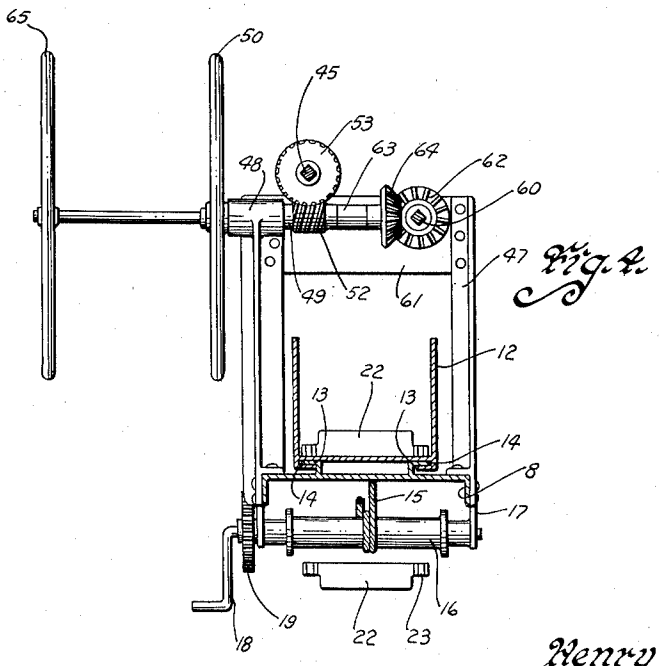


Fig. 4.

Witness
Edward P. Seeley

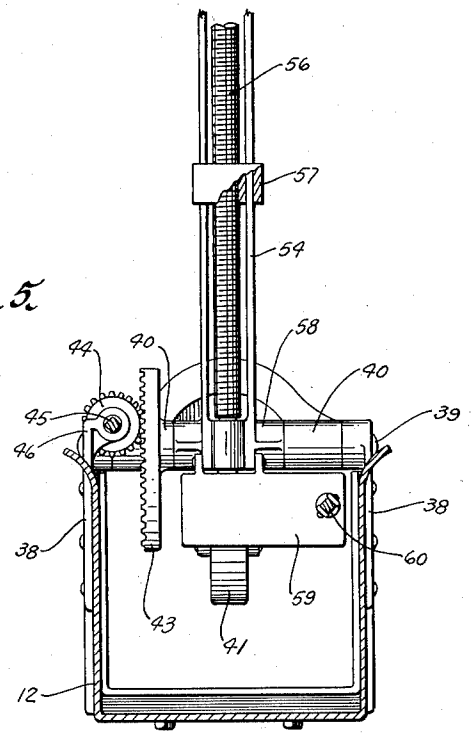
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TRENCHING MACHINE

Filed May 31, 1947 4 Sheets-Sheet 4

Fig. 5.



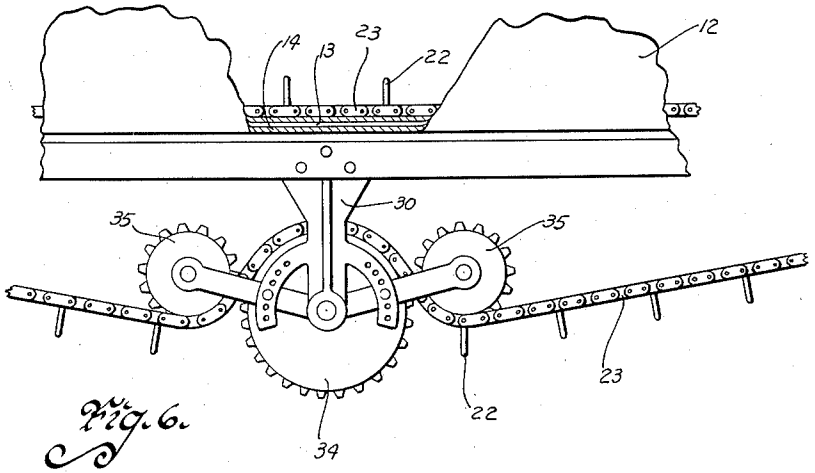


Fig. 6.

