

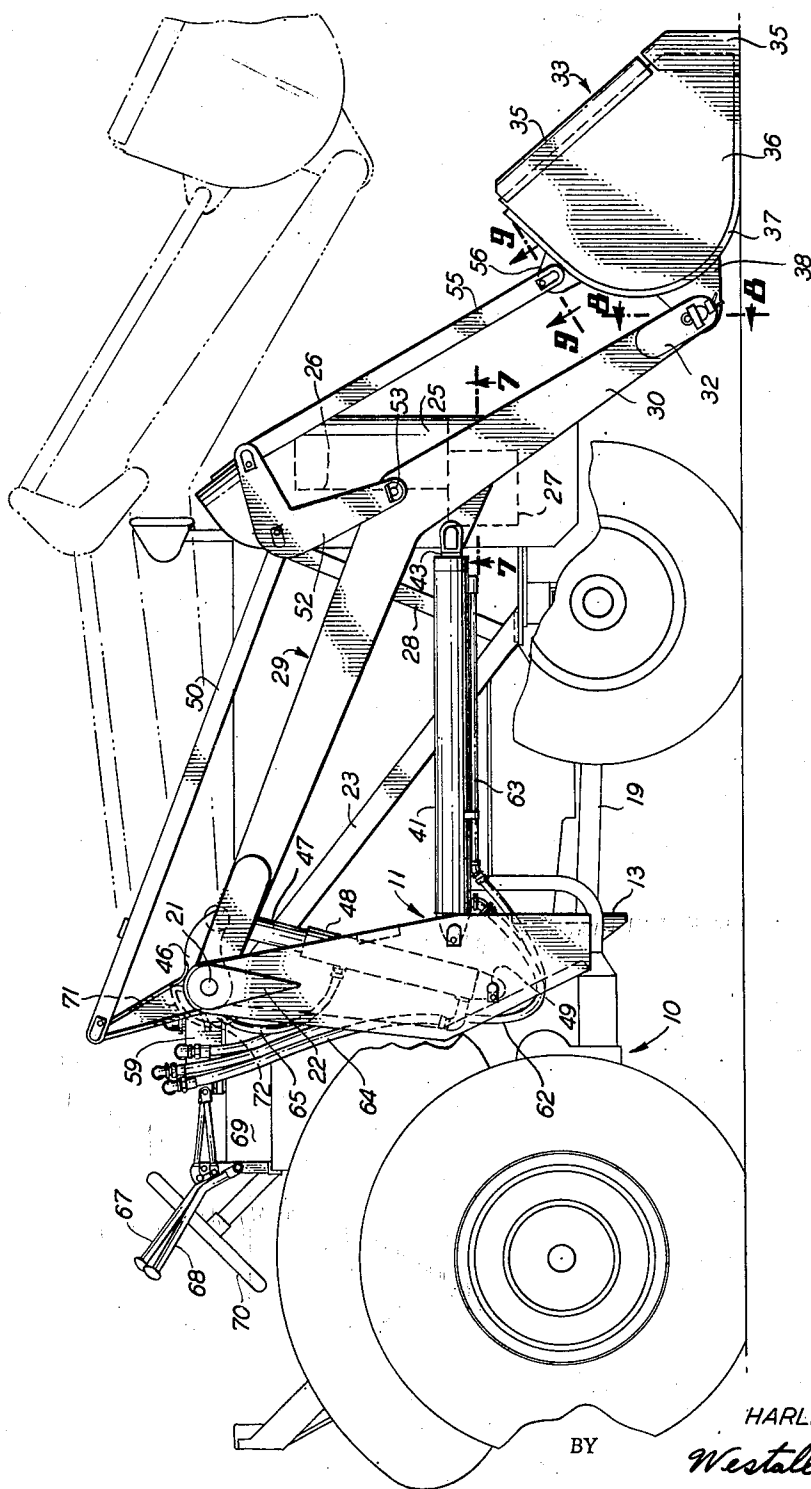
Feb. 9, 1954

H. R. REESE
HYDRAULIC LOADER

2,668,631

Filed Oct. 6, 1947

4 Sheets-Sheet 1



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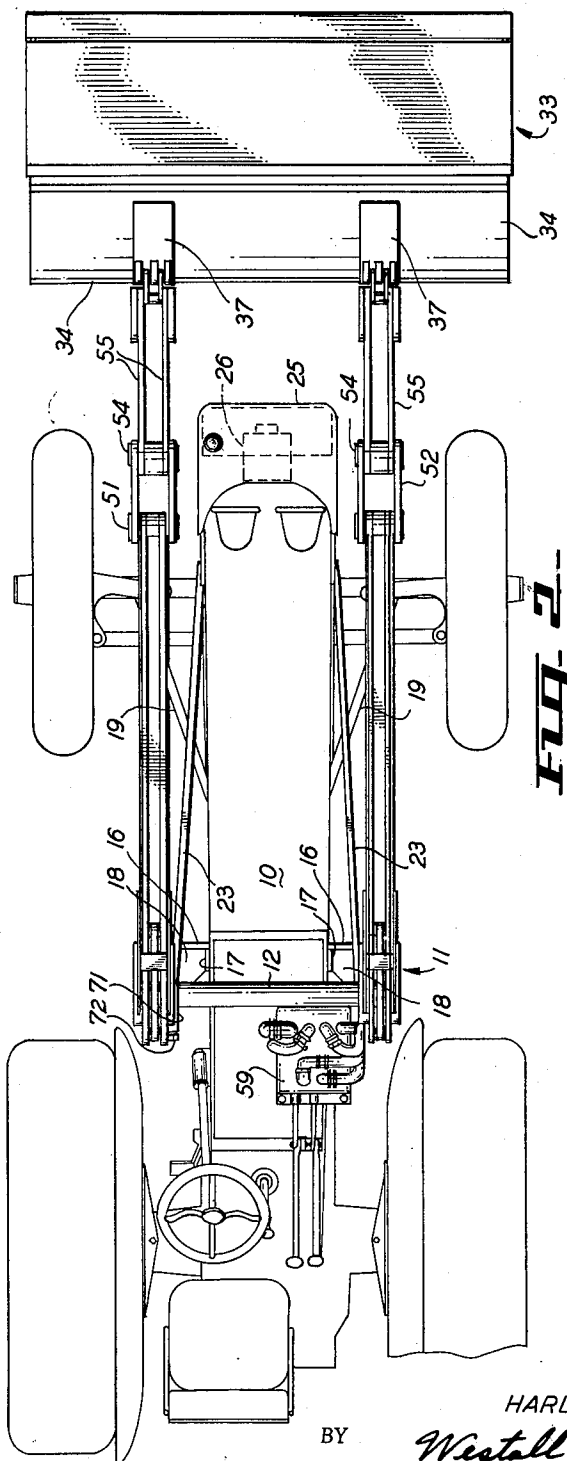
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4 Sheets-Sheet 3

