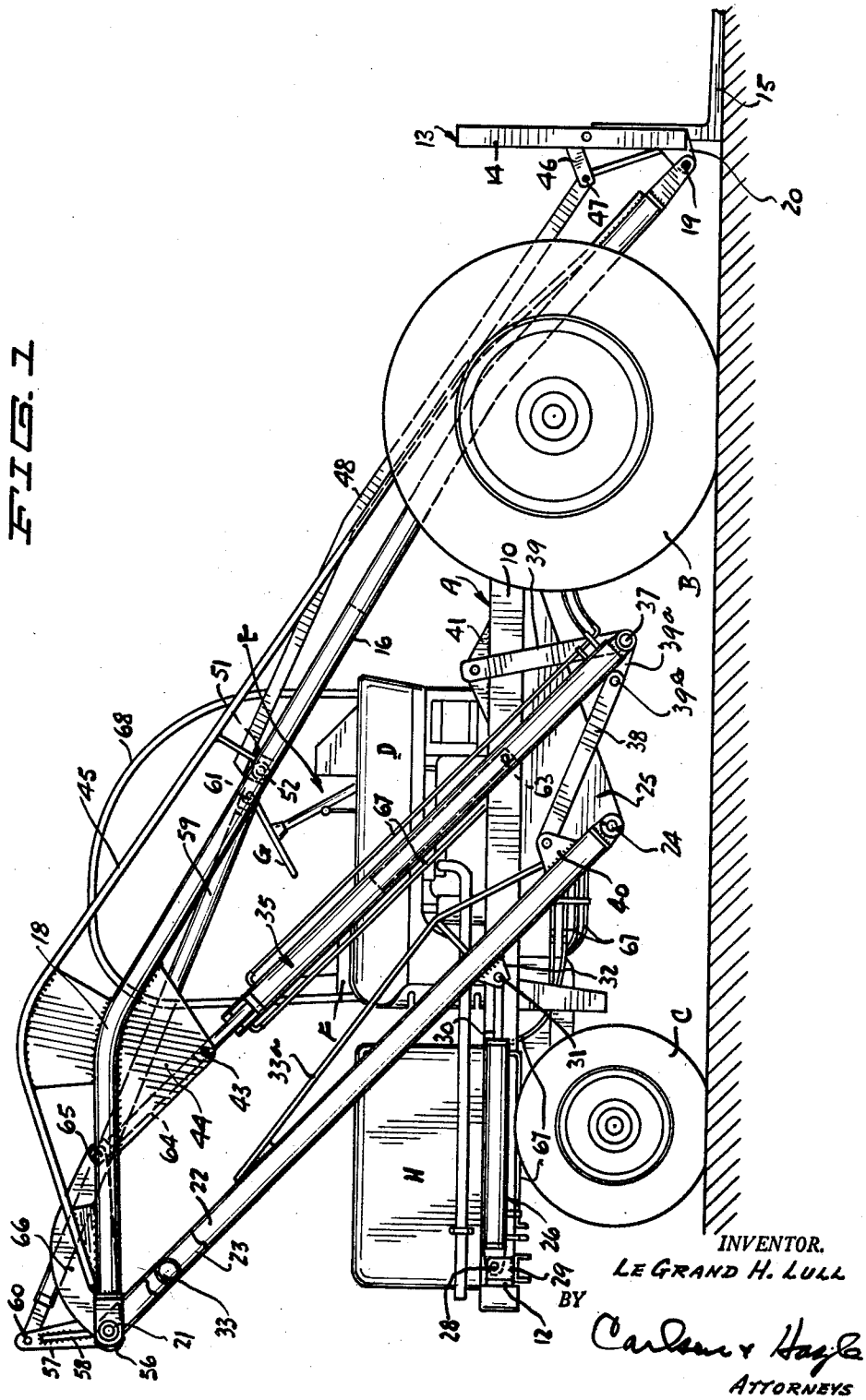
Dec. 25, 1962 LE GRAND H. LULL 3,070,244

LOADER

Filed Oct. 13, 1958 8 Sheets-Sheet 1

FIG. 1



Dec. 25, 1962 LE GRAND H. LULL 3,070,244

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Filed Oct. 13, 1958 8 Sheets-Sheet 2