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UNITED STATES PATENT OFFICE

2,579,025

TRENCHING MACHINE

Henry Van Donselaar, Grinnell, Iowa

Application May 31, 1947, Serial No. 751,518

7 Claims. (Cl. 37—101)

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The present invention relates to a trenching machine for digging a ditch or trench and more particularly to a trenching machine for digging trenches or ditches on farms to install tile for drainage purposes.

It is an object of the invention among others to provide a trenching machine that is designed for use on a farm to be operated by farm labor; a trenching machine that is economical to manufacture and operate; a trenching machine that is simple of operation and doesn't require expert help to operate; a trenching machine propelled by the power available on a farm; a trenching machine simple in construction, simple of design and easy to repair in case of breakdown; and a trenching machine that is long lasting and more durable in operation requiring less repair and lost time in operation.

In carrying out the objects of the invention there is provided a trenching machine with a pair of wheels on an axle. A supporting structure is mounted on the axle between the wheels and has an elevator mounted on the supporting structure. The elevator has a cutting edge on the forward end of the elevator. There are means associated with the elevator to lower or raise the forward end of the elevator with respect to the means associated with the elevator.

The means associated with the elevator may be a wheel attached to the forward end of the elevator and the said elevator is adjustable vertically with respect to the wheel to raise or lower the cutting edge on the forward end of the elevator with respect to the wheel. The elevator is slidably mounted on the supporting structure to move horizontally on the supporting structure. There are means attached to the supporting structure accessible from the side of the trenching machine to move the elevator horizontally on the supporting structure which may be a roller member attached to the supporting structure on which a rope attached to each end of the elevator winds to move the elevator horizontally on the supporting structure. A power take-off runs from the axle to an idler shaft journaled in the supporting structure to rotate the idler shaft and a transmission means is between the idler shaft and the elevator to operate the elevator. The power take-off may be a sprocket wheel on the axle with a sprocket chain running to a sprocket wheel on an idler shaft to rotate the idler shaft. There is a second sprocket wheel on the idler shaft with a sprocket chain running from the elevator and passing over the second sprocket wheel on the idler shaft to operate the elevator. The supporting structure has a pair of spaced flanges and the elevator a pair of grooves on each side thereof receiving the flanges when the elevator is mounted on the supporting structure so as to be slidable with

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respect to each other. A post extends perpendicularly from the forward end of the elevator and has a hitch attached thereto to connect with a vehicle to move the trenching machine forward. There are means operable from the supporting structure to move the hitch up and down on the post. A supporting bar runs from the top of the post to the top of the elevator with the length of the supporting bar being adjustable. A shaft is journaled in the supporting structure and when rotated, rotates a second shaft through a worm gear. The second shaft has a gear on the end thereof to mesh with a gear segment on the forward end of the elevator to raise or lower the forward end of the elevator with respect to the wheel. The post includes a screw therein with the hitch attached to the screw. A second shaft is journaled to the supporting structure and has a beveled gear on the end thereof which meshes with a beveled gear on the end of another shaft with the other end of this shaft connected to the screw to rotate the screw within the post. The hitch is screw threaded and rides on the screw to move up and down on the screw by rotation of the screw.

With the foregoing and other objects in view, the invention will be more fully described herewith and will be particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a side elevational view of the trenching machine with the forward end of the trenching machine shown lowered to cut a trench.

Figure 2 is a top plan view of the trenching machine.

Figure 3 is a rear elevational view of the trenching machine.

Figure 4 is a sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a sectional view taken on the line 5—5 of Figure 1.

Figure 6 is a fragmentary view with parts broken away showing the sprocket chain operating the elevator.