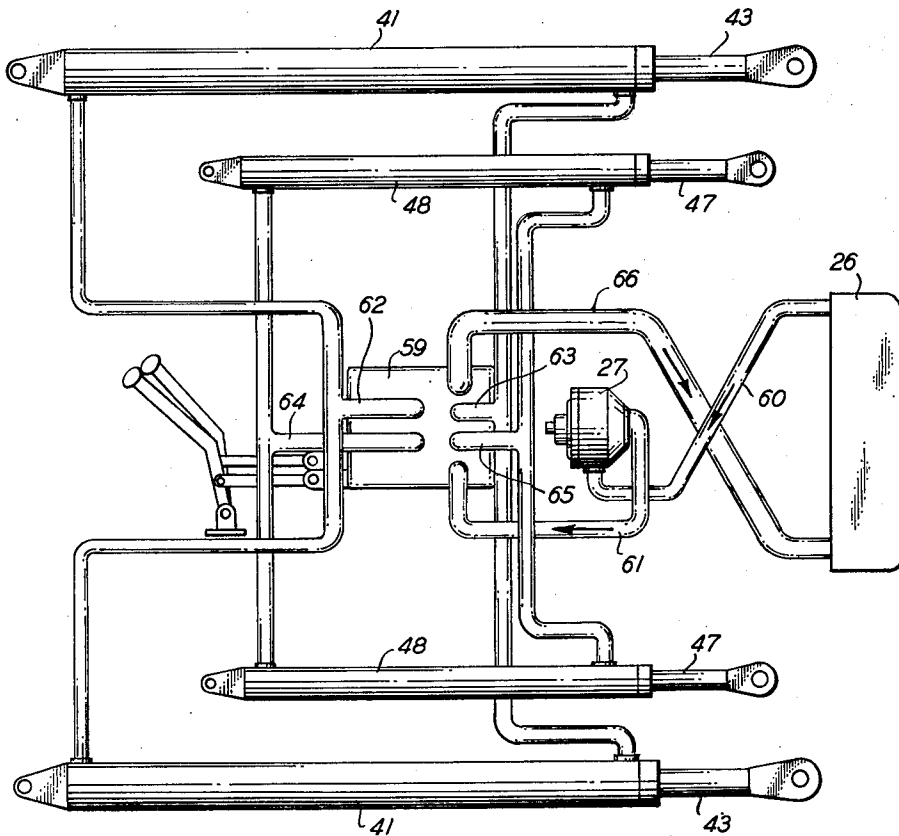


Fig. 3.

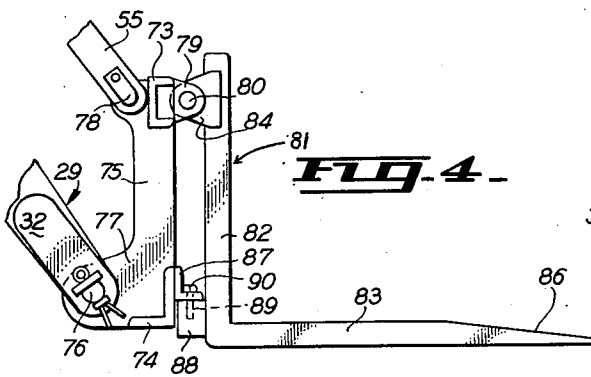


Fig. 4.

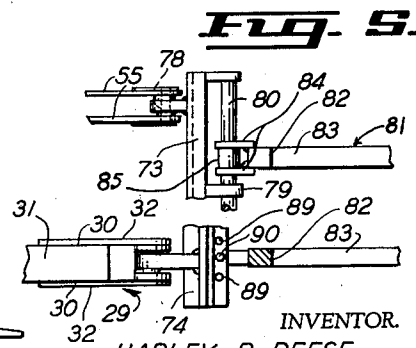


Fig. 5.

