Feb. 18, 1964 A. L. LUCAS 3,121,503

SWINGABLE SUPPORT FOR AN EXCAVATING UNIT

Filed Dec. 20, 1961 4 Sheets-Sheet 1

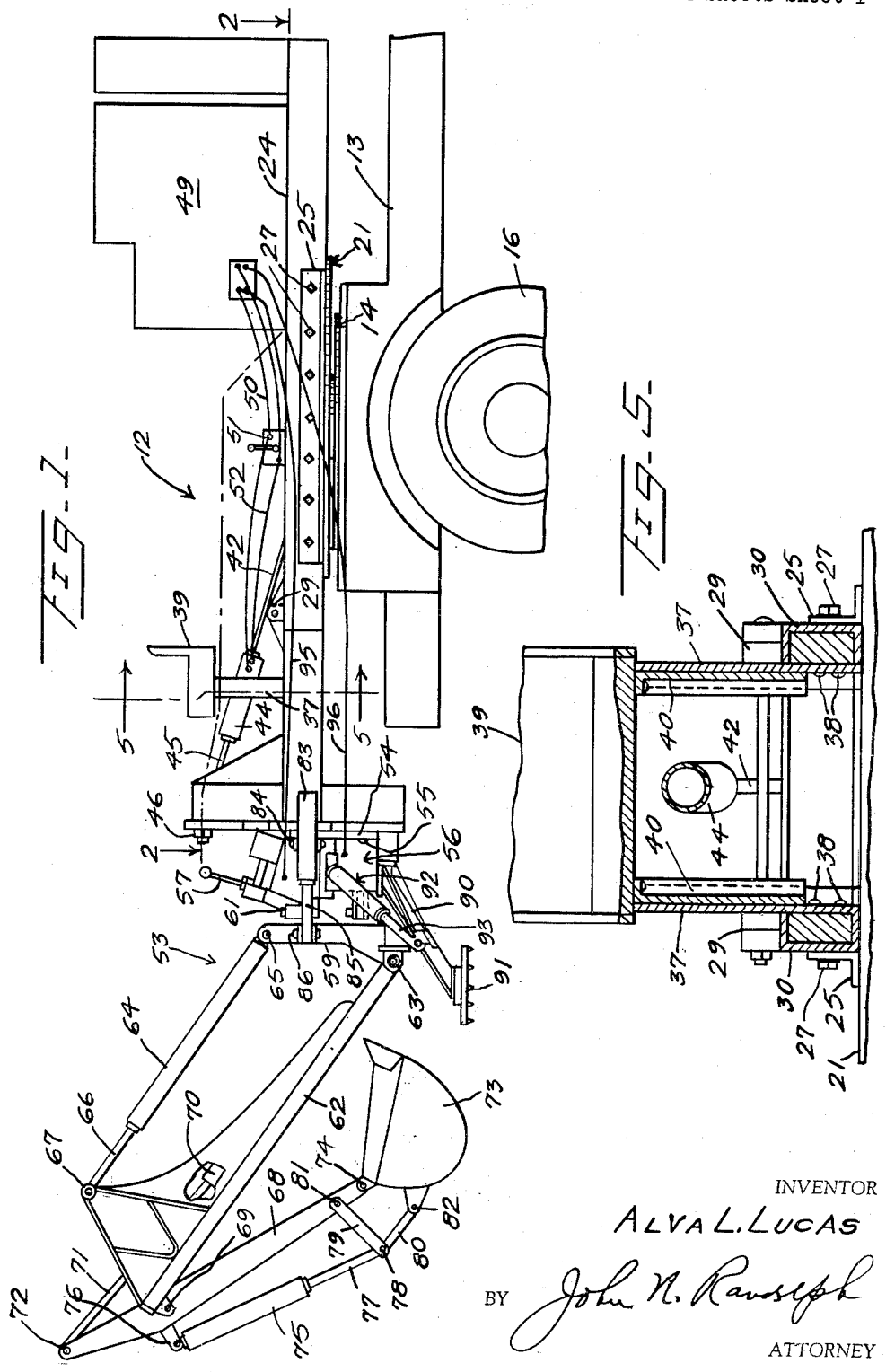

FIG. 1.