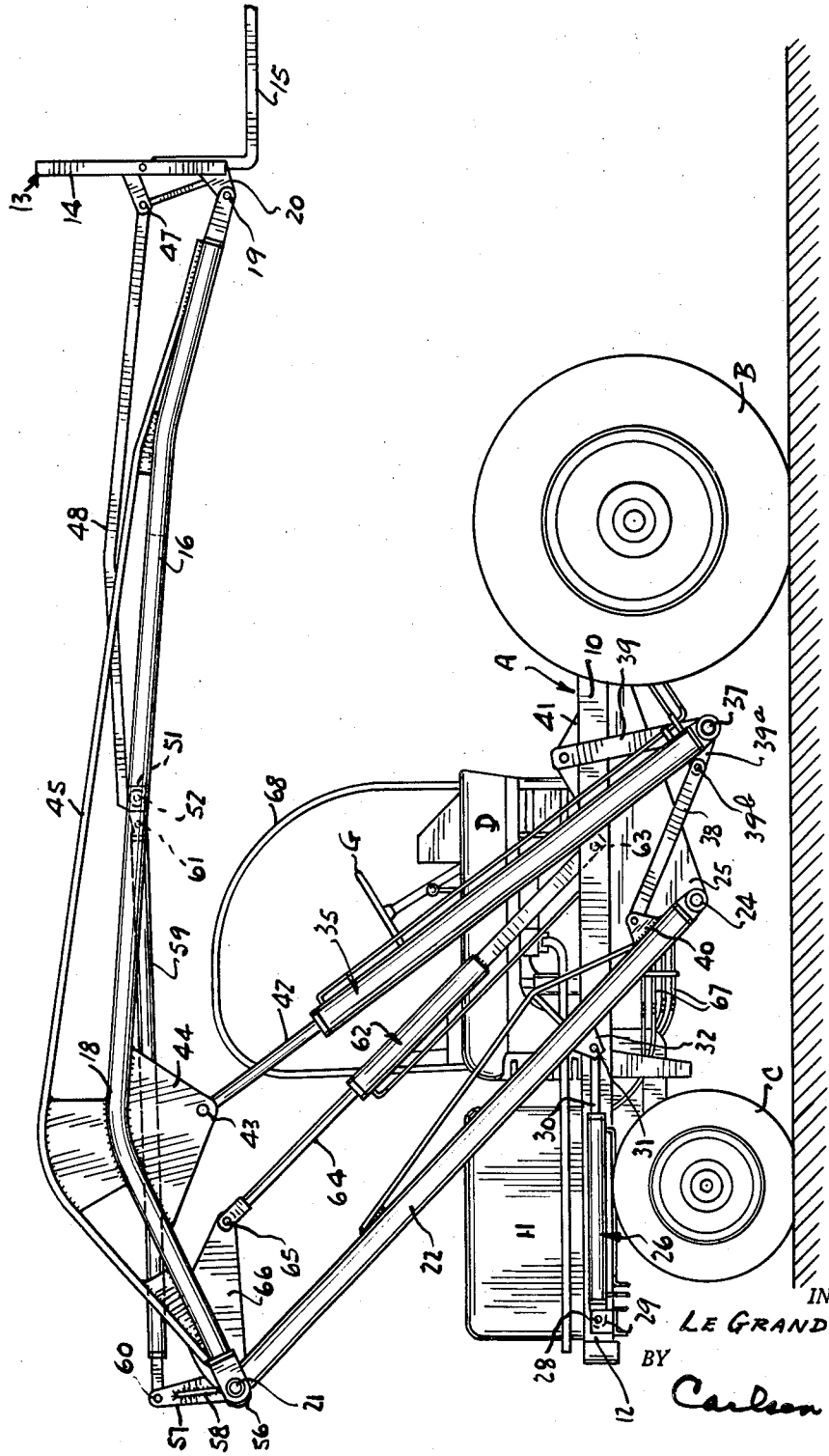

FIG. 2

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Dec. 25, 1962 LE GRAND H. LULL 3,070,244

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Filed Oct. 13, 1958 8 Sheets-Sheet 3