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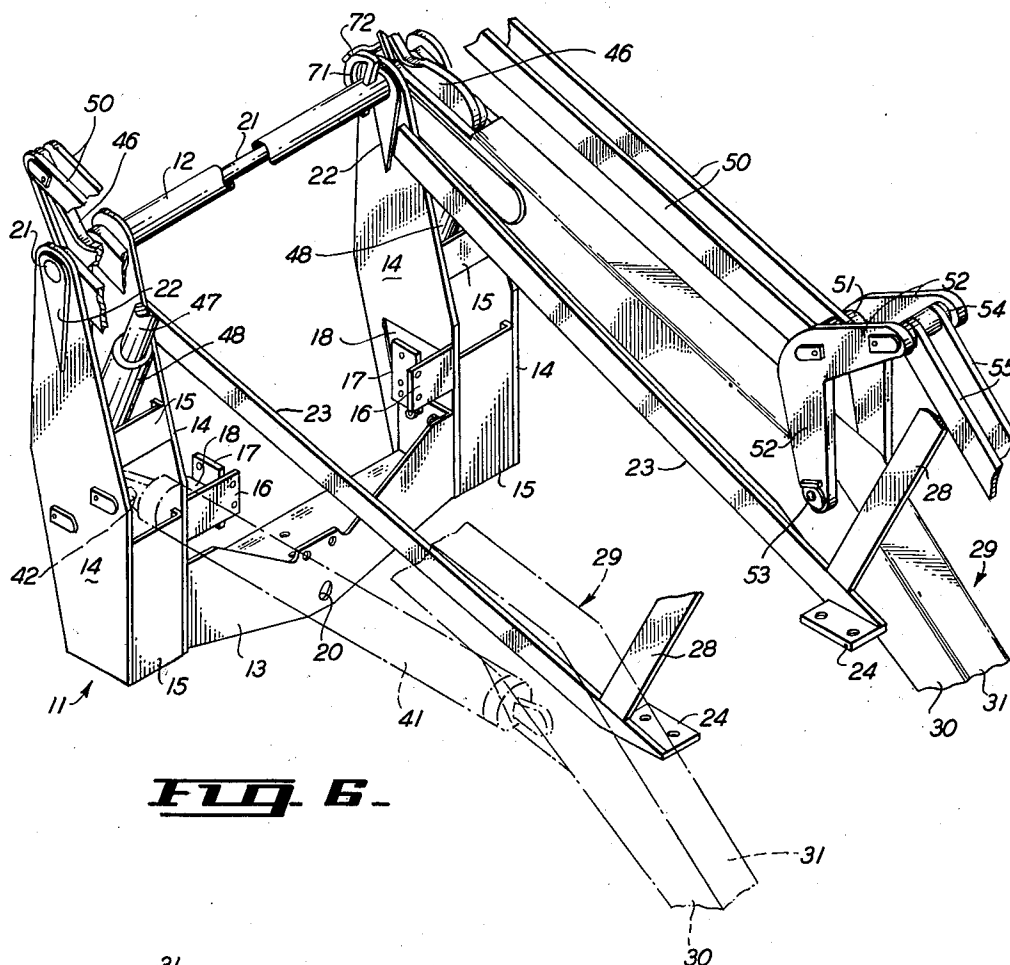


FIG. 6.

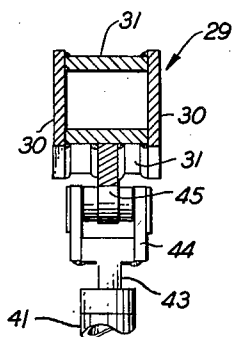


FIG. 7.

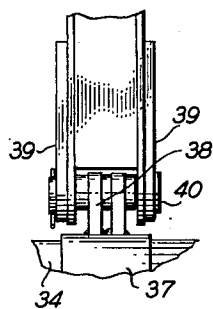


FIG. 8.

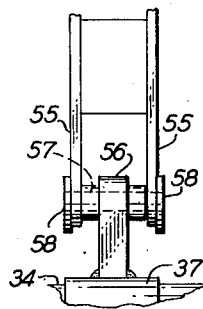


FIG. 9.

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2,668,631

HYDRAULIC LOADER

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Application October 6, 1947, Serial No. 778,221

2 Claims. (Cl. 214-140)

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This invention relates generally to hydraulic loaders, and more specifically contemplates tractor attachments adapted for control by the driver of the tractor in effecting the manipulation of a bucket, fork, blade or the like comprising part of the attachment for loading dirt, pipe, boxes or other materials, as well as for leveling, filling, scraping and analogous utilities.

While many different types of loader attachments for tractors have been devised, the present invention is concerned generally with a structure which embodies essentially a frame mounted upon the tractor chassis in combination with hydraulically actuated lifting arms extending in front of the tractor for the pivotal support and elevation of a suitable tool, of which a bucket may be considered representative. It is common practice in such devices to raise the bucket by a hydraulic ram but to utilize gravity to lower the same. The bucket is held in operative relationship with respect to the lifting arms by suitable latching mechanism which, upon being tripped, permits the dumping of the load. It is not possible with such constructions to apply a downward pressure upon the bucket when the unit is employed as a scraper as in leveling or in back-filling operations. A greater disadvantage and limitation upon utility, however, results from the fact that the bucket can be maintained in only two predetermined positions relative to the lifting arms. As a consequence, the tilt of the bucket is progressively increased as the arms are raised. If the arms are movable to a height considered essential for universal utility, the tilt of the work-containing element is often excessive, and renders the device impractical for the loading of many materials, such as pipe for example.

A principal object of the present invention is to provide a loader attachment for tractors comprising a frame structure for the pivotal support above the tractor of load-lifting arms actuated hydraulically to swing a load-containing member in a vertical arc in front of the tractor, wherein the load-supporting member is movable relative to the arms and controlled hydraulically independent of movement of the arms to afford an infinite number of angular adjustments, the respective hydraulic controls for the lifting arms and bucket being double acting so as to compel movement of said elements in either direction upon their respective pivots, and thereby enable the application of downward pressure to the work as when employing the device as a scraper.