FIG. 5.

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SWINGABLE SUPPORT FOR AN EXCAVATING UNIT

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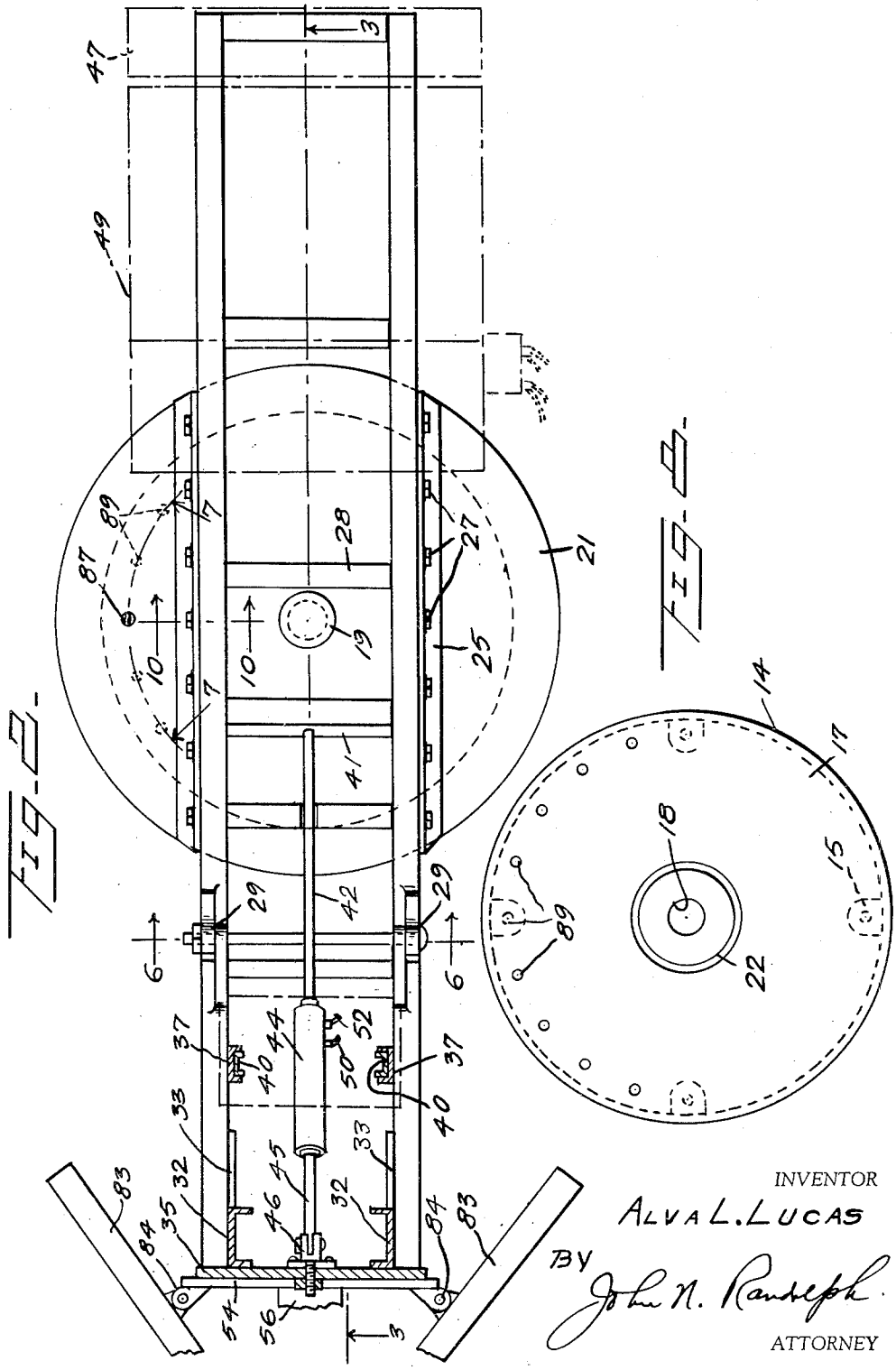

