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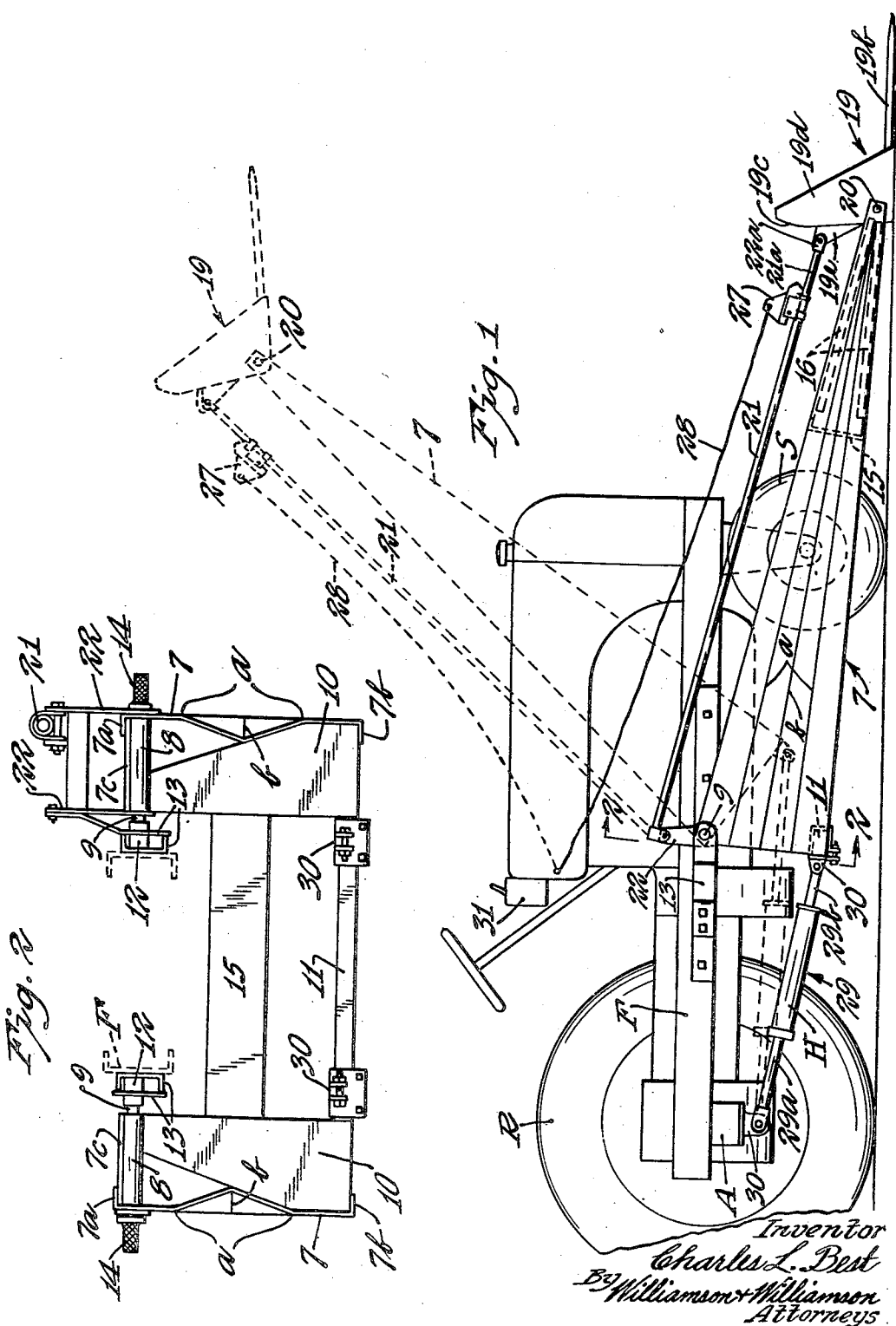
C. L. BEST