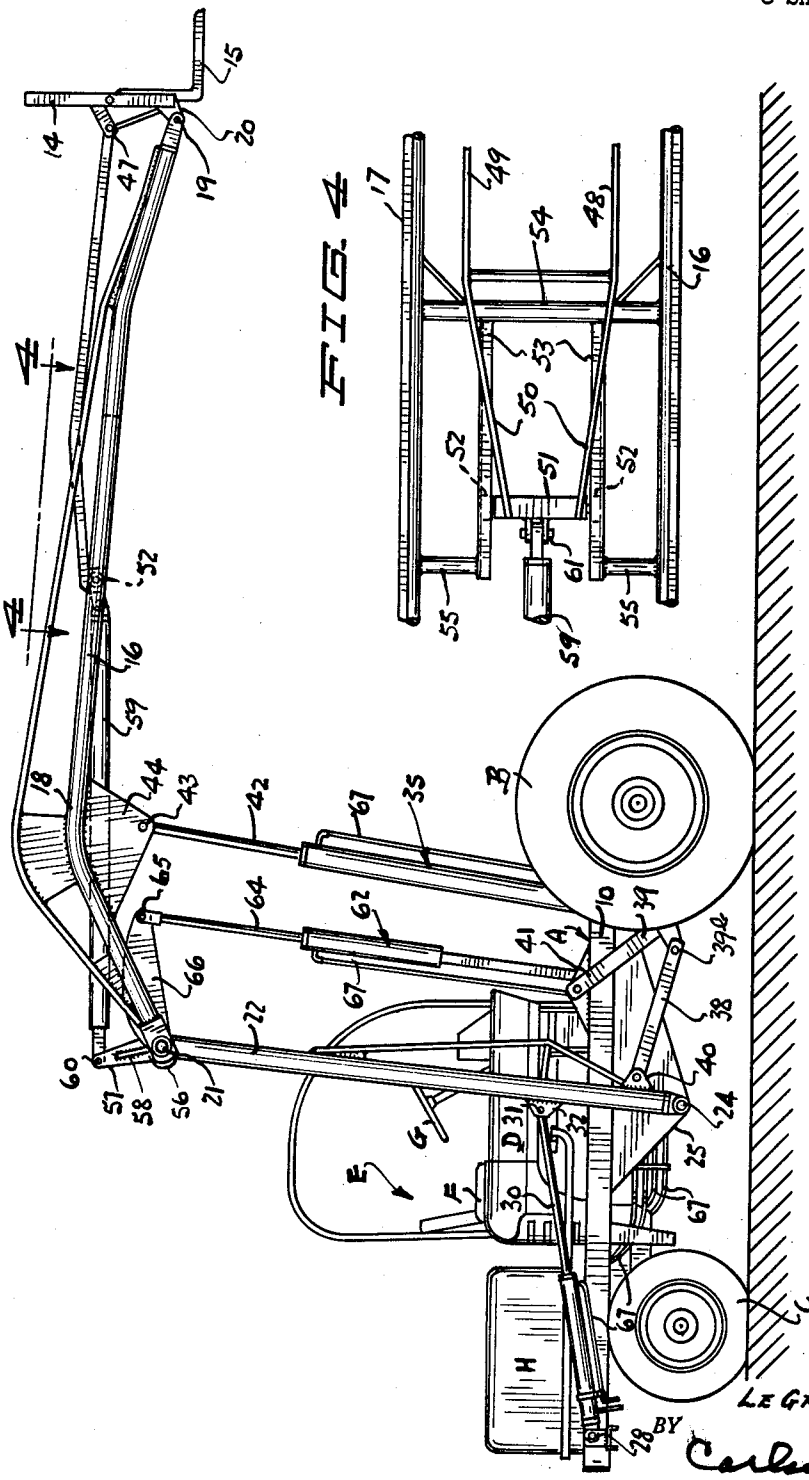

FIG. 4

FIG. 3

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FIG. 5

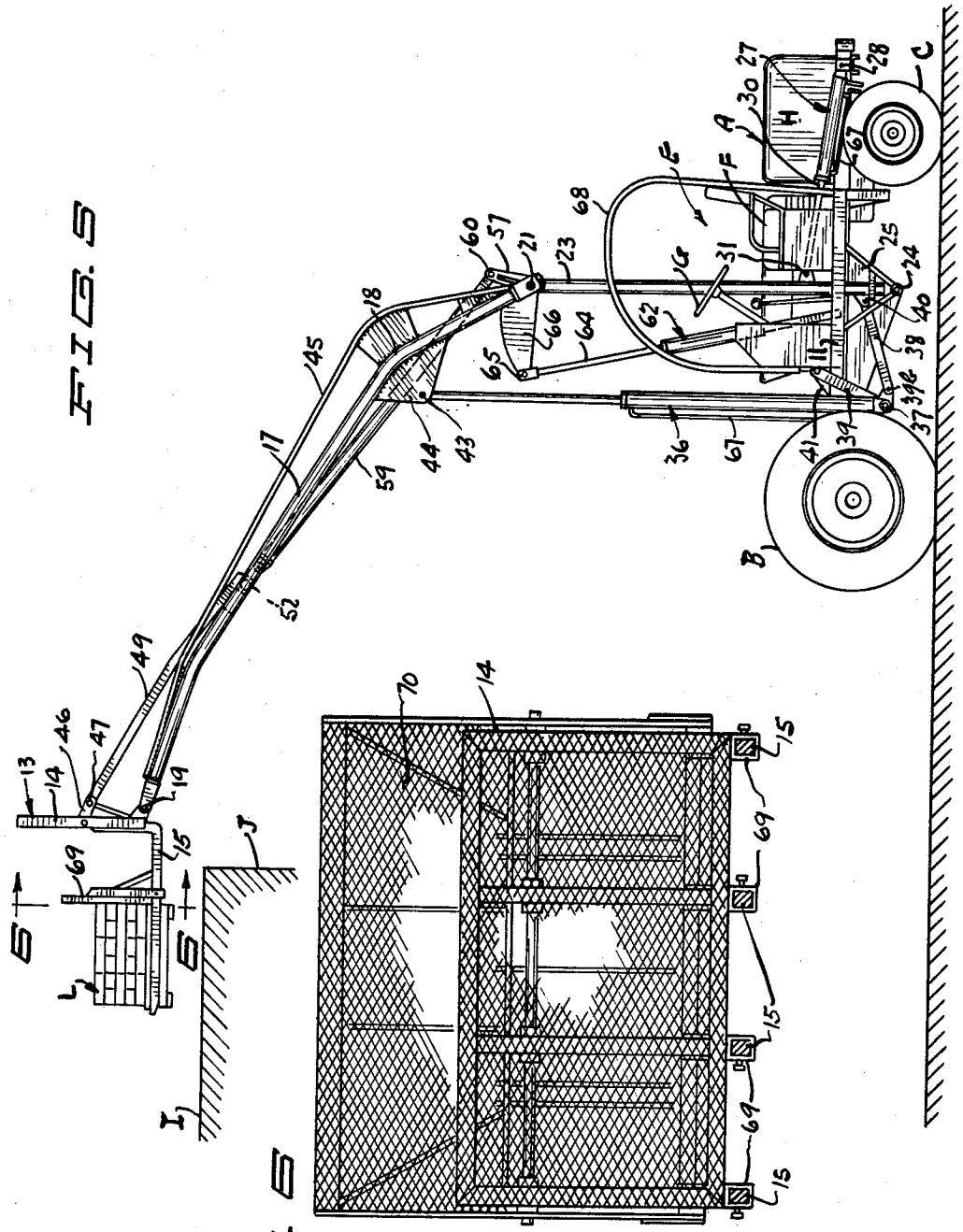

FIG. 6

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LOADER

Filed Oct. 13, 1958 8 Sheets-Sheet 5

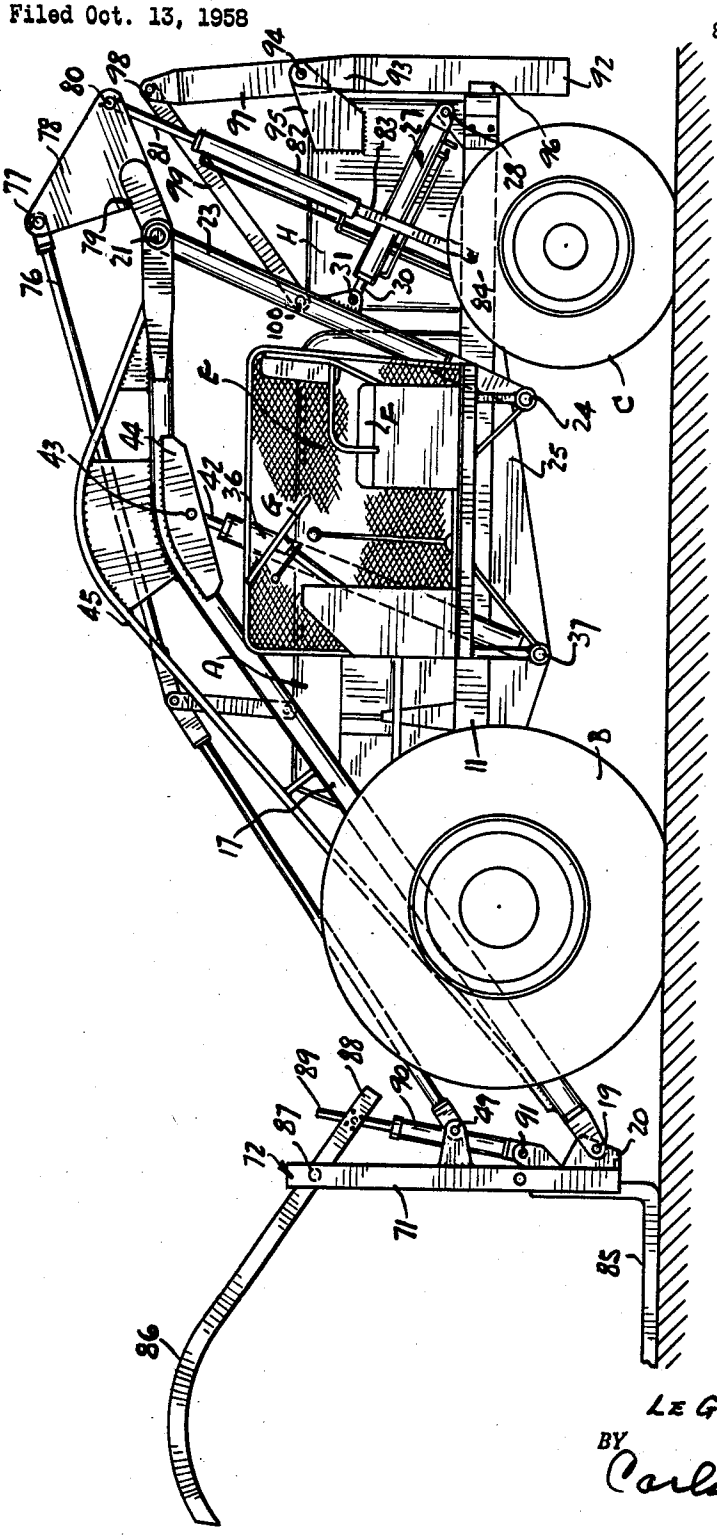

FIG. 7

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Filed Oct. 13, 1958 8 Sheets-Sheet 6