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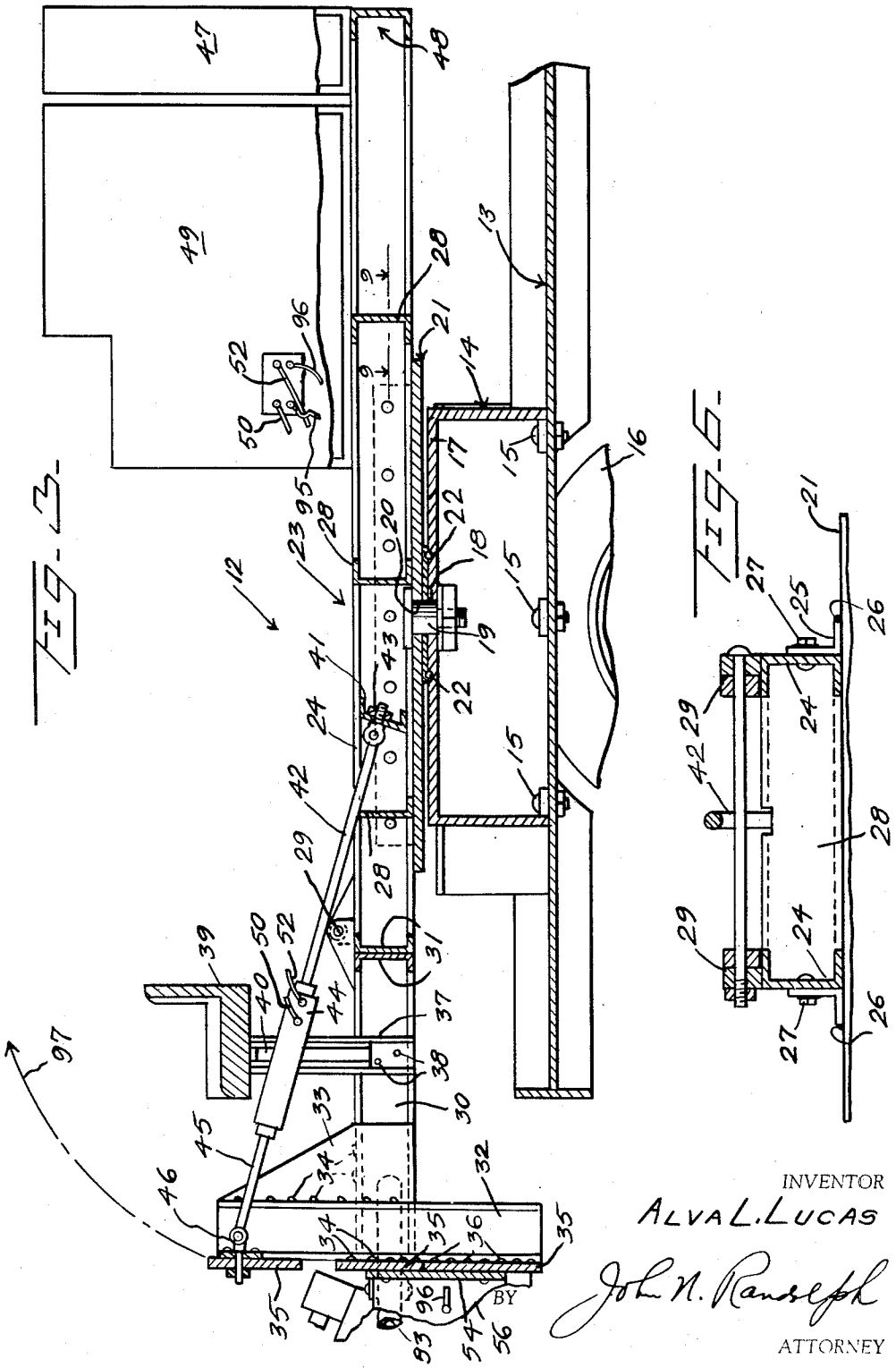

FIG. 3.

FIG. 5.