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LOADING AND GATHERING APPARATUS FOR TRACTORS

Filed July 29, 1946

2 Sheets-Sheet 1



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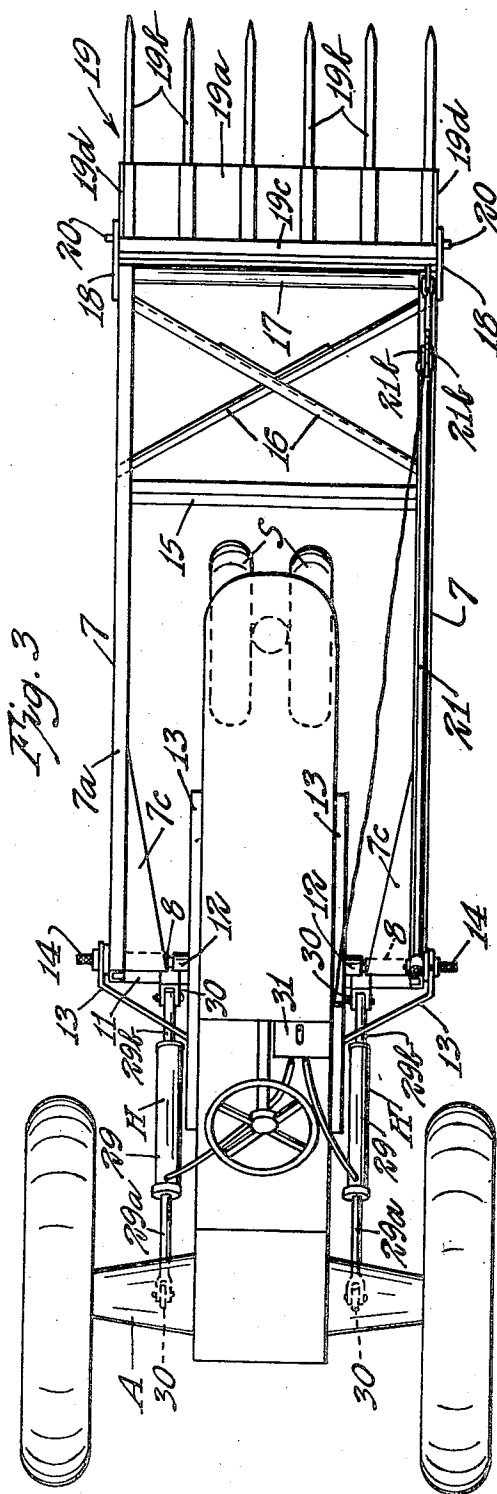
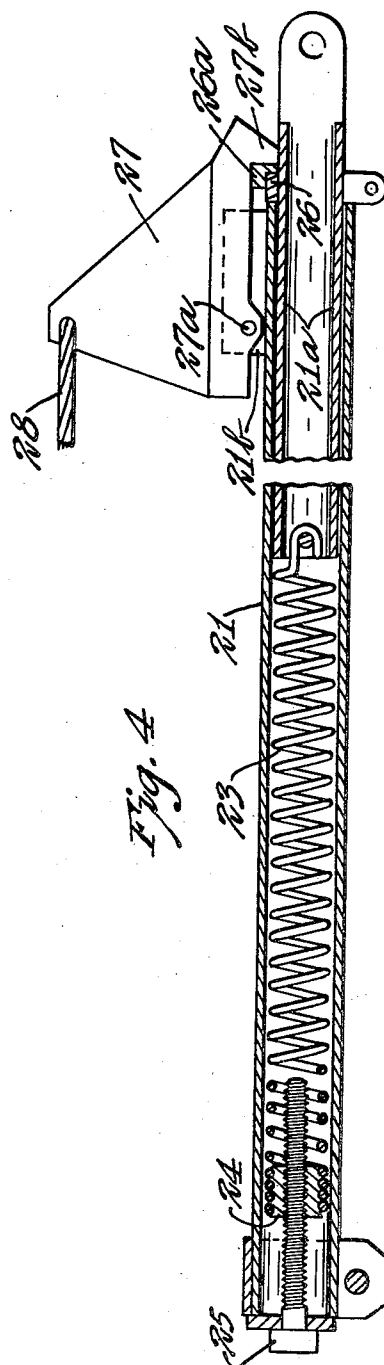
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,494,684

LOADING AND GATHERING APPARATUS
FOR TRACTORSCharles L. Best, Watertown, Minn., assignor of
one-half to Paul Ebling, Minneapolis, Minn.

