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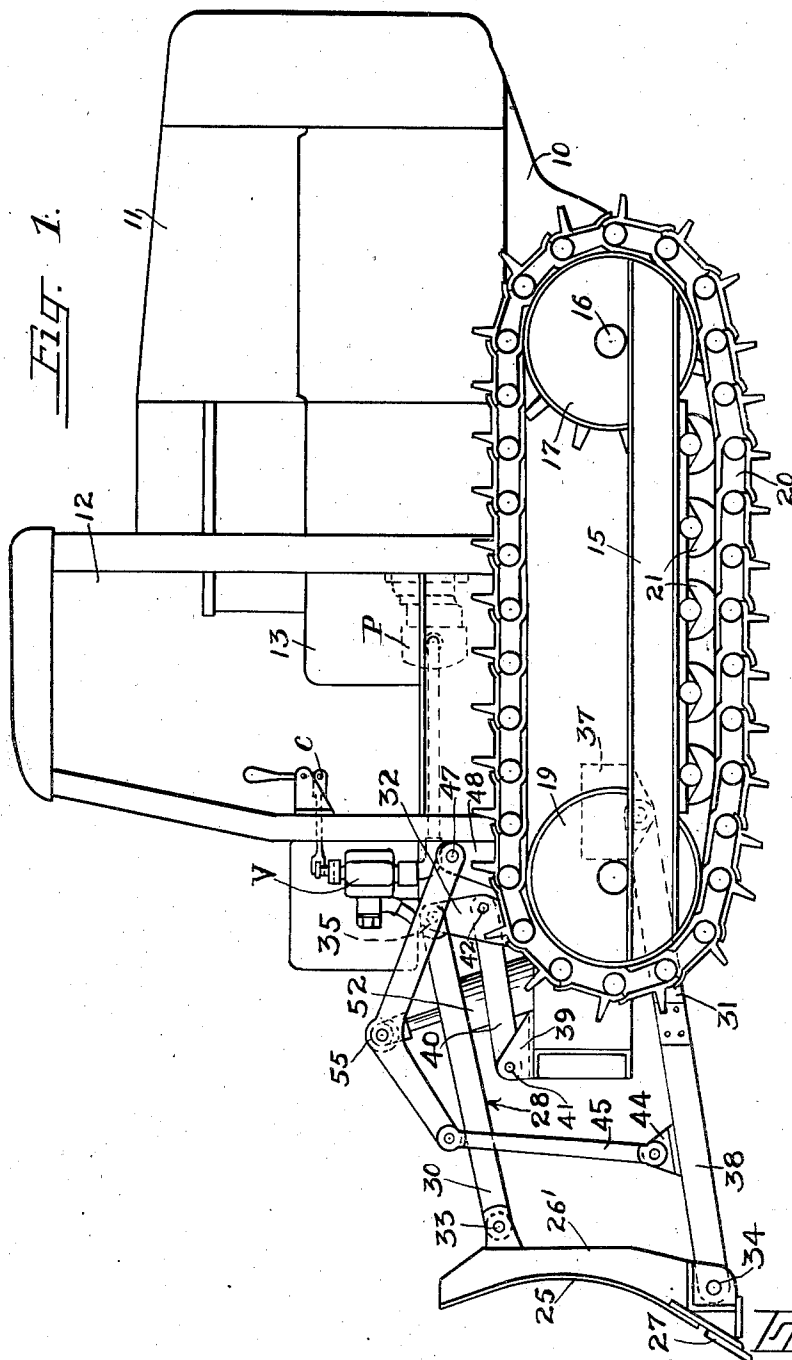
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2,404,760