Another and highly important object hereof is the provision of a load-lifting arm and bucket-

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control assemblies relatively operable to maintain the pre-adjusted angular position of the bucket throughout the range of movement of the lifting arms, thus obviating inadvertent disturbance of the load regardless of the height to which it is elevated while permitting any degree of manually-actuated correction of the angle when required at any position of the lifting arms.

Another object is to provide a frame structure for the support of the lifting arms and associated mechanism comprising a rectangular frame adapted to completely encompass the tractor chassis, and including upright frame members secured to the sides of the tractor and extending above the tractor body for the pivotal support of the lifting arms, in combination with a transverse beam connecting the lower ends of the uprights beneath the tractor and secured to the power plant of the tractor to reinforce the positions of the uprights.

Another object is to provide an indicator adapted for disposition adjacent the controls for the tractor and loader attachment, whereby the operator may determine instantly the angle of the bucket or other load-containing device regardless of the disposition of the latter in the range of movement of the lifting arms and throughout the range of its independent pivotal movement.

Still another object is the provision of a hydraulic system for actuating loader mechanism of the type hereinabove alluded to, embodying a pump actuated directly from the crankshaft of the tractor engine, and a fluid reservoir in adjacent relationship to assure greater pump efficiency and uniform hydraulic pressure throughout the system.

Another object is to provide a fork assembly adapted to be substituted for the bucket, comprising brackets pivotally associated with the lifting arms and angle-control mechanism, to which the tines of the fork are individually pivoted to permit greater flexibility in manipulation when desired, in combination with means to transmit both upward and downward pressure to the tines when occasion requires.

Generally speaking, this invention contemplates an attachment for tractors which is capable of controlling work-engaging means in a very simple and effective manner. The invention contemplates a rectangular open frame structure adapted to receive and be secured to a tractor chassis or body, the frame structure including upright side frame members terminating at about the level of the steering wheel of the tractor.

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Pivotaly connected to the top of the upright frame members are downwardly bent lifting arms which extend forwardly and are pivotaly connected to a bottom portion of a work-engaging means in front of the tractor. Power means for each bent lifting arm includes a normally horizontally disposed hydraulic cylinder means pivotaly connected to an upright side member intermediate its ends and to the bent lifting arm at the rear vertex of the included angle formed by the bent arm. Selective positioning of the work-engaging means is controlled by two sets of parallelogram linkage systems for each arm, the two sets including a forward linkage means comprising a link member extending parallel to a forward reach of a bent arm and pivotaly connected to the work-engaging means at its forward end and to one end of a virtually right angle knee lever at its rear end. The knee lever is pivoted at the other end to the lifting arm adjacent the outer vertex of the angle formed by the bent arm and includes a leg portion extending virtually in prolongation of the forward reach of the lifting arms. The second set or rear parallelogram linkage system includes a link member pivotaly connected to the knee or at the angle of the knee lever and to one end of a bell crank lever which is pivoted intermediate its ends to the axis about which the lifting arms are rotated. The bell crank lever includes a forwardly projecting portion which is pivotaly connected at its end to upwardly directed power means for actuating the linkage means. The particular arrangement of the two sets of parallelogram linkage systems permits lifting of the arms without changing the selected position of the work-engaging means with respect to a horizontal plane. The power means for the linkage means and for the lifting arms are independently controlled.

Numerous other objects and salient features of the invention, as for example relative simplicity of construction, ease of operation, maximum strength and durability under all normal working conditions, and versatility in application of the unit to the loading requirement of numerous industries, will be apparent to those of skill in the art upon an examination of the following description read in the light of the accompanying drawings, in which:

Fig. 1 is a side elevation of a tractor attachment embodying my invention, illustrated as installed upon a conventional tractor, shown partially broken away;

Fig. 2 is a plan view of the tractor and the attachment hereof depicted in Fig. 1;

Fig. 3 is a schematic diagram of the hydraulic system;

Fig. 4 is an elevation of a fork assembly adapted to be substituted for the bucket in association with the lifting arms and angle-control mechanism, shown partially broken away;

Fig. 5 is a reduced plan view of the fork assembly illustrated in Fig. 4, with the upper pivoted elements broken away to show, fragmentarily, the lower attachment for the tines;

Fig. 6 is a perspective view of the loader frame assembly for supporting the lifting arms and control levers, the latter elements being broken away;

Figs. 7, 8 and 9 are sectional views, taken on correspondingly-numbered lines of Fig. 1, showing, respectively, the connection between one of the rams, and the lifting arm actuated thereby, the pivotal connection between one of the

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lifting arms and the bucket, and the connection between one pair of control links and the bucket.

Referring to the drawings more in detail, the numerals of which indicate similar parts throughout the several views, 10 designates generally a tractor upon which the loader attachment of my invention is mounted. The attachment comprises a rectangular yoke consisting essentially of a pair of uprights 11 adapted for attachment to the sides of the tractor as herein-after more specifically described, and extending to horizontally-aligned points above the body of the tractor. A tubular member 12 is interposed between the upper ends of uprights 11 and a transverse beam 13 extends beneath the tractor and is secured rigidly to the lower extremities of the uprights. Each of uprights 11 comprises a pair of identical side plates 14 which are held in spaced parallel relationship by a plurality of transverse spacers 15 welded or otherwise secured rigidly to and extending between corresponding edge portions of plates 14. Each upright 11 is secured to a side of the tractor by a bracket comprising an inwardly-directed retainer plate 16 welded or otherwise secured to the forward edge of the inner side plate 14 thereof and disposed in a vertical plane. Forming a part of the same attaching bracket is a transversely arranged retainer plate 17 welded vertically across the end of a horizontal member 18 similarly secured to the upright for the positioning of the latter plate 17 inwardly from the inner face of the adjacent frame side plate. Each of the retainer plates 16 and 17 connected to each upright 11 are provided with a series of bolt holes to facilitate the attachment of the upright to the chassis of tractor 10.