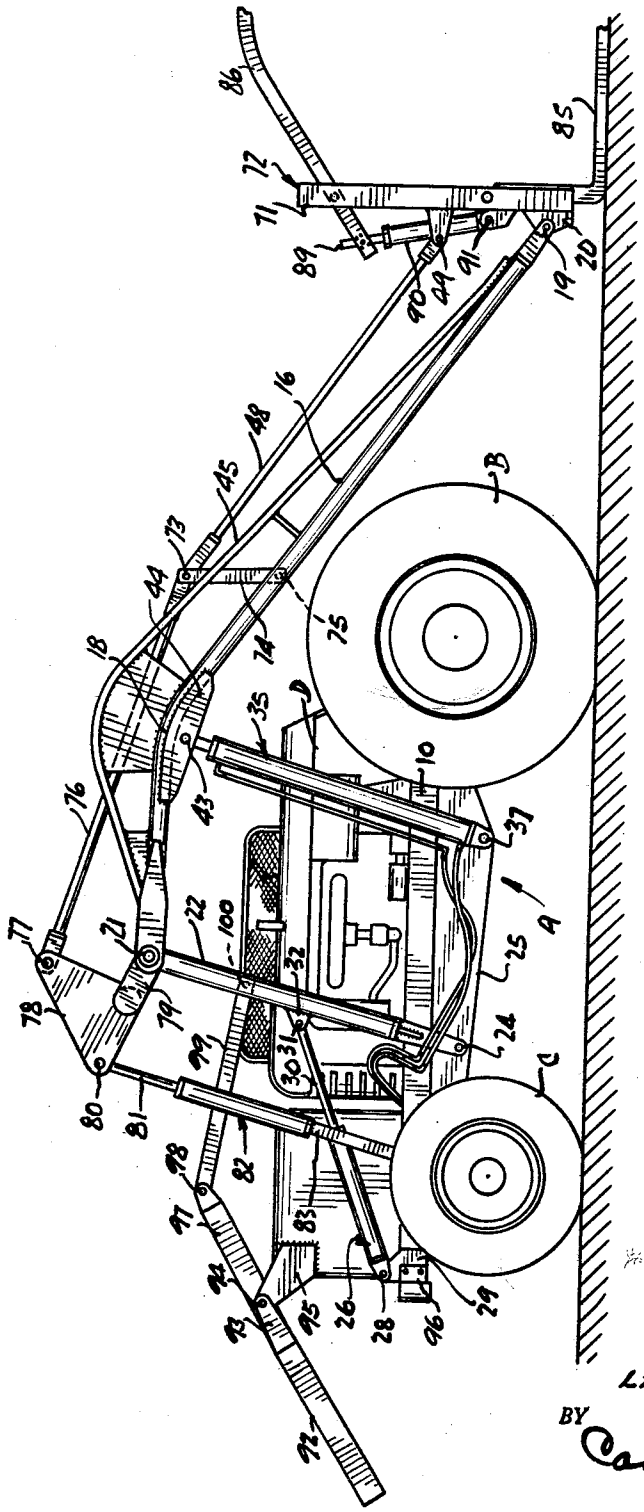

FIG. 8

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FIG. 10

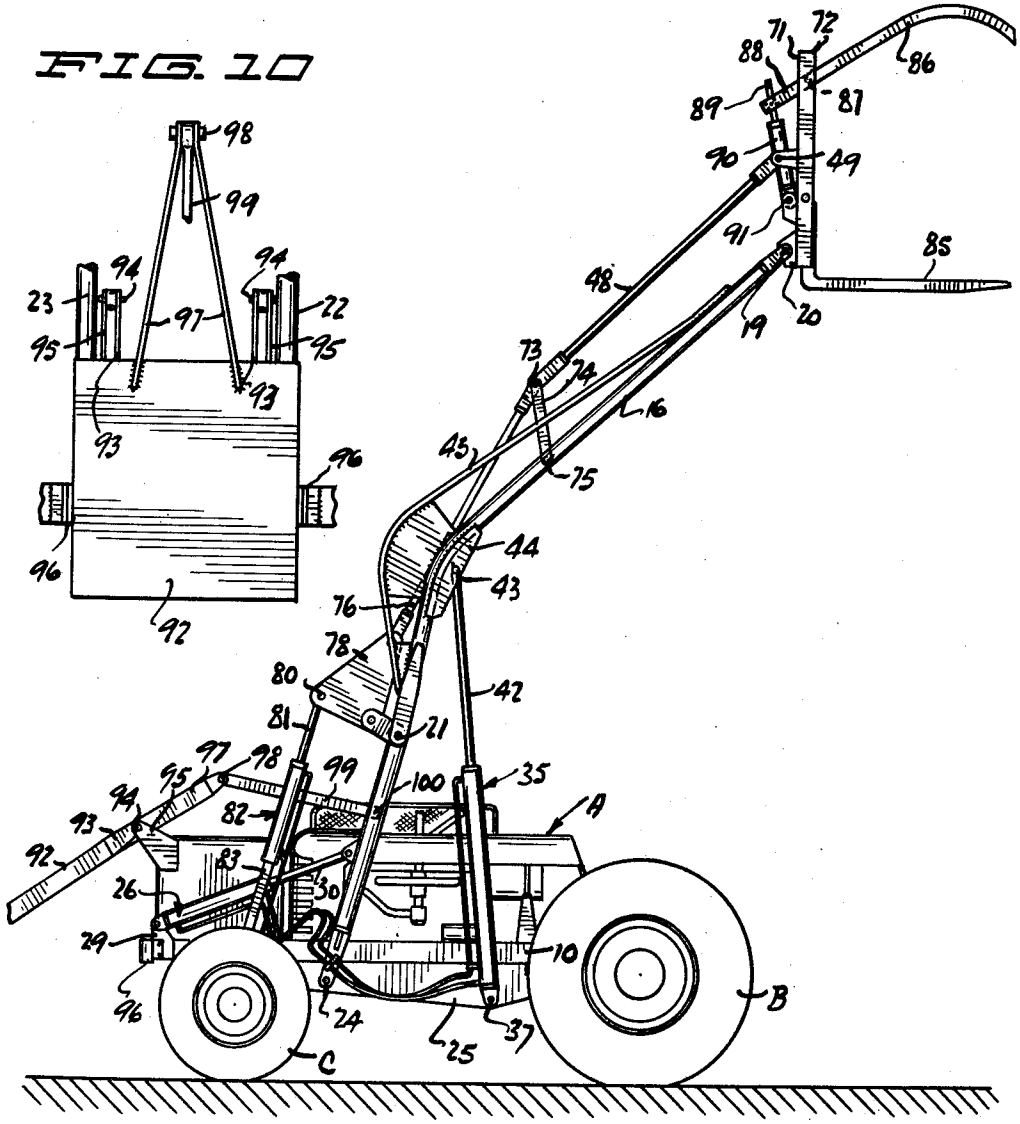

FIG. 9

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Dec. 25, 1962 LE GRAND H. LULL 3,070,244