The trenching machine is shown mounted on two wheels 1 and 2 connected by an axle (not shown) in axle housing 3. The wheels 1 and 2 are regular metal wheels, such as used on most farm machinery, for example mowers and manure spreaders. A gear box 4 is connected with each wheel 1 and 2 and is the usual gear box used on many types of farm implements to allow the implement to move forward or backward without the shifting of gears. A gear box 5 is mounted on the axle housing 3, next to a sprocket wheel 6 (Fig. 1), and the rotation of the axle in axle housing 3 is transmitted through gear box 5 to

rotate sprocket wheel 6. Power is transmitted from sprocket wheel 6 to operate an elevator, to be later described. If it is desired that sprocket wheel 6 not rotate, as when the trenching machine is being transported to a job, handle 7 on gear 5 may be actuated and the sprocket wheel 6 is thrown out of gear with the axle in axle housing 3.

A supporting structure 8 is connected by arms 9 and 10 to axle housing 3 with the supporting structure 8 extending forwardly and the supporting structure 8 amply reenforced and supported by cross support members 11. An elevator 12 is mounted on the supporting structure 8 so as to be slidable on supporting structure 8. Figure 4 shows two flanges 13 spaced apart and running along the length of supporting structure 8. The elevator 12 has a groove 14 on each side thereof to receive the flanges 13 therein. The elevator is thus held on the supporting structure 8 and can't fall off but the elevator 12 can move longitudinally on the supporting structure 8 by the groove 14 moving along flange 13. Figure 1 shows a cord or rope 15 attached to each end of the under side of the elevator 12. Figure 4 shows a roller 16 journaled to a supporting bracket 17 extending from the supporting structure 8. The rope 15 wraps around the roller 16 and a handle 18 connected to the roller 16 is accessible from the side of the trenching machine (Figure 1) to rotate the roller 16. A gear wheel 19 is attached on one end of roller 16 and a pawl 20 on the supporting structure 8 fits into the space between the gears on wheel 19 to hold the elevator 12 in any adjusted position. As the roller 16 is turned by handle 18, the pawl 20 having been removed from the space between the gears, the rope 15 winds and unwinds from the roller 16 depending on which direction forward or backward, it is desired to move the elevator 12. The elevator 12 moves within the flange 13 and groove 14 as previously explained.

The elevator 12 has a conveyor belt 21 with upstanding portions 22 attached on the belt 21 and a sprocket chain on each side of the belt 21, one sprocket chain 23, being shown in Figure 1. At the lower end of the elevator 12 is a bracket member, one side of which is shown in Figure 1 at 24. A shaft 25 is journaled in the bracket members 24 and a sprocket wheel 26 is secured to each of the respective ends of the shaft 25. The sprocket chains are engaged and supported by the sprocket wheels 26. The sprocket chains 23 advance the belt 21 upwardly within the elevator until the top of the elevator 12 is reached. The earth carried by the belt 21 is dumped when the top of elevator 12 is reached into conveyor chute 27, which is adjustable as to length and may direct the earth to the side. A pair of brackets 28 on either side of the top of the elevator 12 support a pair of sprocket wheels 29 over which the sprocket chains 23 pass to direct the belt 21 under the elevator 12.

The supporting structure 8 has brackets on each side of the elevator 12, one bracket being shown at 30 in Figure 1. A shaft 31 (Figure 2) has one end journaled in a bearing 32 supported from the supporting structure 8. The shaft 31 has a sprocket wheel on one end thereof with a sprocket chain 33 running from sprocket wheel 6 to rotate shaft 31. The other end of shaft 31 is journaled in bracket 30 and has mounted thereon sprocket wheels, one of which is shown at 34, over which the chains 23 run. Each chain 23 has idler sprockets 35 adjustable on brackets 30 to tighten chains 23. The elevator 12 is operated from the rear axle turning sprocket wheel 6 as the trenching machine moves forward and operates the elevator through shaft 31 and sprocket wheels 34.