As hereinabove indicated, the lower ends of the uprights 11 are connected by a transverse cross beam 13, the ends of which are flanged and bolted to the inner side plates 14 of each upright frame and comprises horizontal and vertical members welded together, and each provided with a series of holes for attachment of the composite beam 13 to the clutch housing or other suitable mounting of the tractor proper. It will be understood that the beam 13 supplants the usual fitting employed in conventional tractors for support of the rearward ends of forwardly diverging radius rods 19, numeral 20 indicating a hole in the center of the cross beam 13 for this purpose. The tubular member 12 comprising the upper transverse element of the yoke is welded to the inner side plates 14 of the respective uprights 11 and houses bearings (not shown in opposite ends for the journalling of a shaft 21, the ends of which project through the respective upright frames 11 and terminate in the outer side plates 14 thereof. 22 indicates each of a series of pads welded to the opposing surfaces of the inner side plates 14 and to the outer surfaces of the outer side plates to reinforce the upper ends of these members.

The vertical disposition of the yoke is reinforced by a pair of braces 23 attached to the upper ends of the respective uprights 11 and extending downwardly and forwardly to the front of the tractor. The lower ends of braces 23 are each equipped with an integral foot 24 to facilitate their attachment by bolts or the like to the tractor chassis.

At the forward end of the tractor a bumper tank guard 25 is mounted which encloses and shields a reservoir tank 26 for the hydraulic sys-

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tem. A pump 27 of conventional construction is located within the bumper tank guard 25 adjoining the reservoir for direct connection to, and actuation by, the crank shaft (not shown) of the tractor engine. While a feature of the invention resides in the close juxtaposition of pump 27 and reservoir 26 of the hydraulic system to one another and in the location of the pump to receive motivation directly from the crank shaft of the engine, the precise design and construction of these elements forms no part of the present invention and accordingly are not illustrated in detail. The tank guard 25 is reinforced by a pair of diagonal braces 28 secured to the upper end of the guard at opposite sides of the tractor and at their lower ends to the respective braces 23 adjacent the connection of the latter to the chassis.

A pair of lifting arms 29, angular in form, are pivoted upon opposite ends of shaft 24. Each arm 29 comprises a pair of side bars 30 secured rigidly in parallel, spaced relationship by plates 31 extending across the upper and lower edges, respectively, of the bars of the respective arms. The pivoted ends of bars 30 of each lifting arm are reinforced by pads 32, welded or otherwise secured thereto, and are both arranged between the side plates 14 of the upright frame 11 with which the arm is associated. Each arm 29 comprises two straight reaches forming an obtuse angle therebetween, with the vertex of the angle located opposite the tank guard 25 and the forward end of the arm extending sharply downward. It will thus be seen that this form of lifting arm locates the forward arcuately moving ends thereof closely adjacent the front end of the tractor when the arms are in their lowermost position, the angle of the arms assuring ample clearance for the chassis of the tractor.

The outer end of the load-lifting arms 29 are connected pivotally to a work-engaging element which in the embodiment of Fig. 1 comprises a bucket 33 largely of conventional design and contour. The back and bottom of the bucket consist of a single plate 34, the forward, lower edge of which is equipped with a wear plate 35 extending the length of the bucket. The end members 36 of the bucket are similarly provided with wear plates 35 at their leading edges to withstand the force of impact of these edges against the work. The outer surface of the back and bottom plate 34 is reinforced by a pair of straps 37, welded or otherwise attached thereto at opposite sides of the middle of the bucket (Fig. 2), to each of which straps 37 are attached a pair of lugs 38 located adjacent the bottom of the bucket and extending rearwardly in parallel relation. The top and bottom plates 34 of the respective lifting arms 29 terminate short of the outer ends of the latter which are equipped with pads 39 to reinforce the side bars 30 of the arms. As indicated in Fig. 3, the reinforced ends of the side bars 30 of the respective arms encompass the lugs 38 adjacent corresponding ends of the bucket and are journaled to the lugs by a pin 40 whereby the bucket may be tilted freely with respect to the lifting arms.

The lifting arms are raised and lowered so as to impart corresponding movement to bucket 33 by hydraulic rams comprising a pair of normally horizontally disposed cylinders 41 pivotally mounted upon pins 42 in the respective upright frames 11 of the yoke. The ends of pins 42 are carried by the side plates 14 of the frame in which they are disposed, respectively, so as to

permit the cylinders 41 to project toward the forward end of the tractor and swing in vertical arcs between the spacers 15 of the side frames 11. The end of each piston rod 43, projecting from the swinging end of each ram is equipped with a pair of reinforcing plates 44 forming a yoke adapted to encompass a gusset plate 45 welded to the bottom 31 of the complementary arm 29 at virtually the inner vertex of the included angle formed by the contiguous lower edges of the arm. The end of each rod 43 is pivotally connected to the gusset plate 45 as by a suitable pin extending through the yoke and the plate 45. It will thus be seen that hydraulic pressure transmitted to the bores of the pivoted ends of the cylinders 41 compels the extension of the piston rods 43 and corresponding elevation of the lifting arms 29 and bucket 33, while pressure transmitted to the opposite ends of the cylinders 41 acting upon the opposite side of the piston therein is effective to lower the bucket.