Application July 29, 1946, Serial No. 686,862

3 Claims. (Cl. 214-140)

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This invention relates to power-actuated loading and gathering apparatus for self-propelled vehicles such as tractors, trucks and the like and relates particularly to a highly simplified apparatus of this character which may conveniently be embodied in attachments for conventional tractors and other types of self-propelled vehicles and which, when installed, is adapted to scoop up material by pushing action at the front of the vehicle; to thereafter lift the load some distance above the ground and to then transport the load and dump the same from an elevated position for loading or piling.

It is an object of my invention to provide a very simplified, comparatively inexpensive, but nevertheless highly efficient front end loader which may be very quickly and easily attached for operation to conventional tractors and other automotive vehicles of numerous types and wherein application of power for elevating the load is advantageously and very simply effected.

A further object is the provision of a simplified front end loader wherein the mounting of all parts before elevation of the load for dumping is well below the top of the main vehicle chassis in non-obstructing position and providing for clear vision of the driver.

Another important object is the provision of a front end loader of the class described wherein intermediate boom-elevating mechanism, levers, gears or hoists, are dispensed with and the boom arms themselves, are directly connected with the source of actuating power for efficient elevation thereof, the connections being at all times disposed well below the center of gravity of the vehicle and preferably below the main horizontal chassis frame.

More specifically, it is an object to provide material-gathering and loading apparatus of the class described wherein the boom structure itself is formed to constitute at its rear portions, depending bell crank arms directly connected with underslung hydraulic jacks or the like for elevating the load carrier.

Still another object is the provision in combination with boom structure of the class described, of automatic load leveling or pitch-controlling mechanism for constantly maintaining a desired slight inclination or pitch on the bottom of the load carrier during the various steps in the cycle of elevating the load to its maximum height.

These and other objects and advantages of my invention will be more apparent from the following description made in connection with the accompanying drawings wherein like reference

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characters refer to similar parts throughout the several views and in which—

Fig. 1 is a side elevation of an embodiment of my invention, applied to a conventional type of farm tractor with the right hand bull wheel removed and with the dotted lines indicating the maximum elevated position of the loading apparatus;

Fig. 2 is a vertical cross section taken substantially on the line 2-2 of Fig. 1, looking in the direction of the arrows with the boom arms disposed substantially horizontally and with parts of the tractor, including the motor and wheels, omitted;

Fig. 3 is a top plan view; and

Fig. 4 is a detail, vertical section taken longitudinally through the automatic load-leveling link and showing the latch mechanism for release of the load carrier for dumping.

In the drawings, an embodiment of my apparatus is illustrated as applied to a farm tractor of conventional type having the usual chassis with the longitudinal main frame members F and having the large rear traction wheels R widely spaced apart and the usual relatively small front wheels S which are spaced closely apart and converge towards their lower periphery. The heavy rear axle housing designated as A journals the axles of the rear wheels in conventional manner and is preferably utilized in my apparatus as the medium for attachment of the power-actuating mechanism, preferably comprising one or more hydraulically operated jacks H.