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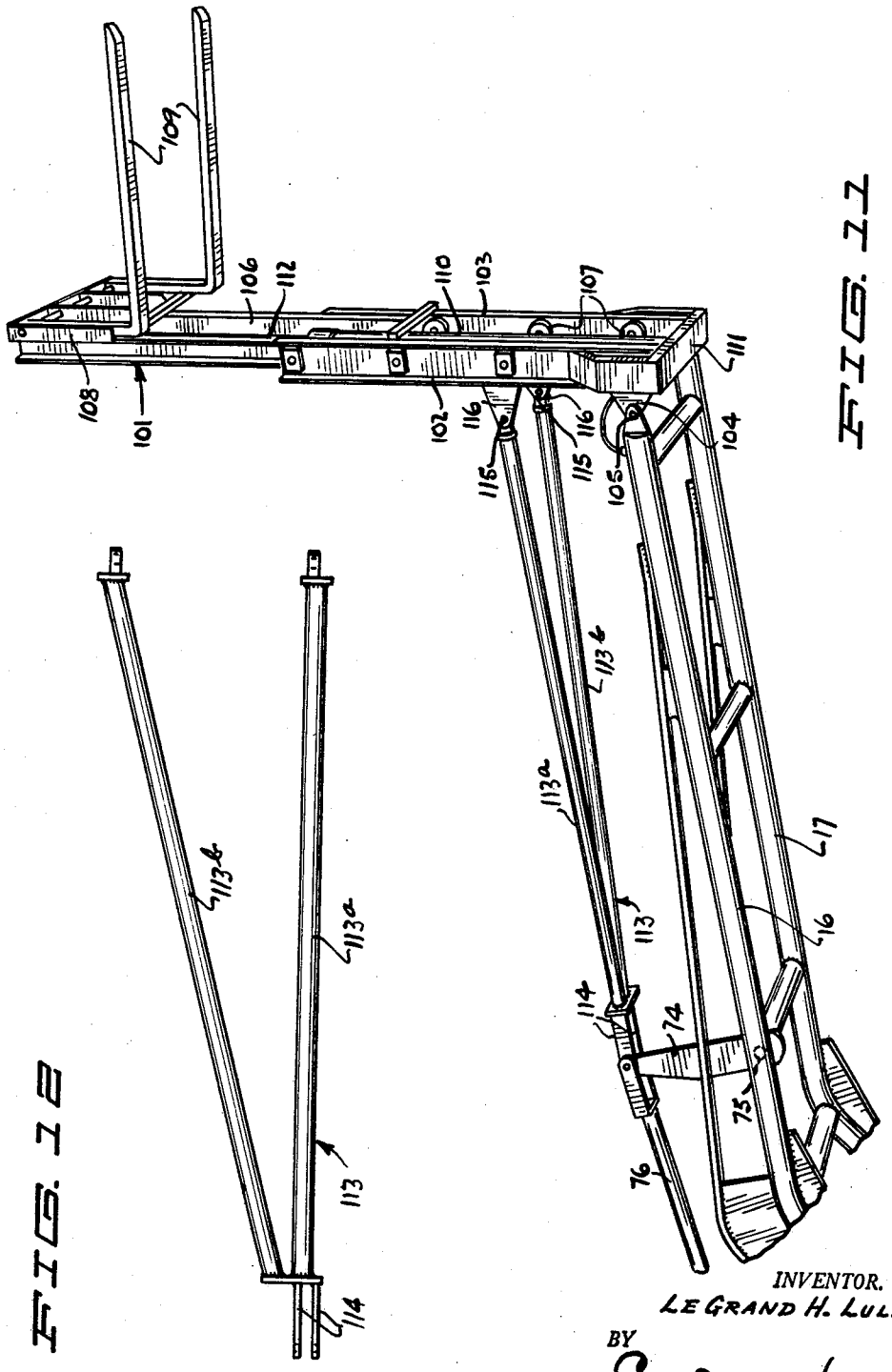

FIG. 12

FIG. 11

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United States Patent Office 3,070,244 Patented Dec. 25, 1962

3,070,244

LOADER

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Filed Oct. 13, 1958, Ser. No. 767,011
1 Claim. (Cl. 214—140)

My invention relates generally to improvements in loaders of the tractor mounted or self-propelled type and capable not only of raising a load to a high elevation but also of manipulating the load carrier so that many kinds of materials, depending upon the type of load carrier with which the loader is equipped, may be handled to great advantage. Buckets and forks are most commonly used as the load carriers but many other special carriers such as cranes, masonry and lumber or log carriers, concrete hoppers and platforms for the workers themselves, etc., may also be used.

The primary object of my present invention is to improve this class of loaders, particularly providing a loader which will raise the load to a very considerable elevation, and to make clear the advantages of the loader of my invention it will be described herein as used in the building industry. In such work it has been the custom heretofore to elevate lumber, steel, concrete blocks, bricks and other materials going into construction of the building, up to the second and succeeding floors by means of some form of windlass or hoist mechanism, this being a slow and laborious operation as well known. By the use of the loader of my invention, however, stacks of lumber, structural steel, blocks, bricks and the like may be picked up from storage stacks on the construction site and may be elevated to second or third floors of the building under construction and then thrust forwardly and deposited on these floors where the material is needed, all with a very substantial saving in time and work consumed in the process. It is, accordingly, another important object of my invention to provide a loader in which the load carrier may be moved from a loading position at ground level upward slightly to a transport position for travel toward the building and then may be swung upwardly to the necessary height and finally thrust forwardly a substantial further distance to deposit the load in the desired location. For the latter purpose the booms which support the load carrier are themselves carried upon the tractor or vehicle frame by means of forwardly-rearwardly swingable or translatable supports which may be hydraulically actuated in order to move the carrier in a longitudinal direction for a substantial distance with respect to the load carrier. Another object is to provide a loader having linkage so constructed and arranged that the weight of the load is at all times in and above the zone of the traction wheels of the tractor or other carrier for the loader and in which counterbalancing is provided in such fashion that the load weight-to-counterbalancing weight ratio is advantageous. Another object is to provide linkage and operating mechanism which will permit the load to be thrust forwardly with a reaching action at any elevation of the load and so that the carrier may be reached forward over intervening materials for loading, thus making the machine convenient and extremely versatile in its operation. Another object of my invention is to provide automatic leveling means by which the load carrier may be maintained at a desired level or tilt as it is raised and lowered and which may also be hydraulically actuated at any elevated position of the carrier to positively tilt the same as may be desired. It is to be noted that all of these movements of the load carrier may be carried out without moving the tractor or vehicle itself and this is frequently a very desirable feature. For example, when working adjacent to the wall of a building under construction, the tractor may find good footing at one position

from which the load may then be manipulated as necessary without danger of tilt or sway induced by movements of the tractor itself away from or off such good footing.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIG. 1 is a side elevation of a loader according to my invention showing a load carrier thereon and in its lowered position.

FIG. 2 is another side elevation but on a smaller scale, and showing the load carrier elevated some distance and illustrating the manner in which the leveling or tilting mechanism maintains the carrier in its proper position as it is raised and lowered.

FIG. 3 is still another side elevation, on a smaller scale than FIG. 2, showing the load carrier elevated still further but particularly illustrating the forward reaching action of the mechanism.

FIG. 4 is a fragmentary plan view, along the line 4—4 in FIG. 3.

FIG. 5 is a further reduced side elevational view, from the opposite side of the loader showing the load carrier raised still further and projected forward to reach over the edge of a building structure and deposit a load thereon.

FIG. 6 is a greatly enlarged sectional detail and elevational view on the line 6—6 in FIG. 5 showing slip-on shield and fork structure for carrying special loads such as material originally piled upon pallets.

FIG. 7 is a side elevation of a somewhat modified form of loader, viewed from the same side as FIG. 5 but on a larger scale, and having a swingable counterweight and log or heavy lumber holding forks and clamps.

FIG. 8 is an opposite side view, on a somewhat reduced scale of the loader of FIG. 7 showing the load carrier thrust or reached forwardly and with a compensating movement of the swingable counterweight.

FIG. 9 is a still further reduced view of the loader of FIGS. 7 and 8 with the load carrier elevated.

FIG. 10 is a fragmentary detail rear elevational view of the swinging counterweight of the loader of FIGS. 7–9.

FIG. 11 is a fragmentary perspective view of the forepart of the boom arms and associated components of loaders of the general types earlier shown herein but showing a tower-type of load carrier applied thereto for achieving greater elevation of the load wherever this may be desired.

FIG. 12 is a fragmentary perspective of the forked tilting link usable with the tower-type of load carrier or other load cariers wherever desired.