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SWINGABLE SUPPORT FOR AN EXCAVATING UNIT

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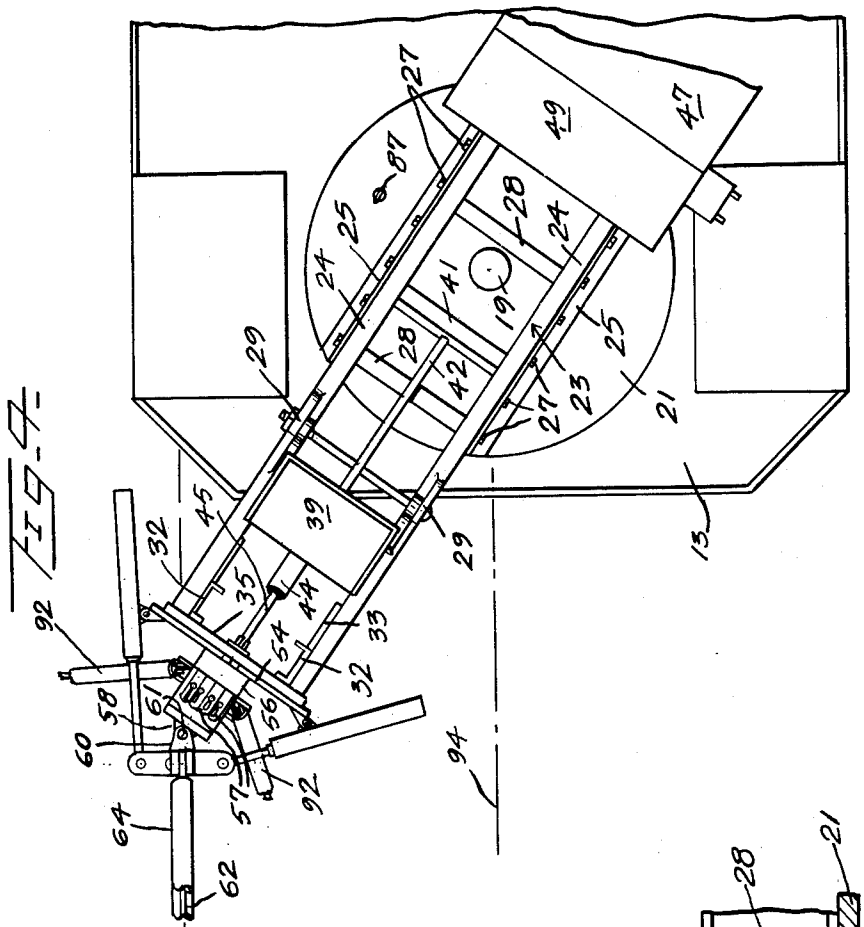

FIG. 4

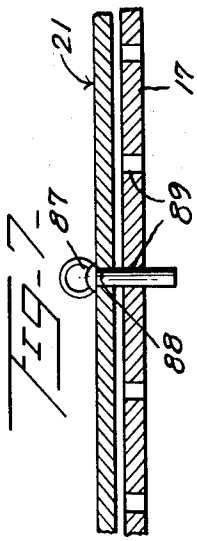

FIG. 7

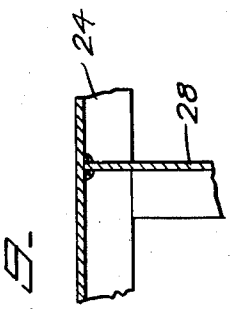

FIG. 8

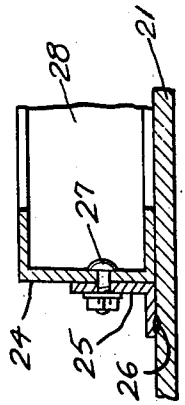

FIG. 10

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3,121,503
SWINGABLE SUPPORT FOR AN EXCAVATING UNIT

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Filed Dec. 20, 1961, Ser. No. 160,707
1 Claim. (Cl. 214—138)

This invention relates to a novel swingable support for mounting a conventional excavating unit on a carrying vehicle and by means of which the maneuverability of the excavating unit is greatly enhanced.