My improved gathering and loading apparatus employs a pair of substantially rigid, interconnected, forwardly extending boom arms 7 pivoted at their rear ends and upper corners to suitable heavy mounting brackets, preferably attached to and supported from the longitudinal frame members of the vehicle chassis. While any suitable comparatively light but strong construction may be utilized for the boom 7, as shown, integral forwardly converging boom arms may be employed constructed for the most part from integral, heavy gauge sheet material or plate shaped into an elongated triangle with the two arms disposed in vertical planes along opposite longitudinal sides of the vehicle chassis and with the forward ends of said boom arms projecting considerably beyond the forward end of the self-propelled vehicle, for clearance thereof in swinging movement and for mounting and accommodation of the load carrier or implement at a point somewhat forward of the vehicle body. The boom arms 7 in the form illustrated, see Figs. 1 and 2,

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are corrugated or longitudinally folded along converging lines *a* and *b* to reinforce the structure and further, have inturned, upper and lower flanges *1a* and *1b* respectively. The upper flanges *1a* of the boom arms, diverge rather sharply at the rear ends thereof, forming gusset plates *1c* which are welded or otherwise rigidly connected with transverse, horizontal pivot tubes *8* wherein the heavy pivot pins *9* for swingably securing the rear ends of the boom arms, are journaled. Vertical, upstanding reinforcing plates *10* interconnect the rear edges of boom arms *7* with bearing sleeves *8*, thereby reinforcing the rear end of the boom structure and also serving as ends thereof and as a medium for rigidly interconnecting the rear ends of the boom arms through the medium of transverse, horizontal cross piece such as a channel bar *11* which may be welded or otherwise rigidly connected to the rear ends of arms *7* and the vertical reinforcing plates *10*. The tubular mounting sleeves *8*, it will be noted, are affixed to the rear upper corners of the boom arms *7* and are interconnected with suitable laterally and outwardly projecting bearings *12* affixed to the longitudinal frame channels *F* by suitable means which may include the provision of reinforcing guide mountings *13* secured to the rear and medial portions of chassis frame members *F*. Pivot pins *9*, in the form of stub shafts, extend from mounting brackets *12*, horizontally through the tubular members *8* of the boom arms and have detachably connected with the outer ends thereof, the heavy knurled retaining nuts *14*, as shown.

The rear ends of the boom arms *7* defined by end plates *10* and the interconnecting transverse channel bar *11*, constitute the short, thrust-receiving arm of a bell crank lever whereas the working end of such lever construction is of course, the outer extremities of the boom arms *7* which project beyond the front end of the self-propelled vehicle.

Boom arms *7* are additionally interconnected and reinforced at their forwardly projecting portions by suitable means such as first, an upstanding, transverse, relatively high, rigid channel plate *15*, welded or otherwise rigidly affixed at its ends to the inner walls of the boom arms *7* and disposed just forwardly of the front wheels of the traction vehicle for clearance therewith throughout the swinging arc of the boom structure. A pair of diagonally crossed, reinforcing channel irons *16*, interconnect the two arms *7* of the boom structure forwardly of the transverse channel *15* and adjacent the forward extremities of the boom structure, a transverse rigid tube *17* further interconnects the boom arms and reinforces the structure. Vertically disposed load-carrier mounting plates *18* conforming in shape, as shown, to the forward side extremities of the boom arms, are welded or otherwise rigidly affixed thereto and project forwardly beyond the boom structure in transversely opposed relation, to receive and removably journal a load carrier such as a bucket, rake, scoop or plow, therebetween. The particular detachable load carrier illustrated in the drawings comprises a tine-equipped bucket indicated as an entirety by the numeral *19* and having a rearwardly disposed bottom *19a* from which a plurality of forwardly and horizontally disposed rigid tines *19b*, project and having a rigid back *19c* secured thereto with upstanding side walls *19d*, completing the load carrier. The load carrier is suitably reinforced at its rear and lower transverse portion and carries in its sides

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or ends, transverse, horizontal sleeve bearings wherein stub shafts or pivot pins *20* are received for journaling the load carrier between the forwardly extending rigid mounting plates *18* attached to the front end of the boom structure.

The load carrier is thus pivotally mounted upon pins *20* for dumping of the load when the boom structure is elevated and when the carrier is released, the greater weight of the load being disposed forwardly of the axes of pivot pins *20*.