Bucket 33 may be locked against movement or shifted to an infinite number of positions with respect to the lifting arms 29. To this end, I provide a pair of bell cranks 46 pivoted on opposite ends of shaft 24 within the upright frames 11, and between the side bars 30 of the respective lifting arms 29, journaled on the ends of the shaft at corresponding sides of the unit. One end of each bell crank 46 is pivotally associated with the plunger rod 47 of a hydraulic ram by which the tilting of the bucket is controlled. The lower ends of the cylinders 48 of the bucket-control rams are pivoted on pins 49 mounted in the respective uprights 11 at points below and rearwardly of the pivotal connection of the cylinders 41. Bell cranks 46 are pivoted in unison in response to hydraulic pressure transmitted to the cylinders 46 of the bucket-control rams, as is hereinafter more in detail described.

The upper opposite end of each of bell cranks 46 is pivotally engaged by a pair of parallel links 50 which extend forwardly in parallel relationship with the pivoted reach of the lifting arm therebelow. The forward ends of the respective pairs of links 50 are pivoted on a hinge pin 54, journaled between a pair of angular plates 52 at the angle thereof and forming a composite virtually right angled knee lever. The complementary lower ends of the lever plates 52 are in turn pivotally secured by a hinge pin 53 to the lifting arm 29 therebelow at the outer vertex of the angle defined by the latter. It will thus be seen that actuation of the hydraulic rams 47-48 resulting in the tilting of the bell cranks 46 correspondingly moves the knee levers 52 of the bucket control assembly through the links 50. Hinge pins 54 transfixing the upper ends of the lever plates 52 of the respective knee lever assemblies provide pivotal mountings for, respectively, two pair of links 55 which extend forwardly in parallel relationship with the outer ends of the lifting arms 29 therebelow for pivotal attachment to the bucket 33. To accommodate the forward ends of links 55, each strap 37 of bucket 33 has welded thereto a rearwardly projecting lug 56 disposed adjacent the upper edge of the bucket, through which a pin 57 and bushing project (see Fig. 9). The ends of the two links 55 at each side of the unit are mounted upon the ends of the pin 57 transfixing the lug 56 in alignment therewith and are reinforced by pads 58.

An important feature of construction and operation lies in the particular arrangement at each side of the unit of the links 55 lying parallel to

forward and downwardly extending reaches of an arm 29, knee lever 52 which is pivotally connected to one end of links 55 and to arm 29 at the outer vertex of the angle formed by the angularly related reaches of arm 29, and the pivotal connections of the lifting arm 29 and links 55 to the bucket. The pivotal connections between these several elements form the four corners of a forward set of parallelogram linkage means.

A rear set of parallelogram linkage means is cooperable with the forward set and comprises the pivotal connections made by the pivoted rear end of each lifting arm 29 about a horizontal axis, the parallel spaced links 50 lying above and parallel to the rearwardly directed reaches of each arm, the bell crank lever pivoted about said horizontal axis and having one leg pivotally connected to the adjacent end of links 50 and the pivotal connection of the other end of links 50 to the knee or intermediate portion of knee lever 52. It will be apparent that a common point of pivotal connection of the two parallelogram sets of linkage means occurs at the pivotal connection of knee lever 52 to the lifting arm 29. The distances between corresponding pivotal connections of each parallelogram linkage means are virtually equal as implied from the use of the term parallelogram. As is hereinafter explained more in detail, this arrangement of the bucket control mechanism and the lifting arms 29 obviate any disturbance of the preadjusted angular disposition of the bucket, incident to the movement of the lifting arms.

The hydraulic system, by which hydraulic fluid under pressure is supplied to the respective rams 41—43 and 47—48 for actuating the lifting arm 29 and bucket control mechanism, includes a conventional valve 59, the construction and details of which, being well known in the art, are not specifically illustrated. Referring more particularly to Fig. 3, it will be observed that fluid from the reservoir tank 26 is drawn into the pump 27 directly associated therewith through conduit 60 and transmitted under pressure to the pressure chamber of the valve 59 through a conduit 61. Leading out of valve 59 are two flexible hoses 62 and 63 connected, respectively, to opposite ends of the two hydraulic cylinders 41 by which the lifting arms 29 are actuated. In a similar manner tubes 64 and 65 connect valve 59 with the opposite ends, respectively, of the ram cylinders 48 by which the bucket control mechanism is actuated. A fifth conduit 66 leading out of the valve conveys the return flow of the hydraulic fluid to the reservoir 26. Valve 59 is actuated through suitable linkage by a pair of manually-operated levers 67 and 68 mounted upon a suitable standard 69 adjacent the steering wheel 70 of the tractor.

One lever 67 is effective for controlling the flow from the pressure chamber of valve 59 to the hydraulic rams 41—43 for manipulating the lifting arms 29 while the other lever 68 controls the flow of fluid under pressure to the smaller rams 47—48 by which the bucket control mechanism is actuated. More specifically, the valve 59 is constructed to communicate the hose 62 with the pressure chamber thereof and coincidentally open the hose 63 with the return conduit 66 to the reservoir tank 26 when the lever 67 is drawn toward the operator so as to extend the rams 41—43 and elevate arms 29 and bucket 33. Shifting lever 67 in the opposite direction opens the valve pressure chamber to the hose 63 leading to the opposite ends of the respective ram cylinders

41 and communicates the hose 62 with the reservoir tank 26. A neutral or intermediate position for lever 67 is effective to close both hoses 62 and 63 so as to maintain the preadjusted position of the ram pistons and accordingly locks the lifting arms 29 against movement. The other lever 68, similarly operated, permits the communication of tube 64 with the pressure chamber of valve 59 in response to its being drawn toward the operator and coincidentally communicates the opposite ends of the ram cylinders 48 with the reservoir tank 26 through tubes 65 and conduit 66 so as to compel the outward projection of the piston rods 47 and thereby tilt the bell cranks 46 rearwardly and the bucket 33 upwardly. Movement of lever 68 in the opposite direction vents the pivoted end of the ram cylinders 48 to the reservoir tank 26 through tube 64 and return flow conduit 66 and transmits fluid pressure to the opposite ends of the rams through tube 65, thereby tilting the bucket downwardly. As in the case of the valve control for rams 41—43, an intermediate neutral position of lever 68 hydraulically locks the rams 47—48 and control mechanism so as to maintain the adjusted position of bucket 33.