Referring now more particularly and by reference characters to the drawing, I have illustrated my improved loader as mounted upon a self-propelled frame A having spaced apart large traction wheels B at the front and rearwardly located, smaller dirigible wheels C. An engine is mounted on the frameA within the hood and housing D and an operator's station E is located alongside the mid-portion thereof, including a seat F and a steering wheel G for steering the wheels C. A source of fluid under pressure is provided within a housing H at the rear of the frame and conventionally includes a suitable pump powered by the said engine, a reservoir and related components. Since these are all well known in the art they are not shown and will not be described in detail herein. While this self-propelled vehicular support for the loader may be of any special construction and design, it may advantageously be built up from an ordinary industrial tractor, modified to increase its wheel base and so that its traction wheels B are at the front, but this too being rather common in the load industry the necessary changes in transmission, stearing and other components will not be detailed herein.

Suffice it to bring out that for my purpose the frame A, in addition to the chassis of the tractor itself, includes longitudinally extending sills or side bars **10—11** rigidly mounted and heavily braced to carry the weight and resist the twisting forces of the loader and its carried load. The mounting and bracing of these side bars **10—11**, as they will hereinafter be called, is carried cut in accordance with modern day fabrication methods for heavy machinery of this kind.

Also at the rear of the frame there is provided a counterweight designated generally at **12** and the weight of the housing H and its fluid tank, pump, etc., will add to the overall counterweight effect.

The load carrier **13** of my invention as shown in FIGS. 1–6 includes an upright back structure **14** from which transversely spaced forks **15** project forwardly, but as will be presently set forth this carrier may vary according to the work to be done and the maximum elevation of the work which is desired.

The load carrier **13** is carried on the forward ends of transversely spaced booms **16—17** preferably made up from heavy steel tubing and rigidly cross connected to operate as a unit by a plurality of cross tubes and trusses in accordance with usual good practice in machines of this kind. In line with present fabrication procedures these components are welded together but here, as in the case of other parts to be similarly secured to each other, the welds will not here be designated by reference numerals. The booms **16—17** are bent at a slight angle at **18** adjacent their rear ends so that, with the load carrier **13** lowered as in FIG. 1, the main forward portions of the booms will angle downwardly and forwardly within the traction wheels B clearing the axle therebetween, while the shorter rear portions of the booms will extend almost horizontally in the rearward direction. At their forward ends the booms **16—17** are pivoted by heavy pivots **19** to suitable lugs **20** secured to and rearwardly extending from the lower edge of the back structure **14** of the load carrier **13**. In most instances the rear ends of the booms would then be pivoted about some fixed axis on the tractor or vehicular frame A but in accordance with my invention I pivot these ends of my booms **16—17** on a transverse axis at **21** to the upper ends of forwardly-rearwardly swingable boom supports or links **22—23** the lower ends of which are pivoted at **24** to heavy brackets **25** welded to and slung from the side bars **10—11** of the frame A, at points between the wheels B and C. These boom supports or carriers **22—23** are rigidly connected at their upper ends to operate as a unit and are positioned about said pivots **24** by translating or reach rams **26—27** the cylinders of which are pivoted at rear ends at **28** to brackets **29** on the rear corners of the frame A. The fluid reciprocated piston rods **30** of these rams **26—27** extend forwardly and are pivoted at their ends at **31** to lugs **32** secured on the said boom supports some distance above the lower ends thereof. Thus it will be understood that the admission of fluid to the rams **26—27** to project their piston rods **30** forwardly will swing the supports **22—23** forwardly, and vice-versa. The rear pivot **21** for the booms **16—17** may thus be held in one position or may be translated or moved forwardly and rearwardly to impart a reaching action to the booms with respect to frame A. The supports **22—23** are rigidly cross connected near their upper ends as by a cross tube **33** (FIG. 1) and additional stiffening of the links is provided by the trusses or ribs **33a**.

The booms **16—17** are swung upwardly and downwardly at their forward ends by elongated lift rams **35—36** located forwardly of the boom supports **22—23** and at their lower ends these rams **35—36** are pivoted on a common transverse axis at **37** to the brackets **25** or, as here shown, to the connected ends of links **38—39** which are pivoted in upwardly diverging relationship to brackets **40** on lower ends of the rams **35—36** and to brackets **41** on the frame sides **10—11**. These rams **35—36** have elongated piston rods **42** extending upwardly beneath the booms and pivoted at **43** thereto between heavy gussets or webs **44** welded to the undersides of the booms below the bends **18** therein. Upward projection of the piston rods **42** by proper admission of fluid under pressure to the rams **35—36** will thus swing the booms upward about the pivot **21** and vice-versa. Stiffening at the load points represented where the lift forces are applied is provided by tensioned struts or reinforcing trusses **45** secured to the upper sides of the booms **16—17** as clearly shown. Actually the forwardmost links **39** have upwardly-rearwardly angled lugs **39a** which are pivoted at **39b** to the rear links **38** for proper action.

The load carrier **13** is tilted forwardly or rearwardly about its pivot connections **19** to the booms **16—17** by fluid actuated tilting or leveling linkage next to be described. Lugs **46** are welded to and project rearwardly from the aforesaid back structure **14** of the load carrier and pivoted on transverse axes by pins **47** to these lugs are front links **48—49** (FIG. 4) extending rearwardly above the forward portions of the booms. The rear ends of these links **48—49** converge at **50** (also FIG. 4) and are secured to a cross head **51** at the ends of which are rollers **52** running in parallel guides or tracks **53** rigidly secured to and carried between forward end portions of the booms **16—17** by front and rear cross tubes or members **54—55**.

A heavy tubular rocker rock shaft **56** is carried between upper ends of the supports **22—23** coaxially with the pivot **21** and upon the pin or tube joining the supports to form said pivot. Centrally of this rocker **56** a bifurcated lever **57** is rigidly affixed and secured against lateral displacement by a brace **58**. A rear actuating link **59** is pivoted at its rear end at **60** to the upper end of the lever **57**, extends forwardly therefrom to the aforesaid crosshead **51** with a pivot connection **61** (FIG. 4) between the link and the crosshead. It will be noted that the distances between and relative angles of the front pivot axes **19—47** and rear pivot axes **21—60** is substantially the same, constituting a parallel motion linkage to retain the load carrier **13** at the proper angle with respect to the booms **16—17** as they move upwardly and downwardly. Power tilting of the load carrier **13** is, however, provided by a tilting ram **62** pivoted at its lower end at **63** to one of said frame sides (here shown as the side **10**). Said ram **62** has an upwardly and normally rearwardly angling extensible plunger **64** the upper end of which is bifurcated and pivoted at **65** to a heavy (and suitably angularly braced to the rocker **56**) actuator or rocker plate **66** the rear corner of which is rigidly secured or welded to the rocker **56** near one end thereof. In the position shown in FIG. 1 the tilting ram **62** is obscured by ram **35** and while here only a single tilting ram is shown, two may, of course, be used if so desired.