More particularly, it is an object of the present invention to provide a swingable support for mounting a conventional excavating unit relative to a supporting vehicle, which will enable the excavating unit to dig a much larger excavation without moving the vehicle than is possible when the unit is mounted in a conventional manner, and which will enable the excavating unit to operate in areas which would otherwise be inaccessible thereto.

Still a further object of the invention is to provide a swingable support which is mounted for oscillating movement on a conveying vehicle and which support is swingable relative to the vehicle for positioning the excavating unit in a plurality of selected positions laterally offset to either side of the longitudinal axis of the vehicle.

Still another object of the invention is to provide a support which may be oscillated to different angularly adjusted positions relative to a vehicle on which it is supported by manipulation of the excavating unit.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

FIGURE 1 is a side elevational view, partly broken away, showing the swingable support mounted on an end of a wheeled vehicle and supporting the excavating unit at one end thereof;

FIGURE 2 is an enlarged horizontal sectional view of the support, taken substantially along the line 2—2 of FIGURE 1;

FIGURE 3 is a longitudinal sectional view thereof, taken substantially along the line 3—3 of FIGURE 2, and including a part of the vehicle;

FIGURE 4 is a fragmentary top plan view showing the support in an angularly adjusted postion relative to the vehicle;

FIGURE 5 is an enlarged fragmentary transverse sectional view, taken substantially along the line 5—5 of FIGURE 1;

FIGURE 6 is an enlarged fragmentary cross sectional view, taken substantially along a plane as indicated by the line 6—6 of FIGURE 2;

FIGURE 7 is an enlarged fragmentary sectional view taken substantially along the line 7—7 of FIGURE 2;

FIGURE 8 is a top plan view of a part of the support;

FIGURE 9 is an enlarged fragmentary horizontal sectional view, taken substantially along a plane as indicated by the line 9—9 of FIGURE 3, and

FIGURE 10 is an enlarged fragmentary transverse sectional view taken substantially along a plane as indicated by the line 10—10 of FIGURE 2.

Referring more specifically to the drawings, the swingable support in its entirety and comprising the invention is designated generally 12. The support 12 is shown mounted on a bed 13 of a wheeled vehicle such as a truck, only a part of which is illustrated.

The swingable support 12 includes a turntable base 14 which is mounted on and secured to the truck bed 13 by fastenings 15. The base 14 is disposed between and substantially in transverse alignment with the rear truck wheels 16. The base 14 includes a substantially flat top

plate 17 having a central opening 18 to receive a hub member 19 which extends downwardly through a central opening 20 in a turntable 21 and downwardly through the base opening 18 for rotatably mounting the turntable 21 on the base 14. Antifriction bearing means 22 are interposed between the top plate 17 and turntable 21 and around the hub 19 for supporting the turntable 21 out of contact with the base 14, for free rotary movement relative to said base.

The support 12 includes an elongated frame, designated generally 23, which includes two elongated rigid C-beams 24 which are disposed in spaced apart parallel relation to one another and which extend across and have intermediate portions resting on the turntable 21 and which are spaced equal distances from and straddle the hub 19. As seen in FIGURE 6, the beams 24 open toward one another and are disposed between two elongated rigid angle members 25 which are welded or otherwise secured, as seen at 26, to the upper side of the turntable 21 and which are bolted or otherwise fastened as seen at 27 to the beams 24 for securing the frame 23 immovably on the turntable 21. The frame 23 also includes a plurality of cross braces 28 which extend between and are rigidly secured to the beams 24, and which are preferably of channel shape cross section.

Corresponding ends of the beams 24 are connected by hinges 29 to inner ends of two short beams 30 which are also of channel shape cross section and which form straight extensions of the beams 24 in the extended positions thereof, as illustrated in the drawings. The adjacent ends of the beams 24 and beam extensions 30 have cross braces 31 which are disposed in abutting engagement to prevent the beam extensions 30 from swinging downwardly past positions in alignment with the beams 24. The hinges 29 are disposed above the beams and beam extensions to permit the beam extensions 30 to swing upwardly relative to the beams 24 about the axis of the hinges 29. Thus, the beam extensions 30 form a part of a hinged end of the frame 23.