It will thus be seen that the position of the bucket is controlled independently of the adjustment of the lifting arms 29. Accordingly, the bucket may be tilted to a position with its bottom vertically disposed and thereupon lowered against the work so as to permit the bucket to be employed as a back-filling scraper or leveling device. It will be appreciated, however, without specific illustration, that a conventional scraper equipped with lugs for its attachment to the ends of lifting arms 29 and links 55 may be substituted for the bucket if desired. The angle of the scraper with respect to the work may be altered in the same manner as is the bucket of the present embodiment, i. e., incident to manipulation of the lever 68 through the control mechanism. The normal utility of the unit equipped with a bucket contemplates that the latter be initially positioned with its bottom in a horizontal position and disposed below the level of the work.

As hereinabove generally indicated, an important feature of the invention resides in the construction and arrangement of the control mechanism with respect to the lifting arms, whereby the position of the bucket relative to a horizontal plane and predetermined by adjustment of the control mechanism is maintained throughout the range of movement of the lifting arms. This result is achieved as a consequence of the compensating adjustment of the control mechanism effected by the knee levers 52 pivoted to the lifting arms 29. Thus elevation of the lifting arms tending to raise the back of the bucket and thereby tilt the latter forwardly also results in changing the angles between lifting arms 29 and the upward extensions of the bell cranks 46. However, as the links 50 are of a length equal to the distance between the shaft 21 for the arms 29 and the pivot axis of the knee levers 52, the latter will swing forwardly to an extent exactly proportionate to the elevation of the arms. Accordingly, the links 55 are projected forwardly relative to the lifting arms, without variation of the actual positions of the bell cranks 46, to a degree sufficient to coincidentally and progressively compensate for the movement of the arms throughout the range of their movement.

It will thus be seen that the admission of hydraulic fluid under pressure into the ends of

the ram cylinders 41 pivoted to the side frame uprights 41 (with the arms 29 and bucket in the position shown in Fig. 1) is effective to initially induce motion of the bucket forwardly and slightly upward with the bottom of the bucket maintaining a preadjusted horizontal position, to pick up the load. The bucket may be tilted backward slightly as arms 29 continue to rise so as to heap the load in the bucket or prevent the same from falling out by the admission of fluid under pressure into the lower ends of the ram cylinders 48 associated with the bell cranks 46. Due to the provision of dual controls, the tilting of the bucket is entirely independent of the movement of arms 29, and accordingly an infinite number of adjustments of the bucket, at any elevation of the lifting arms, is possible.

With the load elevated to dumping or discharging position, arms 29 may be locked by shifting the lever 67 to a neutral position, which results in closing both hoses 62 and 63 to both the return flow conduit 66 and the pressure chamber of the valve mechanism 59. Thereupon bucket 33 may be tilted to a degree required to eject the load. It will be appreciated that while the dumping of a load of dirt contained by the bucket may be accomplished quickly by the complete extension of the rams 47—48, the control mechanism permits the gradual, controlled tilting of the bucket with a corresponding slow discharge of the contents thereof, or the bucket may be tilted to an extent only sufficient to permit a load, comprising fragile goods, to be manually removed more readily.

When in its lower position, the bucket is not always entirely visible to the operator, i. e., when the arms 29 are in their lowermost positions. However, in order to facilitate the manipulation of the bucket throughout its range of operation, I provide an indicator disposed adjacent the tractor controls, whereby the operator may observe at all times the exact angular position of the bucket or other load containing expedient with which the unit is equipped, with respect to a horizontal plane. This device comprises an arcuate band 71 having its ends rigidly secured to the rearward edge of the inner side plate 44 of one of the upright frames 41 in horizontal alignment with the adjacent bell crank 46. An indicator finger 72 secured to the hub of the bell crank and movable therewith is bent to overhang band 71 which is marked in a suitable manner to indicate to the operator by the position of the finger thereon, the angular disposition of the bottom of the bucket or corresponding or complementary element of a substituted load-containing member.

A modification of the load-containing member, comprising a sectional fork assembly is illustrated in Figs. 4 and 5. The device consists of a channel iron 73 and an angle 74 which are secured in horizontal, spaced, parallel relationship by a pair of vertical brackets 75, the upper ends of which are welded across the back of the channel 73 with the lower ends of the brackets 75 similarly secured to the angle 74. Brackets 75 are spaced apart a distance corresponding to the distance between the complementary lifting arms 29 which are pivoted as at 76 to rearward projections 77 of the lower ends of the respective brackets. In a like manner the forward ends of the pairs of links 55 are pivoted by pins 78 to the upper ends of the respective brackets. Fitted into and welded to channel 73 are several forwardly projecting lugs 79, through which a rod

