Nov. 13, 1945. J. W. CRABTREE 2,389,029

FRONT END LOADER FOR SELF-PROPELLED VEHICLES

Filed Aug. 23, 1944 2 Sheets-Sheet 1

Fig. 1

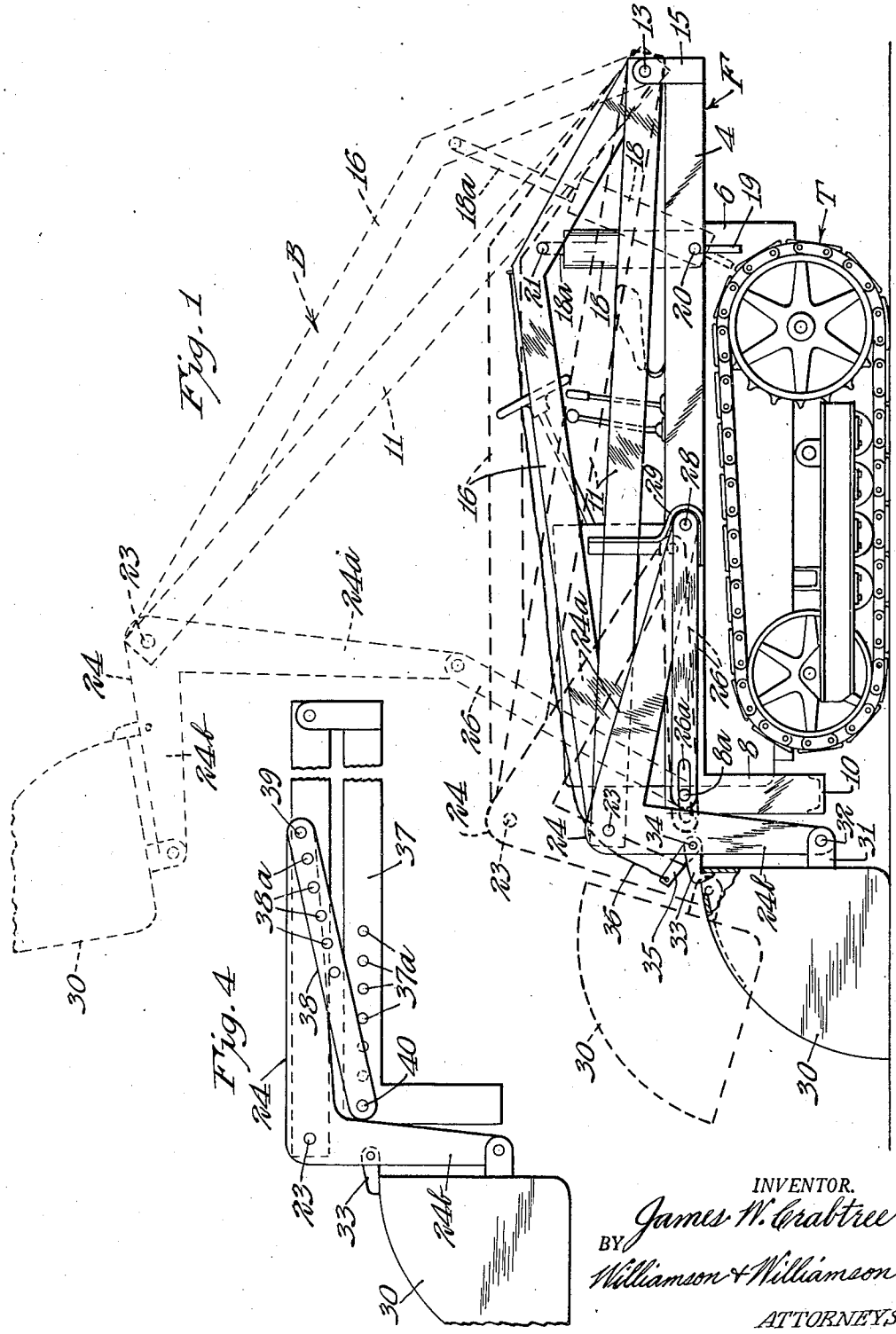


Fig. 4

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Fig. 2

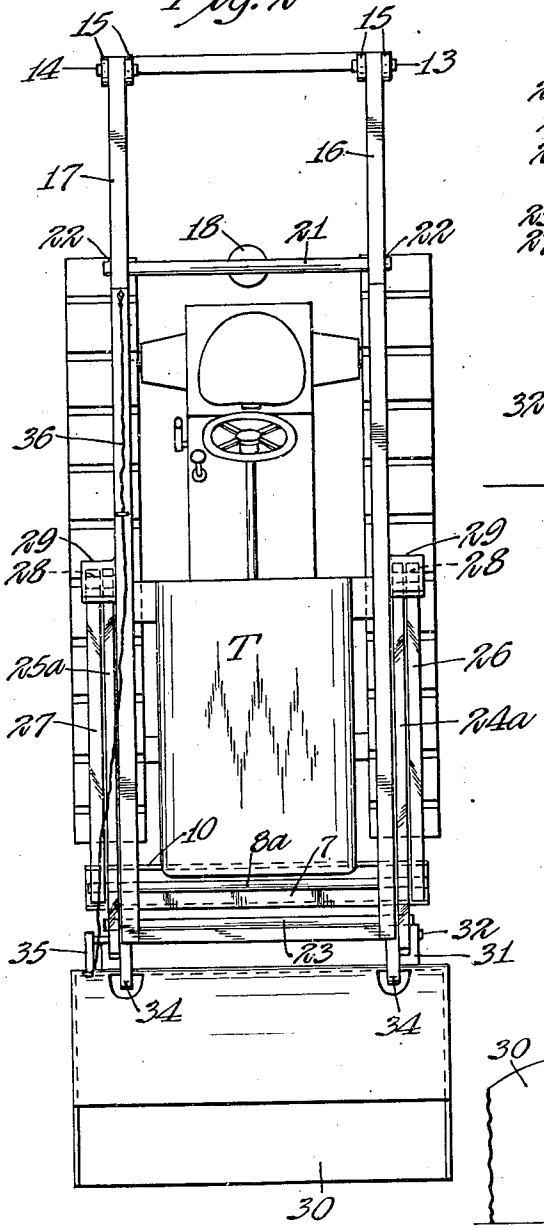


Fig. 3

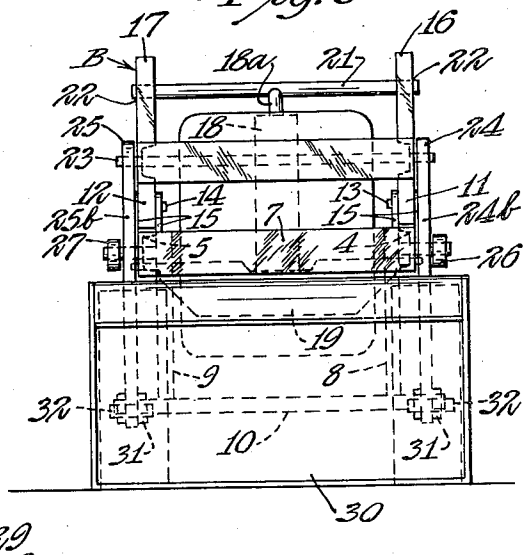
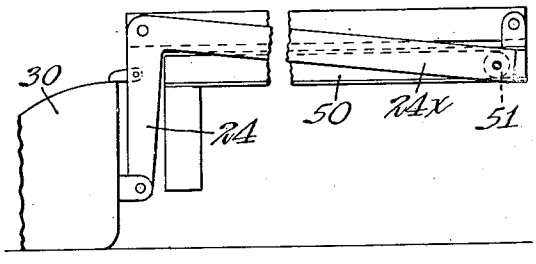


Fig. 5



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FRONT END LOADER FOR SELF-PROPELLED VEHICLES

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5 Claims. (Cl. 214—140)

This invention relates to front-end loaders for self-propelled vehicles such as tractors, patrol graders, trucks and other automotive vehicles and relates particularly to such apparatus which is constructed to pick up or gather material at the front of the self-propelled vehicle during the travel thereof and to subsequently lift the material gathered and to dump or discharge the same from an elevated position for loading or piling purposes.

It is an object of my invention to provide a comparatively simple and efficient push-type front-end loader for self-propelled vehicles wherein the elevating structure or boom is disposed in close compact relation with the sides of the vehicle chassis when material is being gathered; which will not obstruct the vision of the driver of the vehicle; which permits the vehicle to be used for picking up material beneath relatively low overhanging buildings, trees or the like and which nevertheless enables the loaded implement to be raised to a substantial height for dumping upon a pile or relatively high collection apparatus.