BULLDOZER OR SCRAPER STRUCTURE

Filed Feb. 22, 1944

4 Sheets-Sheet 1



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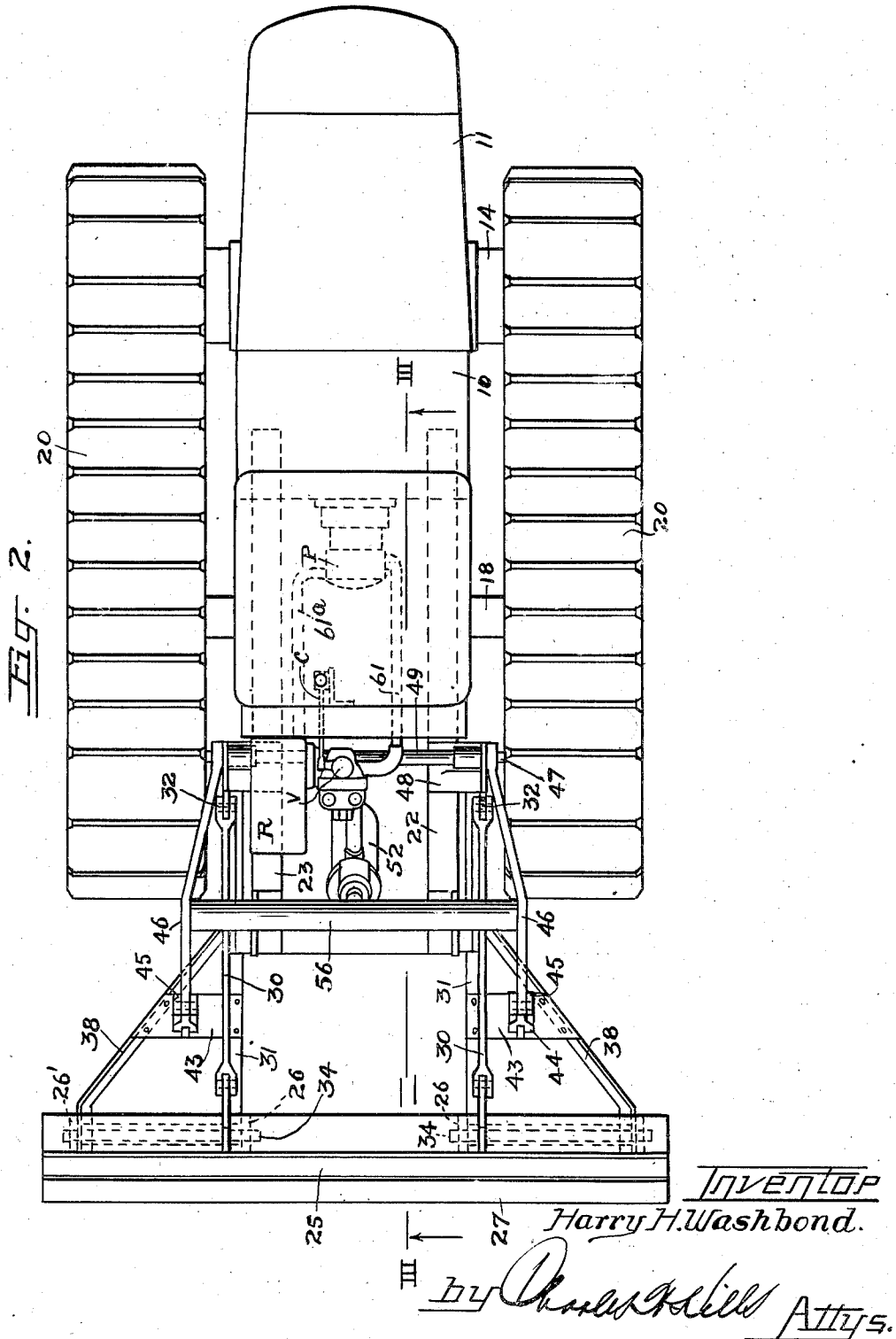
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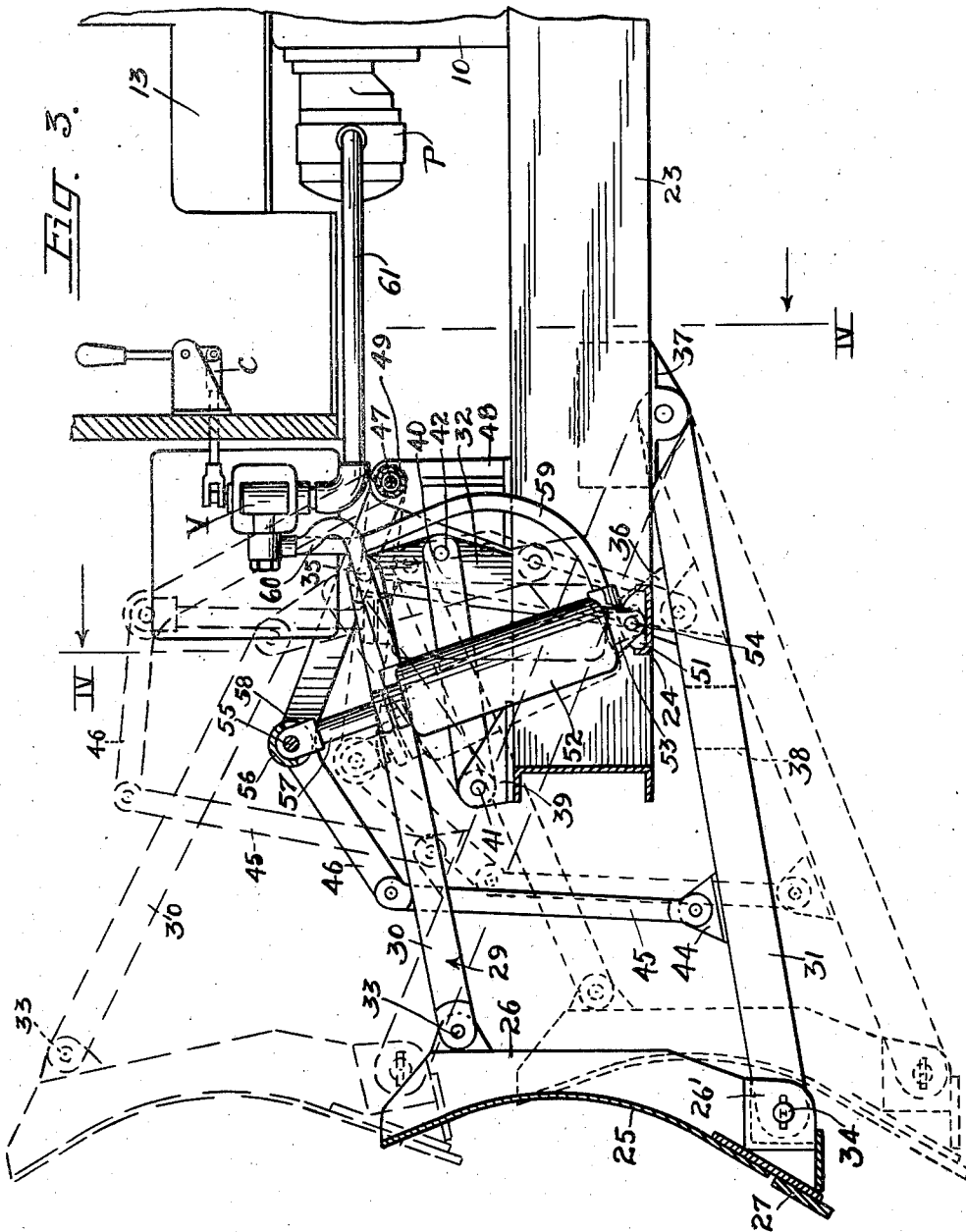
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BULLDOZER OR SCRAPER STRUCTURE