80 extends for the pivotal support of a plurality of tines 81. Each tine 81 consists of a bar bent to form a right angle, the sides 82 and 83 of which are of unequal length. The end of the shorter side 82 of each tine 81 is equipped with a pair of lugs 84 welded to the back thereof for pivotal association with the rod 80. Encircling the rod between the lugs 84 of each tine 81 is a tubular spacer and bearing 85 effective to reinforce lugs 84 which are slidable on the rod 80 so as to vary the juxtaposition of the tines 81 with respect to one another. The longer side of each tine 83 projects forwardly for extension under the work, and to facilitate this result the forward ends of the tines are tapered as at 86, along their upper edges. Pivotal movement of the tines 81 on rod 80 is limited in one direction by an angle 87 secured rigidly across the back of angle 74, and by the latter angle itself. In order to maintain the tines in their desired normal positions with respect to the brackets 75, I provide bumper pads 88 secured to the backs of the tines 81, respectively, in positions to abut against the underside of the angle 87 and against the back of angle 74. The side of angle 87 which normally overhangs the bumper pads 88 of the several tines is provided with a series of holes 89 selectively registerable with holes formed in the respective pads 88, whereby pins 90 extending through such aligned complementary holes are operable to retain the tines in fixed relationship with the brackets 75. The number of tines 81 carried by the rod 80 may accordingly be varied and their relative spacing altered within limits determined by the number of holes 89 provided in angle 87. With the pins 90 engaged, the forwardly projecting elements 83 of the tines are secured in parallel relationship and may be manipulated to assume different angles with a horizontal plane in the same manner as the bucket. Thus the tines may be raised and lowered by the lifting arms 29 and tilted forward or back according to requirements, by the control mechanism. The compensating effect of the control assembly whereby any preadjusted angle of the load-containing member is maintained regardless of the movement of the lifting arms is particularly important in the utility of a fork attachment. In the loading of pipe for example, the fork may be inserted beneath the load with the forward end of tines 81 in a horizontal plane and thereafter slightly tilted to avoid gravitation of the pipe from the fork. The load may then be raised quickly to the desired height by merely transmitting the required power to the lifting arm assemblies and the fork will maintain its preadjusted position with respect to a horizontal plane without the necessity of progressive manipulation of the control mechanism.

Where the ground upon which the load is located is uneven, it may occasionally be difficult to initially place the tines beneath the load. By removing the pins 90, each of the tines may be permitted to "float" on the surface of the ground, the brackets 75 being retracted somewhat incident to lowering of the arms 29 to enable the free movement of the tines on rod 80 as they are advanced forwardly. Thus the forward tapered ends of the tines may follow the contour of the ground to a considerable degree in positioning them beneath the load. Tilting of the brackets 75 rearwardly in response to appropriate actuation of the control mechanism brings the angles 74 and 87 into contact with the bumper pads 88 and thereafter correspondingly

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tilts the tines to pick up the load which may be supported and transported in the manner hereinabove described as if the pins 90 were engaged.

It will thus be seen that I have provided a tractor attachment comprising a frame structure embodying a yoke adapted to completely encompass the chassis of the tractor with the lower beam 13 thereof secured to the underside of the power plant of the tractor and the uprights 11 on either side affording means for the pivotal support of angular lifting arms 29, and control linkage, and of hydraulic rams by which the latter elements may be actuated, the angular form of the lifting arms being effective to position the load-containing member closely adjacent the front of the tractor, in combination with control mechanism operable to hydraulically tilt the load-containing member to any of an infinite number of angular positions coincidentally recorded by an indicator adjacent the tractor controls, and further adapted to compensate for movement of the lifting arms so as to maintain the preadjusted angular disposition of the load-containing member throughout the range of movement of the lifting arms.

While I have shown and described but two embodiments of my invention, it will be appreciated that various changes in size, design, number, shape and proportion of the various parts may be made, that other attachments such as a scraper equipped with means by which it may be connected to the lifting arms 29 and the control links 55 may be substituted for the bucket or fork, that conventional type fork assemblies modified as last above noted may be employed, and that an indicator may be included in the assembly similar to the indicator 71—72, for designating to the operator the positions of the lifting arms at all times, without departing from the spirit of my invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. In an attachment for a tractor, the combination of: means including a rectangular frame structure for attachment to a tractor and providing a horizontal transverse axis intermediate ends of the tractor; a pair of forwardly and downwardly extending, angle-shaped lifting arms adapted to be disposed on opposite sides of the tractor, each lifting arm being pivoted at one end at said horizontal axis and pivotally connected at the front end to a work-engaging means; a pair of normally horizontally disposed

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hydraulically actuated means, each pivotally connected to said frame structure forwardly of the horizontal axis and pivotally connected to an associated arm in proximity to the inner vertex of the included angle formed in the angle-shaped arm; means for controlling the position of said work-engaging means comprising a pair of forwardly facing knee levers, each pivotally connected at one end to an associated arm adjacent the outer vertex of the angle formed in the arm; a pair of front link means, each disposed parallel to a forward reach of an associated arm and pivotally connected at one end to said work-engaging means and at the other end to the other end of the associated knee lever; a pair of bell crank levers, each pivotally connected intermediate its ends to the frame structure at the horizontal axis; a pair of rear link means, each disposed parallel to a rear reach of an arm and pivotally connected to the associated knee lever at the knee thereof and to one end of the associated bell crank lever; and a pair of hydraulically actuated means, each pivotally connected to the end of a forwardly extending leg of the associated bell crank lever and to said frame structure.

2. In an attachment as claimed in claim 1 including a work-positioning indicator means comprising a stationary curved member secured to the frame structure adjacent to said horizontal axis and to one of said bell crank levers and provided with indicia, and a cooperable indicator element carried by said one bell crank lever and movable therewith.

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