I provide a simple mechanism for normally retaining the load carrier in operative position for gathering a load of material and thereafter, elevating the same and for maintaining the level or pitch of the bottom of the load carrier properly throughout the entire elevation arc. This mechanism comprises an elongated tubular link *21*, pivotally connected at its rear end with a fixed but preferably radially adjustable, upstanding lug *22* secured to the mounting bracket at one side of the vehicle which is utilized for pivotal connection with the boom arms *7* or otherwise, suitably fixed to the chassis frame of the vehicle. Link *21* includes a tubular, slidable, outer extension *21a* normally locked to the body of link *21*, by a latch structure to be hereafter described, and having its outer end bifurcated for pivotal connection by a pin *22a* with a lug *19e* fixed to the right hand side of the back of the load carrier *19* with the pivotal connection *22a* disposed substantially the same distance above the upper, longitudinal edge of the adjacent boom arms *7* as the spaced relationship between the pivoted rear end of link *21* and the pivot pin *9* for the boom. Thus, in the elevation of the boom structure, a relative, gradual and progressive tipping or swinging of the load carrier to the outer ends of the boom arms, takes place through the connection link *21*, thus maintaining the inclination of the load carrier properly with respect to the horizontal to properly hold the load and prevent shifting of its center of gravity to a point rearwardly of the load carrier trunnions *20*.

To facilitate dumping of the load from an elevated position of the boom structure, and to effect return swinging of the load carrier to normal position, I provide a simplified latch and spring return mechanism illustrated in detail in Fig. 4.

To this end, the tubular link extension *21a* which is slidably telescoped within the outer portion of the tubular body of link *21*, is connected by an elongated coil spring *23* with a longitudinally adjustable plug *24* threadedly connected with a long adjustment bolt *25* mounted axially of link *21* in the rear end thereof. This spring, under adjusted tension, urges the link extension *21* inwardly to its limit of movement relative to the main tube of link *21* which is determined by abutment of a collar *26* fixed to extension tube *21*, said collar abutting against the outer extremity of the main tube *21*. An upstanding latch plate *27* is pivoted at its lower and rearward portion by pin *27a* between a pair of narrow, upstanding mounting lugs *21b* provided at the top and near the outer end of the tube *21*. Latch member *27* is adapted by gravity, to drop to the full line position shown in the drawings and has at its forward corner, a depending latch element *27b* which is adapted to engage a cooperating upstanding locking element *26a* affixed to the abutment collar *26* of the slidable rod extension. A cord or light cable *28* is affixed at one end to the upper end of latch member *27* and extends rearwardly, to a point adjacent the steering wheel of the tractor for manipulation.

by the driver to release the latch and cause dumping of the load.

Power-actuating mechanism is provided for applying forward thrust against the depending, short bell crank arms of boom arms 7 and to this end, I prefer to utilize a pair of simple, underslung, hydraulic jack mechanisms, one disposed at each side of the vehicle chassis below the longitudinal main channel frame. Each of the jack mechanisms, indicated as an entirety by the numeral 29, comprises a hydraulic cylinder having its rear end pivotally connected with a suitable, depending mounting bracket 30 affixed to and below the axle housing A. An adjustable connector rod 29a may be provided at the rear end of the cylinder to facilitate in combination with a variety of specific mounting brackets, attachment of the hydraulic jacks to conventional tractors or other vehicles of a number of different types. The hydraulic jack mechanisms 29 carry forwardly projected, hydraulically operated piston rods 29b, the ends of which are detachably connected with clevis elements 30 or other suitable mounting means, adjustably secured to the lower thrust-receiving cross channel 11 which interconnects the depending short bell crank arms of the two boom arms. The two hydraulic mechanisms are operatively connected by suitable heavy, flexible conduits (not shown in detail) with the discharge of a hydraulic pump connected in conventional manner and supplied with conventional valve controls for applying hydraulic fluid under pressure to the rear of the cylinders for reaction against the thrust pistons. A control box 31 is mounted for convenience adjacent the steering wheel of the tractor and is provided with a suitable valve or valves for controlling flow, shut-off and return of the hydraulic fluid.