In most front end loaders for tractors and the like a swingable boom structure is utilized carrying at its free and forward end, an implement bucket or set of tines for handling the material. In the upward swinging movement of the boom, the bucket is swung through a radial course with the result that in the upward dumping position, it has been moved rearwardly relative to the motor vehicle and is therefore difficult to discharge the gathered material upon a pile or receiving medium disposed forwardly of the motor vehicle.

With my improved construction, the attachment or supporting means for the gathering or pick-up element, is automatically moved with the elevating, swinging movement of the boom to protrude the implement beyond its normal gathering position and to simultaneously tilt the same backwardly to prevent dropping of material collected. This enables the material to be lifted to a considerable height for discharge while nevertheless maintaining the pick-up implement in a position disposed forwardly of the front of the tractor or other vehicle.

A further object is a provision of a front-end loading apparatus readily applicable to various types of self-propelled vehicles and constructed to have all of the mechanism thereof disposed in close compact relation to the sides of the vehicle chassis, actually below portions of the vehicle body when material is gathered, thus enabling the device to be utilized in digging or scooping up material in the basements or below the floor of a building under construction as well as underneath low hanging objects such as trees, etc.

Another object is the provision of apparatus of the type described wherein the gathering of material, the elevation thereof and the dumping are very easily and accurately controlled by the driver of the vehicle and wherein great saving in time and labor is accomplished through the use of my improved structure.

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 character references refer to the same parts throughout the several views and in which:

Figure 1 is a view in side elevation, the full lines showing an embodiment of my apparatus applied to a Caterpillar tractor in lowered or receiving position and the heavy dotted lines showing the apparatus in partially raised position, which tilts the bucket back to retain material, and the light dotted lines showing the apparatus in fully raised position ready for release;

Figure 2 is a top elevation of my loader;

Figure 3 is a front elevation of the same;

Figure 4 is a partial side elevation showing another method and construction for protracting and raising the bucket; and

Figure 5 is a similar side elevation of another embodiment.

My loading apparatus is mounted on a Caterpillar tractor T and includes as shown, a pair of heavy channel iron side supporting members 4 and 5 which are bolted along the sides of the tractor frame 6 and are interconnected at their front ends by a cross brace 7. Depending downwardly from the forward end of support members 4 and 5 is a pair of vertical channel members 8 and 9 connected by a horizontal cross member 10 at their lower ends. The members 4, 5, 7, 8, 9 and 20 are all welded or riveted together, forming a very strong rigid frame F for supporting the entire movable portion of the loading apparatus.

Immediately above support frame F is a swingable boom construction B, which as shown consists of a pair of side boom members 11 and 12 which overlie members 4 and 5 and are pivoted on their rear ends on journals 13 and 14 and between short upwardly extending bracket plates 15 welded or riveted to frame members 4 and 5. Welded to the boom members 11 and 12 and lying above the same and forming two substantially triangularly shaped truss units with members 11

and 12, are channel members 16 and 17, which complete the swingable boom construction.

As shown, power for raising and lowering frame B is supplied by a hydraulic ram 18 mounted at its lower end midway on a cross beam 19 which extends between support frame members 4 and 5 and which pivots relative to same on a cross pin 20. The plunger rod 18a of ram 18 is pivotally connected by a cross shaft 21 with members 16 and 17.

Pivoted at the front end of and just outside boom members 11 and 12 on a cross shaft 23, is a pair of bell crank bucket or implement supporting levers 24 and 25. On the rear ends of the rear arms 24a and 25a respectively of said bell crank levers and just outwardly of the same a pair of links 26 and 27 are pivotally connected by pins 28. The rear ends of bell crank arms 24a and 25a and also of links 26 and 27 are shaped to fit in a pair of fixed guide channels 29 welded to the supporting frame members 4 and 5 respectively. Guide channels 29 are U shaped and lie on their sides with the channels disposed toward the front of the machine. Upwardly extending guide extensions 29a are integrally formed as shown with channels 29 and have their upper extremities declined at an angle to the vertical.

On the outer ends of the forward arms 24b and 25b of bell cranks 24 and 25 is supported a bucket 30, by means of brackets 31 welded to bucket 30, and pivotally connected to arms 24b and 25b by stub shafts 32. The guide channels 29 are shaped to hold the ends of bell cranks down during initial movement of boom B causing the bucket to begin tilting back slightly after lifting power is applied.