Upright posts 32, forming parts of the frame 23, are secured intermediate of their ends to the inner sides of the outer ends of the beam extensions 30, said posts preferably being of channel shape cross section and disposed to open toward one another. The posts 32 are reinforced and braced by gussets 33 which engage the inner flanges of said posts. The gussets 33 are secured to the posts 32 and beam extensions 30 by welding, as seen at 34, and the posts 32 are secured by additional welds to the beam extensions 30. Mounting plates 35 extend across the outer flanges of the uprights 32 and are welded or otherwise secured thereto, as seen at 36. The mounting plates 35 constitute the outer end of the frame 23.

Posts 37 of channel shape cross section have lower ends bolted or otherwise secured, as seen at 38 in FIGURE 3, to the inner sides of the beam extensions 30 between the gussets 33 and the inner cross brace 31 thereof. The posts 37 extend upwardly from the beam extensions 30 and support a seat 39 on their upper ends. The seat 39 has rigid downwardly extending legs 40 which telescope into the posts 37 for detachably retaining the seat thereon and so that the seat can be lifted upwardly and detached from said posts.

A cross brace 41 extends between and is secured to the beams 24 over a part of the turntable 21 and is disposed at an incline, as seen in FIGURE 3. One end of a rigid rod 42 is pivotally connected by an eye fastening 43 to the cross member 41 for vertical swinging movement. The rod 42 normally extends from the fastening 43 over the axis of the hinges 29 and is rigidly secured at its opposite end to the inner end of a hydraulic cylinder 44 which extends outwardly therefrom between the posts 37

and beneath the seat 39. A piston rod 45 extends outwardly from the opposite end of the cylinder 44 and is pivotally connected at its outer end to the uppermost mounting plate 35 by an eye fastening 46.

A counterbalance 47 is mounted on and secured to the opposite end 48 of the frame 23, and a conventional power unit 49 for supplying hydraulic pressure is mounted on and secured to the frame 23 between the counterbalance 47 and the hub 19.

A supply conduit 50 leads from the power unit 49 through a control unit 51, mounted on a part of the frame 23, and thence to the hydraulic cylinder 44, and a return conduit 52 leads from the cylinder 44 back through the control unit 51 to the power unit 49.

The swingable support 12 mounts a conventional excavating unit or apparatus 53 commonly known as a "back hoe" and which includes a mounting plate 54, constituting one end thereof, which is secured by suitable fastenings 55 rigidly to the outer sides of one or more of the mounting plates 35. A supporting structure 56 of the unit 53 projects outwardly from the outer side of the plate 54 and carries control mechanism 57. Brackets 58 extend forwardly from the structure 56. An upright post 59 has vertically spaced pairs of ears 60 which straddle the brackets 58 and which are pivotally connected thereto by fastenings 61. The fastenings 61 are disposed in vertical alignment to provide a pivot axis about which the post 59 swings relative to the stationary structure 56. The inner end of a boom 62 is pivotally connected at 63 to the lower end of the post 59 for vertical swinging movement. The boom 62 is supported by a hydraulic ram the cylinder 64 of which is pivoted at 65 to the upper end of the post 59 and the piston rod 66 of which is pivotally connected at 67 to an outer portion of the boom 62. A lever 68 is pivotally connected at 69 to the underside of the outer end of the boom 62 and at a point spaced from its ends. A hydraulic cylinder 70 is pivotally mounted on the pivot 63 and the outer end of the piston rod 71 thereof is pivotally connected at 72 to the end of the lever 68 which is located nearer the pivot 69 than the other lever end to which an excavating bucket 73 is pivotally connected at 74. A hydraulic cylinder 75 is pivotally mounted at 76 on the lever 68, near its pivot 69, and the piston rod 77 thereof is pivotally connected at 78 to adjacent ends of two links 79 and 80. The other end of the link 79 is pivoted at 81 to the lever 68, inwardly of and adjacent the pivot 74, and the other end of the link 80 is pivotally connected at 82 to the bucket 73 at a point spaced from the bucket pivot 74. The pivots 63, 65, 67, 69, 72, 76, 74, 78, 81 and 82 are all disposed horizontally so that the parts connected thereby all swing in substantially the same vertical plane.