Operation

With the boom arms 7 dropped to extreme lowered position, as shown in Fig. 1, the load carrier 19 is disposed in scoop form along the ground, with the tines 19b extending forwardly and inclined rearwardly slightly from the ground from their forward extremities. At this time, it will be noted that the hydraulic jack elements 29 are very nearly longitudinally aligned with the lower, longitudinal edges of the boom arms providing when the valves for the circulating fluid, are closed, almost directly aligned thrust-applying elements between the load carrier and the supporting brackets 30 for the hydraulic jacks. Further thrust in the forward movement of the tractor and pick-up or collection function of the load carrier, is applied between the load carrier and the medial portion of the chassis frame of the tractor, through the upper portion of the boom arms which extend in declined relationship from the heavy mounting brackets 12 with the cooperation of the brackets 13. Thus, in picking up a load through push action of the tractor, stress is distributed between the chassis frame of the vehicle and the rear or axle housing A of the vehicle.

When the load carrier is filled by pushing action to the desired capacity, the valve of the hydraulic system is operated to force fluid into the cylinders of the jacks 29 and the boom arms 7 are swung upwardly to position the boom above the ground in substantially horizontal position for transportation of the load, whereafter the valve is reclosed and the fluid locked to retain the boom structure in such position. The slightly

elevated load may then be transported by the tractor to the point for dumping or piling. Then, the hydraulic jack mechanisms 29 are again operated to apply thrust against the depending short bell crank arms of boom 7, thereby elevating the boom structure to the desired position for dumping and if desired, to the maximum elevated position shown in dotted lines in Fig. 1. At this time, it will be noted that the load carrier is still disposed forwardly of the tractor in a position to dump into a truck or other body or to unload material upon a pile.

To release the load carrier and dump the load, it is only necessary for the operator to pull the cord or cable 28 thereby, releasing the latch element 27b from engagement with its cooperating element 26a. The weight of the load, disposed forwardly of the trunnions or pivot pins 20, causes forward dumping of the load carrier and when the load is completely released, the spring 23 has sufficient tension to draw the extension tube 21 inwardly to extreme inward position, thereby swinging the load carrier back to normal, load-receiving position and causing the same to be locked in such position through camming action of the lock stud 26a with the inclined forward edge of the latch element 26b.

In the elevation of the boom structure, the pitch or level-controlling link 21 attached at its forward end to a point considerably above the trunnions 20 of the load carrier, causes the load carrier to first tilt slightly backward to retain the load and then to maintain such slightly tilted position throughout the entire arc of elevation of the boom structure.

A simplification of structure and ease of attachment are two of the important features of my improved front end loader. In installing my structure the boom arms 7 rigidly interconnected at their forward portions by the transverse members 15 and 17 and the diagonal braces 16, may be laid upon the ground and the tractor may be driven into the boom structure between the rearward and longer portions of the boom arms 7. Thereafter, the pivot sleeves 8 for the two boom arms, with the heavy stub shafts or pivot pins 9, may be attached to the mountings on the tractor and the knurled nuts 14 attached, to pivotally connect the rearward and upward corners of the boom arms. The jack mechanisms 29 which may, if desired, be left upon the tractor and the forward ends thereof suspended from the chassis, are then interconnected by applying fastening pivot pins through the forward apertured ends of piston rods 29b and through the clevis bracket 30 which have been previously adjusted as to spaced relation and secured to the transverse thrust-receiving channel 11 interconnecting the depending, shorter arms of the bell crank levers afforded by the two side pieces or beams of the boom.

With my improved construction, it will be noted that a direct thrust is imparted upon the depending bell crank arm of the boom construction, with a very slight swinging only of the hydraulic jack mechanisms, which are disposed under the chassis frame of the vehicle. The actuation stroke of piston rods 29b of the jacks, is relatively short, but nevertheless is responsible for a very material angulation of the boom structure between lowered or gathering position and extreme elevated position, with the result that dumping heights of from ten to eleven feet may be attained with my improved structure applied to farm tractors of conventional types.