The forward end of the elevator 12 has a cutting edge 36 which cuts the earth 37 and scoops it into the elevator 12. The forward end of the elevator has brackets 38 attached thereto with a shaft 39 extending between the brackets 38. A yoked member 40 is attached to the shaft 39 39 extending between brackets 38 and pivots about the shaft 39. A wheel 41 is attached to the yoked member and provides a forward support for the trenching machine. When deepening cuts are made, the wheel 41 rides in the trench already formed by previous cuts. A roller 42 is ahead of the wheel 41 to contact the side of a trench formed by previous cuts of the trenching machine to prevent the wheel 41 from digging into a side wall of the trench, particularly where the trench curves.

The forward end of the elevator is adjustable vertically with respect to the wheel 41. This adjustability of the forward end of the elevator, either puts the cutting edge 36 in position to cut the earth 37 or places it above the surface of the earth so the trenching machine can be transported from place to place. The yoked arm 40 has a gear segment 43 integrally formed with an extension of one yoke portion of yoked arm 40 and extending rearwardly beyond shaft 39. Gear segment 43 is engaged by gear 44 which is secured to the square shaft 45 that is journaled in bracket 46. Bevel gear 44 riding on gear segment 43 pivots yoke member 40 about shaft 39 which either raises or lowers the forward end of elevator 12. A supporting structure 47 is mounted on top of supporting structure 8 providing a journal 48 for a shaft 49. A wheel 50 is accessible from a seat 51 on the trenching machine for an operator. The shaft 49 has a worm gear 52 that turns a like gear 53 attached to shaft 45. By the operator rotating wheel 50, the forward end of the elevator 12 or cutting edge 36 on the forward end of the elevator 12 can be raised or lowered. The amount of the cut can be controlled and the cutting edge 36 can be moved out of contact with the ground if desired.

An upright post 54 extends from the forward end of the elevator 12 and has a hitch 55 associated therewith. A tractor or other pulling vehicle is attached to the hitch; any means found on a farm is suitable for this purpose be it horses or tractor. The post 54 has a screw 56 mounted therein and rotatable within the post 54. The hitch 55 has a screw threaded portion 57 into which the screw 56 attaches. As the screw 56 rotates within the post 54 the hitch 55 is moved up and down on the screw 56. The post 54 is pivotally mounted on shaft 39 by bearing portion 58, and the end of screw 56 attaches into gear box 59. As the gear box 59 is actuated, the end of screw 56 entered into gear box 59 is turned and the screw 56 rotated. A shaft 60 attaches into gear box 59 (Figure 5) and extends rearwardly to be journaled in bracket 61 (Figure 2). The shaft 60 extends through bracket 61 and has a bevel gear 62 on the end thereof. A shaft 63 extends through the worm gear 52 and shaft 49 journaled in bearing 48 and is rotatable within the shaft 49 and worm gear 52. A worm gear 64 is attached on one end of the shaft 63 to mesh with worm gear 62 to rotate shaft 60 and thus move the hitch 55 up and down on post 54. A

wheel 65 is attached to the other end of shaft 63 and is operated by an operator from seat 51 to raise or lower the hitch as desired.

The post 54 has supporting braces 66 running from the upper end of the post 54 to the upper end of elevator 12. The supporting braces 66 are pivotally mounted to the post at 67 and pivotally mounted to the upper end of the elevator 12 at 68. The supporting braces 66 carry cross pieces 69 and 70 and the supporting braces are telescopically joined at 71 with the cross piece 69 joining the male telescoping members and the cross piece 70 joining the female telescoping members. Between the cross pieces 69 and 70 runs a ratchet piece 72. Bearing portions 73 rotatably support a rotating crank 74 which has a wheel 75 with gears meshing in the ratchet piece 72. By turning the crank 74, the supporting braces can be moved with relation to each other to lengthen or shorten the supporting braces 66.

The trenching machine in being transported to a field to start trenching operations will ride on wheels 1 and 2. The forward end or cutting edge 36 must be raised sufficiently that the cutting edge 36 will be out of contact with the ground. The hitch 55 is attached to a pulling means, such as a tractor and the hitch 55 is properly adjusted on the post 54 by turning wheel 50 to give a sufficient rise to cutting edge 36. The handle 7 is adjusted to throw sprocket wheel 6 out of gear with the axle so the elevator 12 does not operate when the trenching machine is being pulled to a job.