The front ends of links 26 and 27 are provided with longitudinal slots 26a and 27a respectively which are slidably connected with pins 8a and 9a respectively, said pins extending outwardly and horizontally from the channel members 8 and 9. This provides a lost motion connection between the front end of the links and the rigid frame structure to permit the large bell cranks 24 and 25 to be moved for elevating purposes through a slight angulation before the rear ends of said links 26 and 27 are released from confinement in the channels 29. The confining or retaining of the rear ends of bell cranks 24 and 25 with the rear ends of the links 26 and 27, in the initial upward swinging movement of the boom structure, causes the bucket or implement 30 to be immediately tilted backwardly to some degree to prevent the material from spilling out. If the channels 29 or their equivalent were not provided, backward tilting of the implement to any extent would not occur until after the boom structure had been raised through a considerable angle.

Midway of vertical bell crank members 24 and 25, on bell crank arms 24b and 25b, are mounted a pair of conventional latch members 33 on a cross shaft 34. Cross shaft 34 is operated by arm 35 to which is attached releasing rope 36, said rope extending rearwardly along top of member 27 to where the operator can reach same.

Fig. 4 shows an alternate method of getting this initial back tilt to bucket 30. Support member 37 corresponding to member 4 of previously described method has a series of adjustment holes 37 extending backwardly of the machine, and link arm 38 corresponding to link arm 26 has a series of adjustment holes 38a extending forwardly along link arms.

By varying pins 39 and 40, any degree of tilt to bucket necessary, can be obtained.

From the foregoing description and by reference to the drawings, it will be seen that my entire apparatus, when in the lowered position for gathering or collecting material, is disposed compactly in close relation to the main frame of the vehicle. The entire boom structure, including the articulated truss members 16 and 17 are disposed at substantially the level of the hood of the motor vehicle and as shown, actually below the top of the steering wheel.

Operations

While the embodiment of my invention is illustrated as applied to a tractor of the endless track type and is further provided with a dirt excavating implement or scoop attached thereto, it will of course, be understood that the apparatus is equally applicable to various other self-propelled vehicles as well as to operate, elevate and dump other gathering implements such as hay-rakes, baskets, magnetic ore loading implements and the like.

In operation the implement is pushed by the vehicle along or slightly below the ground line, scooping up and collecting the material to be gathered. When the bucket or implement 30 is filled, which the operator can visually determine the valve or other control for the hydraulic ram 18 is actuated to cause the plunger rod 18a to move upwardly lifting the boom structure which swings upwardly upon the rearwardly disposed pivot axis, comprising the pins or stub shafts 13 and 14.

In the initial upward swinging of the boom structure the rear ends of the rear arms 24a and 25a of the large bell crank, implement supporting members are confined by engagement with the channel members 29, the initial upward swinging therefore, causing the outer bell crank arms 24b and 25b to immediately swing forwardly and upwardly, tilting the bucket or other implement 30 supported thereby, in a rear direction to prevent spilling of the contents.

Simultaneously with the initial lifting movement of the boom structure, the links 26 and 27 are moved longitudinally forward the slot and pin connections at their forward end permitting such movement until the rear ends of the slotted portions 26a and 27a respectively abut the connection pins 8a. Thereupon the rear ends of the links 26 and 27 as well as the rear ends of the bell crank arms 24a and 25a are released from confinement in the channels 29 and may move upwardly with the boom. Such upward movement thereafter and the toggle connections causing the bell cranks to be further operated during elevation of the boom until in the maximum raised position, the forward arms 24b and 25b respectively, of the bell crank, are positioned almost but preferably not quite horizontally with the implement or bucket 30, protruded considerably outwardly with relation to the outer or free end of the boom structure.

Such operation causes the implement 30 to be protruded forwardly of the self-propelled vehicle considerably beyond the position it would assume were it merely connected directly with the outer end of the boom structure, which enables the boom to be swung upwardly to a considerable angle elevating the implement to a material height for dumping or discharging material gathered.

In the operation in my device, after the implement 30 has been filled, the operator may move the vehicle to the point where loading is

to be effected and while the vehicle is in motion, the boom may be elevated and will be in position to discharge its load when it has travelled to the delivery point.