From the foregoing description, it will be seen

that I have provided an extremely simple, comparatively inexpensive and highly efficient front end loader adapted to withstand hard, continued usage and capable of lifting heavy loads. In the elevation of the boom structure through the application of power thrust and the pivoting of the upper corner of the boom structure at its rear to the medial portion of the tractor frame, an efficient distribution of stress and weight is obtained between the front and rear wheels of the tractor and throughout the chassis frame and heavy rear axle housing A.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. Material-gathering and loading apparatus for vehicles, having in combination a boom structure comprising a pair of interconnected substantially rigid boom arms disposed at opposite longitudinal sides of a vehicle and swingably connected at their inner ends with the vehicle chassis on a horizontal, transverse axis disposed well below the top of the vehicle chassis, the forward ends of the arms extending beyond the front end of said vehicle, a load carrier pivotally secured to the forward ends of said boom arms, power operated means for swinging said boom arms upwardly and means for maintaining said load carrier at a predetermined pitch during elevation, and for also constituting a latch for retaining said load carrier in load-holding position and for releasing the same to dump by gravity, said means comprising an elongated link extending generally in parallel relation to said boom arms and pivoted at its rear end to the vehicle chassis at an intermediate point in the link thereof, said link having a longitudinally slidable extension at the forward end thereof, said extension having its forward or outer end pivotally connected with the back of said load carrier at a point above the pivot of said load carrier, a spring carried by the main portion of said link for urging said slidable extension inwardly to normally swing said load carrier into material-gathering position, a retractable latch element mounted adjacent the forward end of the main portion of said link and a cooperating latch-engaging element connected with said slidable extension member.

2. Material-gathering and loading apparatus for vehicles, having in combination a readily attachable unitary boom structure comprising as essential elements only a pair of substantially parallel elongated rigid boom arms of triangulated shape disposed edgewise and tapering from their rear to their forward ends and adapted to extend from the medial portion of a vehicle to a point considerably beyond the front of said vehicle and re-inforcing and interconnecting means rigidly securing the forward portion of said boom arms together to complete a general U-shaped unit, a load carrier detachably and pivotally mounted between the forward end of said boom arms, said U-shaped unitary structure being of a width to enable the forward end

of a vehicle such as a tractor to be driven therein with the unit disposed upon the ground and with said boom arms disposed in edgewise relation, said boom arms at the upper rear corners thereof having bearings for accommodating pivot elements disposed on the intermediate and lower portions of the vehicle frame, and a quickly attachable hydraulic jack mechanism comprising a jack unit for each side of the vehicle having a cylinder provided with a rear extension for pivotal attachment to the rear and lower portion of a vehicle and having a piston provided with a forwardly extending rod for pivotal connection with the rear and lower portion of one of said boom arms, and readily connectible pivot pins for swingably connecting said boom arms with the respective sides of a vehicle and readily connectible pivot pins for connecting said hydraulic jack mechanism with the rear and lower portions of said boom arms.

3. Material-gathering and loading apparatus for vehicles, having in combination a readily attachable unitary boom structure comprising as essential elements only a pair of substantially parallel elongated rigid boom arms having at least the rear portions thereof of triangulated configuration and disposed edgewise and tapering forwardly, said boom arms being adapted to extend from the medial portion of a vehicle to a point considerably beyond the front of said vehicle, reinforcing and interconnecting means rigidly securing together the forward portion of said boom arms to complete a general U-shaped unit, a load carrier pivotally mounted upon the forward end of said U-shaped unit, said unit being of a width to enable the forward end of a vehicle such as a tractor to be driven therein with the unit disposed upon the ground, said boom arms at the upper rear corners thereof having pivotal connections for connecting with the intermediate and lower portions of the vehicle frame, and a quickly attachable hydraulic jack mechanism comprising a jack unit for each side of the vehicle having a cylinder provided with a rear extension for pivotal attachment to the rear and lower portion of the vehicle and having a piston provided with a forwardly extending rod for pivotal connection with the rear and lower portion of one of said boom arms.

CHARLES L. BEST.

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