When on the job, and with the course of the trench laid out, the trenching machine is adjusted for cutting and digging purposes. The elevator 12 is moved longitudinally on the supporting structure 8 so that the cutting edge 36 will rest on the ground 37 by turning the handle 18 to rotate roller 16 as previously described. The angle or pitch of elevator 2 as shown in Figure 1 is the proper angle for cutting or slicing the earth as the trenching machine moves forwardly. The handle 7 is actuated to put the sprocket wheel 6 into gear with the axle so the elevator may be operated as previously described. The hitch 55 is properly adjusted by turning wheel 65 to the proper height for pulling the trenching machine. The gear segment 43 and bevel gear 44 are designed to lower the forward end of the elevator 12 a maximum distance of ten inches. The operator must examine the soil and determine how much of a cut the equipment can make in the particular soil. The coupling between the tractor and trenching machine has an automatic release similar in every respect to the automatic release used between a plow and tractor; with the release set to uncouple when the pulling force on the trenching machine exceeds a factor of safety arbitrarily chosen. If the ground is closely packed it will take more force to make a deep or maximum cut of ten inches which may exceed the factor of safety chosen. Therefore the operator must judge what depth cut can be made and adjust the forward end of the elevator 12 from wheel 50 as previously described to the proper depth.

The trenching machine is now ready to be pulled forwardly. The wheel 41 rides on the surface of the ground 37 for the first cut or within the trench for subsequent cuts. The tractor pulling the trenching machine may straddle the trench being cut as may the trenching machine itself. The wheels 1 and 2 are about eight feet apart approximately and the trench is about one foot wide. The earth up to a ten inch depth is sliced off by the cutting edge 36 as the trenching machine moves forwardly, the earth being moved upwardly by the elevator belt 21 which discharges the conveyed earth into chute 27. Chute 27 directs the earth to the left or right and deposits it between the trench and the wheels 1 and 2. The chute 27 is extensible and adjustable.

When the end of the trench is reached, it is necessary to bring the cutting edge 36 out of the trench, turn the trenching machine around and go back up the trench. The operator on seat 51 must raise the cutting edge 36 coming out of the trench by turning wheel 50 and must also lower hitch 55 by turning wheel 65 for the turning operation. After turning and the trenching machine entered into the trench again, the elevator 12 is moved forwardly on the supporting frame 8, to maintain the cutting angle of the elevator 12 the same as the depth of the trench increases, by turning crank 18 as previously described. The operator then properly adjusts the hitch 55 so that wheel 41 rides on the bottom of the trench and adjusts cutting edge 36 for the depth of cut desired by turning wheel 50.

As the trenching machine moves back and forth in the trench, making the trench deeper and deeper, the elevator 12 moves forwardly on supporting structure 8 until the rear end of the elevator 12 reaches supporting structure 8. It is noted that shafts 45 and 60 are of sufficient length, that as the shafts 45 and 60 move forwardly with the elevator 12, they slide through bracket 61 but never out of bracket 61.

In some instances, it may be desirable to dig a trench deeper than the limits of elevator 12. That is, when the elevator 12 has moved forwardly as far as it can on supporting structure 8, the trenching machine has reached the maximum depth it can dig a trench. If additional depth is desired the supporting braces 66 may be brought into play. By turning handle 74 the telescoping sections making up the supporting brace 66 can be lengthened which will in turn drop the cutting edge 36. It is noted, however, that the angle of the elevator 12 will be changed in that its pitch will be steeper and the bite taken each time should be decreased. It is to be understood that lengthening the supporting braces 66 is an emergency and if deeper ditches are necessary as a general rule, the elevator 12 should be made longer originally.

The force from a tractor coupled to hitch 55 to pull the trenching machine forward is distributed by post 54 to the forward end of elevator 12 by the post 54 coupled to shaft 39 and by supporting braces 66 to the rear of the elevator 12.