In operation the load carrier **13** may be moved downward to bring the forks **15** to ground level as shown in FIG. 1 and with the carrier very near the front traction wheels B, in which position the forks may be thrust beneath a palleted pile of lumber, blocks or other material (not shown) merely by moving the entire machine ahead as a unit. Or without travel movement of the machine and merely by the proper admission of fluid under pressure to the translating or reach rams **26—27** the supports **22—23** and lift rams **35—36** may be swung forwardly at their upper ends, with something approximating a parallel linkage motion, thrusting the booms **16—17** and the associated load carrier forwardly and moving the forks **15** beneath the load to be raised. The footing or characteristics of the surface on which the machine must travel, and surrounding stacks of material which may limit room for maneuvering, may determine which action to take in order to bring the load carrier into proper lifting association with the load. In any event, as the load is engaged it may then be raised to a transport position clear of the ground by admitting fluid to the lifting

rams 35—36 to swing the booms 16—17 upward at forward ends about their rear end pviot 21 to elevate the load carrier 13 and the load, whatever it may be so that the machine may be moved about as necessary for example to transport material from a storage space to the building under construction, assuming the loader to be used for this purpose. Note FIG. 2 in which the load has been raised to an elevation above the ground sufficient to clear the view of the operator, although this much lift may not be necessary for transport in many instances. In FIG. 2 also the rams 26—27 have been extended to reach the booms 16—17 forwardly with respect to their positions of FIG. 1. By comparison in FIG. 3 this reaching action has gone even further, the booms 16—17 moving far forward and the supports 22—23 and the upright rams all swung forwardly at their upper ends. In this position the load carrier 13 may even be thrust forwardly over an intervening pile of material, then lowered and raised again with a load of material taken from the ground (or from pallets thereon) from a position far forward of the vehicular frame or tractor, as will be apparent, and reversing this operation will enable the machine to pile and distribute material over a storage area with a maximum of ease and convenience.

When it is desired to lift the load for deposit, say on an upper floor I of a building J under construction (FIG. 5) or to an overhead rack or the like, then the lifting rams 35—36 are further extended to swing the booms 16—17 even higher about their rear end pivot axis 21 and as will be readily observed a quite high elevation may be obtained in this manner. This elevation of the load may and preferably will be accomplished with the reach rams 26—27 at least partly retracted so that the load when high off the ground and particularly with the supporting vehicle in motion will have its weight as close as possible over the zone of support represented by the traction wheels B. The counterweight 12 will then have maximum effect in counter-balancing the load forces in an upright plane lying in the direction of travel. But as the machine approaches the side of the building J the load may be thrust forward with a reaching action by extending the rams 26—27 and swinging the supports 22—23 (and the upright rams of course) in a forward direction so that even with the machine well clear of the building side the load L (FIG. 5) may be thrust forwardly over the floor I for deposit thereon in the desired position and in a safe position at which it will not fall off the floor and back to ground. This reaching action is of particular benefit in such work since the wheels B—C may rest on the good footing clear of any fill or other soft material which so often is present on the ground immediately adjacent the building.

In all positions of the load the carrier 13 may be tilted back to retain the load in place or tilted forward to dump the load by proper supply of fluid to the ram 62 to extend or retract the plunger 64 thereof and thus oscillate the plate 66 and lever arm 60, and move the links 48, 49 and 59 forwardly or rearwardly as the case may be. Also the linkage is so arranged that a self-leveling effect on the carrier 13 to hold it at an adjusted angle as it is raised or lowered will be present for the usual purpose. It will be noted that the tilting linkage for the load carrier projects but very little either above or below the booms 16—17 and in no position of the load does this linkage approach a condition at which jackknifing might occur and lock the load assembly against adjustment by the various rams. Inasmuch as the arrangement of the hydraulic lines leading to the various rams is not material the various lines and conduits are denoted collectively at 67 throughout the several views.

For the protection of the operator an overhead shield 68 is provided over the operator's station E, said shield having heavy mesh screen to ward off any falling materials.

As stated hereinbefore the load carrier employed with my loader may take various forms, according to the kind of material to be handled or the work to be done. The forked carrier 13 shown in FIGS. 1–5 will find many applications and may as seen in FIGS. 5 and 6 be provided with adjustable stops 69 on the forks to carry banded stacks (not shown) of bricks, blocks and the like in which case the back 14 of the carrier is preferably enlarged by bolted on extensions and a heavy screen 70 is provided to prevent injury by any parts or particles which may fall as the carrier is tilted and moved from place to place. As shown in FIG. 6 four forks 15 are used but fewer or more of the same may be readily applied as required. Slip-on hoppers (not shown) may be associated with the forks for handling such materials as wet concrete while a sling or crane (also not shown) may replace the carrier if long materials such as angle irons, heavy timbers, etc., are to be handled.

A loader of the same general kind as that heretofore described is shown in FIGS. 7–10, being particularly useful for very heavy work, shown as fitted with a load carrier suited for gripping and handling logs and heavy timbers and characterized in that it embodies a swingable counterweight the position of which varies with the elevation and position of the load, all as will be presently described. The basic vehicular structure or tractor A is essentially identical to that heretofore described, including the large traction wheels B and relatively smaller and rearwardly disposed steerable wheels C, and the chassis is fitted with the additional and suitable side sills or side bars, again designated at 10 and 11. Here also the operator's station E is located alongside the hood D over the engine and includes a seat F and steering wheel G. In this particular loader the booms 16 and 17 are substantially identical to those shown in the earlier described loader and they are pivoted at their rear ends at 21 to the upper ends of supports or links 22—23, the lower ends of which are pivoted at 24 to brackets 25 slung from the aforesaid side bars 10—11. Here also the lift rams 35—36 are located forwardly of the aforesaid supports 22—23 and are pivoted at lower ends at 37 to the vehicular frame or tractor, but in this instance directly to the aforesaid brackets 25 without the use of the link structure 38—39 previously set forth. The upwardly extending plungers 42 of the lifting rams 35—36 are pivoted at 43 to gussets or brackets 44 welded to the booms 16—17 adjacent the points 18 at which these booms are bent as aforesaid and in this case also the booms are stiffened by the truss bars 45.

In this particular loader the crosshead guided tilting linkage is not employed and instead the forwardmost link or links 48 are pivoted at 49 to the back structure 71 of a slightly different form of load carrier designated generally at 72, with this back structure again provided with heavy lower brackets 20 by which pivot connections 19 are made to the forward ends of the booms 16—17. Links 48 extend rearwardly above the plane of the forward end portions of the booms 16—17 and at rear ends are pivoted at 73 to side levers 74, the lower ends of which are pivoted at 75 to the adjacent booms. The pivots 73 also attach the forward ends of rear links 76, of which three are either one or two and which correspond to the rear link 59 heretofore described. At the rear ends the links 76 are pivoted at 77 to the upper forward corners of bell crank plates 78 having lower forward corner extensions 79 pivoted about the axis 21 in somewhat the manner previously set forth for the lever arm 57, with the lower rear corners of the bell crank plates 78 then pivoted at 80 to the upper ends of plungers 81 of a pair of tilting rams 82, one of which is located at each side of the machine. The tilting rams 82 thus parallel the links 22—23 but are located rearwardly thereof and the rams have lower end stirrup extensions 83 pivoted at 84 to the side bars 10—11 or to suitable brackets affixed thereto, thus anchoring these tilting rams to the frame structure of the supporting vehicle or tractor. Obviously then the

extension of the plungers 81 of the rams 82 in synchronism will rock the bell crank plates 78 about the pivot axis 21 and project the links 75—48 in a forward direction to forwardly tilt the load carrier 72 about the pivots 19, and vice-versa, but the relationship between the pivot axis 21 and pivot 80 at the upper ends of this support and tilting assembly and between the pivots 24 and 84 is such that a parallel motion effect will be brought about to maintain the load carrier 72 in a level position or in any other position to which it may be adjusted about the pivots 19 as the load carrier is raised and lowered, by operation of the lift rams 35—36 in precisely the same manner as has heretofore been set forth.