The unit 53 includes hydraulic cylinders 83 which are pivotally connected at 84 to side edges of the mounting plate 54 and which have piston rods 85 which are pivotally connected at 86 to opposite sides of the post 59 for swinging the post and the parts 63 to 82, carried thereby, in either direction relative to the structure 56 about the pivot 61 through a total arc of approximately 180°.

Brace legs 90 are pivotally connected to opposite sides of the supporting structure 56 and extend outwardly therefrom and are mounted for vertical swinging movement. The brace legs 90 have foot members 91 secured to their outer ends. Hydraulic cylinders 92 are pivotally mounted for vertical swinging movement on each side of the supporting structure 56 above the brace legs 90 and have piston rods 93 which are pivotally connected to the legs 90, intermediate of the ends of said legs, for raising and lowering the legs.

A supply conduit 95 extends from the supply unit 49 to the control unit 57 and a return conduit 96 leads from said control unit back to the supply unit. Conduits, not shown, extend from the control unit 57 to and back from each of the hydraulic cylinders 64, 70, 75 and 92 so that said cylinders can be pressurized and de-pressurized by an operator seated upon the seat 39.

The excavating unit 53 is conventionally mounted upon a stationary upright part of a motor vehicle such as a truck at an end thereof and crosswise of the vehicle. The vehicle is moved to position the excavating unit 53, which is disposed in alignment with the longitudinal axis of the vehicle, in a desired position where an excavation is to be made. When the vehicle is correctly positioned, the cylinders 92 are pressurized to forcibly swing the legs 90 downwardly to anchor the foot members 91 in the earth to thereby hold the structure 56 stationary and to provide a partial support for said structure. The outer end of the cylinder 64 is then pressurized to draw the rod 66 inwardly for raising the boom 62, after which the outer end of the cylinder 70 is pressurized to draw the piston rod 71 inwardly to swing the lever 68 clockwise about its pivot 69, as seen in FIGURE 1, to position the bucket 73 in an extended position beyond the outer end of the boom 62. The outer end of the cylinder 75 is then pressurized to draw the piston rod 77 inwardly thereof to swing the bucket 73 clockwise about its pivot 74. The inner end of the cylinder 64 is then pressurized to lower the boom 62, and the inner end of the cylinder 70 is thereafter pressurized to cause the lever 68 to swing counterclockwise relative to the boom back toward its position of FIGURE 1 and with the bucket in engagement with the earth to exacavate a trench approximately equal to the width of the bucket 73, which is usually about twelve inches. As the bucket becomes filled, the cylinder 75 is pressurized to extend the piston 77 to swing the bucket counterclockwise to a load carrying position as seen in FIGURE 1. The boom 62 is then raised after which the post 59 is swung either to the right or to the left by operation of the cylinders 83. The lever 68 is then swung counterclockwise and the bucket 73 is swung in the same direction for dumping the earth contained therein, after which the post 59 is returned to a position with the boom 62 disposed substantially in alignment with the carrying vehicle or at a right angle to the mounting plate 54. This operation is then repeated any necessary number of times to dig a trench of the desired depth. However, in order to excavate a hole wider than the width of the bucket 73, it is necessary to move the supporting vehicle to laterally offset the unit 53 a distance equal to the width of the bucket after a trench of a desired depth has been dug, since the bucket can only function to excavate while being drawn directly inwardly toward the post 59. This frequent movement of the carrying vehicle for digging an excavation of any considerable width results in a considerable loss of time in starting, moving and manipulating the vehicle and in raising and lowering the brace legs 90. Additionally, it is not always possible to move the carrying vehicle to effect the necessary lateral displacement thereof due to obstructions.

The swingable support 12 overcomes these objections and enables the carrying vehicle to remain stationary and in one place while digging an excavation of a width equal to twice the distance between the hub 19 and the post pivot 61. The initial trench is dug in the same manner as heretofore described and with the frame 23 disposed in alignment with the longitudinal axis of the carrying vehicle. The frame 23 is held stationary relative to the vehicle bed 13 while the excavating unit 53 is in operation by a pin 87, as best seen in FIGURE 7, which extends downwardly through a single opening 88 in the turntable 21 and selectively engages through one of a series of openings 89 in the top plate 17. The openings 89 are disposed in an arc, as best seen in FIGURE 8.