In Figure 5 a somewhat different form of operating connection for protracting and elevating the bucket or other implement is shown. In this form a bell crank implement supporting structure comprising the two levers **24** is provided with elongated rearwardly extending arms **24X** which when the boom structure is in lowered position extend nearly to the rear of the vehicle chassis. The chassis on each of the longitudinal sides is provided with a horizontal channel track **50** in which a wheel or roller **51** is accommodated, said wheel being suitably journaled or pinned to the rear extremity of its associated arms **24X**.

Thus when the boom structure is raised, the bell crank levers **24** will be immediately operated by the roller action of the wheels **51** in tracks **50** and the bucket or implement support will be swung forwardly and upwardly during the elevation of the boom structure, the tilting of the implement during such protraction preventing loaded material from sliding off the front end.

It will, therefore, be seen that with my improved structure, a minimum amount of time and labor as well as consumption of power, is utilized to pick up material, elevate the same and deliver the same at a desired receiving point.

It will further be seen that due to the very compact low slung construction of my boom, implement support and hydraulic mechanism that the device in normal gathering position can be driven below relatively low overhanging objects such as buildings and trees and pick up its load.

It will be further 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 is claimed is:

1. A front end loader for a self-propelled vehicle having in combination a pair of rigidly connected side booms adapted to be pivoted at their rear ends to the rear end of said vehicle along a common horizontal axis disposed below the upper portion of said vehicle, power operating mechanism for said boom having a connection with said boom disposed forwardly of said pivot axis, an implement support swingably mounted at the outer ends of said booms and adapted to be disposed forwardly of the vehicle and across said booms, said support having an attachment arm extending downwardly from said booms when the latter are in lowered, material receiving position and a pair of rigid links disposed at the respective sides of said vehicle for swinging said arm outwardly and upwardly to protract and tilt an implement attached to said arm when said booms are raised, said links being connected at their forward ends to the forward portion of said vehicle.

2. A front end loader for a self-propelled vehicle comprising a boom construction adapted to be pivoted at its rear end to one end of the chassis of a vehicle and lying, when in lowered position, in close low-slung relation to said chassis, a loading implement, an implement support movably mounted on the forward portion of said boom structure for moving said implement outwardly and upwardly relative to the outer end of said boom, an operating connection having one of its ends connected to said implement support and having another end adapted to be connected with said vehicle chassis and related with said implement support to effect the movement of said implement herein defined during the elevation of said boom and a confining member for restricting the operation of said connection during the first portion of the elevation of said boom structure and for releasing said operating connection in the subsequent upper swinging of said boom construction.

3. A front end loader for a self-propelled vehicle comprising a boom construction adapted to be pivoted at its rear end to one end of the chassis of a vehicle and lying, when in lowered position, in close low-slung relation to said chassis, a loading implement, an implement support in the form of a pair of lever structures depending from its fulcrum at the sides and forward end of said vehicle when said boom construction is in lowered position, a collection implement connected with said support and an operating connection including a pair of links pivotally connected adjacent one end to said lever structure for swinging the same and each having a pivotal connection adjacent its opposite end for connection with the forward portion of chassis of the vehicle.

4. A front end loader for a self-propelled vehicle comprising a boom construction adapted to be pivoted at its rear end to the chassis of the vehicle, a collection implement support in the form of a bell crank lever construction mounted on the forward portion of said boom construction with its implement attachment arm depending from its fulcrum when said boom structure is lowered, a collection implement attached to said support and a pair of operating links each thereof pivotally connected adjacent one of its ends with the rear arm of said bell crank construction and having a pivotal connection adjacent its opposite end for attachment to the vehicle chassis at a point materially forward of the boom pivot whereby said implement will be protracted and swung upwardly relative to the outer end of said boom construction when said boom construction is elevated.

5. A front end loader for a self-propelled vehicle having in combination a pair of rigidly connected side booms adapted to be pivoted at their rear ends to the rear end of said vehicle along a common horizontal axis disposed below the upper portion of said vehicle, power operating mechanism for said boom having a connection with said boom disposed forwardly of said pivot axis, an implement support swingably mounted at the outer ends of said booms and adapted to be disposed forwardly of the vehicle and across said booms, said support comprising a pair of axially aligned bell crank levers disposed at the respective longitudinal sides of said vehicle with arms thereof disposed downwardly when said booms are lowered and having connection arms disposed rearwardly at such time and a pair of rigid links connecting the rearward ends of said bell crank arms with the forward portion of said vehicle for operating said implement support and for steadying said implement support when said booms are elevated.

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