As has been stated the load carrier 72 shown as associated with this particular embodiment of my loader is specifically designed for clamping and holding large numbers of logs and heavy timbers while they are raised and lowered or transported from place to place. For such purpose the load carrier 72 is again, like the aforesaid carrier 13, provided with a plurality of forwardly extending forks 85 which may be slipped beneath the material to be handled but in addition forwardly and downwardly curving clamp members 86 are fulcrumed at 87 adjacent the upper portion of the back 71 of this carrier for upward movements away from the forks 85 as the load is released for discharge, or for downward movements toward said forks to clamp the load of material into position. The members 86 have rearwardly extending ends 88 to which are attached the plungers 89 of rams 90 pivoted at 91 to the back 71 of the load carrier so that these members may be manipulated by the proper admission of fluid to these rams to project or retract the plungers as will be readily understood.

This particular form of my loader is also shown as provided with a very heavy rectangular counterweight 92 having upward extensions or hangers 93 by which it is pivoted at 94 to brackets 95 so that this weight will hang normally in the vertical position shown in FIG. 7 immediately to the rear of the housing H forming part of the vehicular assembly A. In such position the weight 92 hangs between lateral guide lugs 96 extending rearwardly from the side bars 10—11 to restrain the weight against lateral displacement such as might occur when the machine is operated over irregular ground surfaces. In addition the weight 92 is provided with upwardly converging arms 97, the upper extremities of which are pivoted at 98 to a link 99 normally angling downwardly and forwardly to points 100 of pivotal attachment to a cross tube, corresponding to the aforesaid tube 33, rigidly joining the supports or links 22—23. Thus the arrangement is such that immediately as the support assembly, which includes the elements 22—23, is moved forwardly to project the booms 16—17 with a reaching action in the forward direction (as seen in FIGS. 8 and 9), the resulting pull on the link 99 will rock the counterweight 92 about the aforesaid pivots 94 so that its lower end moves in an upward and rearward direction and its weight effectively moves rearwardly with respect to the wheels B and C. Thus in any elevated position of the load carrier the forward or reaching projection thereof will result in a shifting in the weight 92 so that it will best and most advantageously support and counterbalance the weight of the load being manipulated, assuring full traction and floatation of the weight carried by the wheels B and C.

In this particular form of the loader the aforesaid forward-rearward movements of the supports 22—23 is again accomplished by reach rams 26—27 as heretofore described, there being one of such rams at each side of the machine pivoted at 28 to brackets at the rear ends of the side bars 10—11 and with projectable plungers 30 pivoted at 31 to brackets 32 on the rear of the supports 22—23. In order, however, to obtain added leverage the rams 26—27 in the normal position of the parts shown in FIG. 7 are inclined in an upward and forward direction by contrast with the substantially horizontal position of these rams in the loader of FIGS. 1–5.

In FIGS. 11 and 12 I show a modification of the front end of my loader in which again appear the booms 16—17 but the load carrier designated generally at 101 is essentially that of my prior Patent No. 2,394,458, issued February 6, 1946, for Load Handling Mechanism. This load carrier is thus what may be referred to as a telescopic tower-type including a generally rectangular outer frame having upright side channels 102—103 rigidly cross connected and carried at their lower ends by brackets 104 and pivots 105 on the forward ends of the booms. An inner frame 106 is carried for upward and downward movements between said side channels 102—103 by a plurality of rollers 107 and a load carrier frame 108 is similarly carried for upward and downward movements between the sides of this inner frame 106, said carrier frame 108 having load engaging forks 109 or such other load engaging elements as may be desired. An elevator ram 110 is supported at the center of this frame assembly upon a lower cross member 111 and has an upwardly projectable plunger 112 operatively arranged to move the frames 106 and 109 upwardly to the extended positions shown and thus to elevate the load carried well above the forward ends of the booms 16—17 as will be understood, particularly by reading my earlier patent as to the details of the load carrier here used. It will be apparent that a very high elevation of the load will be possible by this arrangement.

The load carrier 101 is tilted and held in position by linkage similar to that shown in FIGS. 7–9, in this instance including but one side lever 74 and one rear link 76. In this case the forward link 113 is bifurcated at 114 to fit over and pivot at 73 on the upper end of the side lever and the link 113 itself includes long, forwardly diverging sides 113^a—113^b the forward ends of which meet and are pivoted at 115 to brackets 116 secured to the sides 102—103 of the frame 101 well above the pivots 105 to properly support and tilt the load carrier. This diverging configuration of the forward tilting link provides adequate lateral support and minimum interference with the view of the operator, something to be particularly desired where the load is so high off the ground.

It is to be noted that the reach rams of my loader, in all modifications thereof, have an effect also in obtaining the maximum possible elevation of the load. For example in FIG. 9 it will be clear that when the load is fully raised the reach rams 26—27 are extended to fulcrum the booms 16—17 about their pivot connections 43 to the lift rams 35—36 to effect a still further raising of the forward ends of the booms. Note that in FIG. 8 the support 22 and lift ram 35 are substantially parallel while in FIG. 9 these parts have assumed an upwardly converging relationship. This action makes possible the greatest elevation for a loader having booms, rams, etc., of a certain length as will be understood. Since this action of the rams 26—27 is brought into play only when the booms approach their greatest heights, the leverage is most favorable for achieving this desirable result.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claim. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

In a loader of the character described, a vehicular frame having relatively large front traction wheels and smaller rear ground wheels, a pair of elongated booms extending longitudinally over the frame and having a load carrier mounted at the front ends thereof in the area of the traction wheels, means for raising and lowering the booms about their rear ends for raising and lowering the carrier, said means comprising an upright boom support and an upright lifting ram having their lower

ends pivoted to the frame intermediate the front and rear ground wheels and their upper ends pivoted to the booms, said lifting ram being forward of the boom support, an extensible reach ram located to the rear of the boom support and connecting the boom support to a rear portion of the frame, said boom support and lifting ram being substantially parallel and angling upwardly and rearwardly when the carrier is in lowered position whereby as the booms are raised by the lifting jack and further raised by the reaching rams the boom support will swing over center retaining the load carrier over the zone of traction of the front wheels, a counterweight pivoted to the rear end of the frame, said counterweight having an arm extending above its pivot, and a link connecting the boom support to the upper end of the arm whereby as the boom support swings forwardly during raising of the carrier the counterweight will be moved rearwardly about its pivot.

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