After the initial trench has been dug to the desired depth, the brace legs 90 are raised and with the locking pin 87 removed from the openings 88 and 89, the frame and turntable are turned in one direction or the other to align the opening 88 with a different opening 89, usually the next one on either side of the one previously engaged

by the pin 87, after which the locking pin is re-applied to lock the frame and turntable immovable relative to the vehicle. The digging operation can then be repeated for digging another trench parallel to and communicating with the trench previously dug. In digging the second trench, one of the cylinders 83 is held pressurized slightly so that the post 59 is slightly turned in one direction or the other relative to its initial position in order that the boom 62 will be disposed at an angle to the frame 23 and parallel to the longitudinal axis 94 of the vehicle, as illustrated in FIGURE 4. The angular adjustment of the post 59 always equals the angular adjustment of the frame 23 but is in the opposite direction. It will be readily apparent that after each digging operation the boom 62 can be swung outwardly and away from the support 12 and the vehicle for dumping the load contained in the bucket 73 and thereafter swung back to its initial position at an angle to the support 12 and parallel to the vehicle axis 94. The support 12 is swingable about its pivot 19 through an arc of 180°, or 90° in either direction from a position in alignment with the axis 94, and the post 59 and parts carried thereby are swingable in either direction through an arc of 90° relative to the support 12.

Turning or angular adjustment of the frame 23 can be accomplished in several ways by manipulation of the excavating apparatus 53. For example, with the post 59 swung laterally and the bucket extended after dumping, the brace legs 90 can be raised and the boom 62 lowered to cause the bucket 73 to engage the ground. By then swinging the lever 68 inwardly, as in a digging operation, the bucket 73 wil function as an anchor and remain substantially stationary so that the boom 62 will exert a pull on the post 59 to swing the end of the frame 23 on which the unit 53 is mounted toward the bucket 73. This is accomplished with the locking pin 87 removed.

When the apparatus is in transit, the excavating unit 53 is folded and the boom 62 is raised relative to its position of FIGURE 1. The brace legs 90 are also raised and the seat 39 is removed from the posts 37. The outer end of the cylinder 44 is then pressurized by manipulation of the control 51 for drawing the piston rod 45 inwardly of said cylinder to thereby exert a pull on the fastening 46 for swinging the beam extensions 30 and the parts supported thereby upwardly about the axis of the hinges 29, in the direction as indicated by the arrow 97. With the rear portion of the frame 23 thus raised to support the excavating apparatus 53 in an elevated position, the transporting vehicle can move readily on highways to and from and between locations where excavating is to be accomplished.

Various modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention as hereinafter defined by the appended claim.

I claim as my invention:

In combination with a transport vehicle and an excavating apparatus including a mounting plate, a digging bucket, and means supporting said digging bucket relative to the mounting plate for movement directly toward the mounting plate during digging operation of the bucket and for swinging movement about a vertical axis relative to the mounting plate for dumping the bucket contents; a support for mounting said excavating apparatus on the transport vehicle comprising an elongated frame, means secured to and supported by said transport vehicle and supporting said frame thereabove and in substantially a horizontal plane for swivel movement about a substantially vertical axis relative to the transport vehicle, said frame having an end spaced from said vertical axis a distance such that said frame end is disposed beyond an adjacent end of the vehicle or outwardly of either side of the vehicle, means securing the mounting plate to said frame end for supporting said excavating apparatus on the vehicle for operational movement relative to said vehicle and frame and for swinging movement with said frame end relative to the vehicle for laterally offsetting the excavating apparatus in either direction relative to the longitudinal axis of the vehicle, said frame having a transversely disposed hinge joint between said frame end and said vertical axis, and means anchored to the frame near said vertical axis and to said frame end and extending over the hinge joint, said last mentioned means being retractable for swinging said frame end and the excavating apparatus supported thereby upwardly and inwardly of the frame to a transporting position.

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