It will be understood that the invention has been described for purpose of illustration and explanation and that changes and variations are possible without departing from the scope of the invention; all such modifications and changes are intended to be included in the appended claims.

I claim:

1. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, said supporting structure presenting a pair of spaced flanges on the supporting structure, a groove on each side of the elevator receiving the flanges on the supporting structure, said elevator slidable longitudinally on the flanges and means associ-

ated with the elevator to lower or raise the forward end of the elevator with respect to the means associated with the elevator.

2. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, said supporting structure presenting a pair of spaced flanges on the supporting structure, a groove on each side of the elevator receiving the flanges on the supporting structure, means attached to the supporting structure accessible from the side of the trenching machine to move the elevator longitudinally on the flanges with respect to the supporting structure, and means associated with the elevator to lower or raise the forward end of the elevator with respect to the means associated with the elevator.

3. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, a wheel attached to the forward end of the elevator, said forward end of the elevator movable vertically with respect to the wheel, a post extending perpendicularly from the forward end of the elevator having a hitch attached thereto to connect with a vehicle to move the trenching machine forward, means operable from the supporting structure to move the hitch up and down on the post, a supporting bar running from the top of the post to the top of the elevator with the length of the supporting bar being adjustable and a second means operable from the supporting structure connecting with the forward end of the elevator and wheel to raise or lower the forward end of the elevator with respect to the wheel.

4. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, a wheel attached to the forward end of the elevator, said forward end of the elevator movable vertically with respect to the wheel, a post including a screw therein extending perpendicularly from the forward end of the elevator having a hitch attached thereto to connect with a vehicle to move the trenching machine forward, a shaft journaled in the supporting structure rotating a second shaft attached to the screw within the hitch to move the hitch up and down and means operable from the supporting structure connecting with the forward end of the elevator and wheel to raise or lower the forward end of the elevator with respect to the wheel.

5. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, a wheel attached to the forward end of the elevator, said forward end of the elevator movable vertically with respect to the wheel, a post including a screw therein extending perpendicularly from the forward end of the elevator having a hitch attached thereto to connect with a vehicle to move the trenching machine forward, a shaft journaled in the supporting structure having a beveled gear on the shaft end, a second shaft having a bevel gear to mesh with the bevel gear on the first shaft with said second shaft rotating

the screw in the post, said hitch screw threaded and attached to the screw and moved up and down by the turning of the screw and means operable from the supporting structure connecting with the forward end of the elevator and wheel to raise or lower the forward end of the elevator with respect to the wheel.

6. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, a wheel attached to the forward end of the elevator, a shaft journaled in the supporting structure rotating a pair of shafts extending from the first shaft, one of said shafts connecting into a gear mechanism on the forward end of the elevator, said shaft rotating to raise or lower the forward end of the elevator with respect to the wheel by movement on the gear mechanism, a post including a screw therein extending perpendicularly from the forward end of the elevator having a hitch attached thereto to connect with a vehicle to move the trenching machine forward, another shaft running from the first shaft and attached to the screw in the post and said shaft rotating to turn the screw to move the hitch vertically on the screw.

7. A trenching machine comprising a pair of wheels on an axle, a supporting structure mounted on the axle between the wheels, an elevator mounted on the supporting structure, a cutting edge on the forward end of the elevator, a wheel attached to the forward end of the elevator, said forward end of the elevator movable vertically with respect to the wheel, a shaft journaled in the supporting structure rotating a pair of shafts extending from the first shaft, one of said shafts rotating through worm gears, a gear segment on the forward end of the elevator meshing with a gear on the end of the shaft rotated through the worm gear, said shaft when rotating raising or lowering the forward end of the elevator with respect to the wheel by movement on the gear mechanism, a post including a screw therein extending perpendicularly from the forward end of the elevator having a hitch attached thereto to connect with a vehicle to move the trenching machine forward, the other shaft having a bevel gear meshing with a bevel gear on the end of the shaft journaled in the supporting structure, said other shaft rotating the screw in the post and said hitch screw threaded and attached to the screw in the post and moved up and down by the turning of the screw.

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