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4 Sheets-Sheet 3



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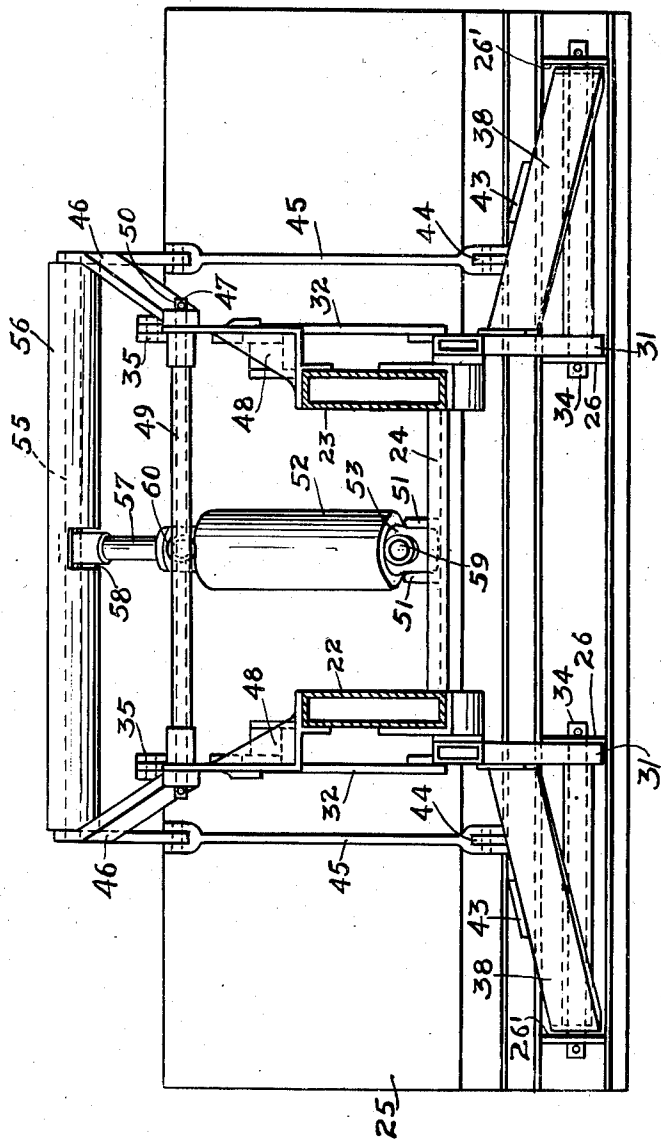
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4 Sheets-Sheet 4

Fig. 4.



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UNITED STATES PATENT OFFICE

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BULLDOZER OR SCRAPER STRUCTURE

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This invention relates to a bulldozer or scraper structure adapted for attachment to and control from a power vehicle, such as a tractor.

An important object of the invention is to produce an efficient bulldozer or scraper whose operating parts are supported on the front end of a power vehicle in front of the driver's cab so that the driver may readily observe the operation.

Another object is to provide an arrangement in which the support for the blade element of the bulldozer or scraper embodies a pair of linkage quadrilaterals of which the blade element constitutes the front link.

A further object is to provide an arrangement in which hydraulic power means mounted on the vehicle is connected to apply power to the lower links of the quadrilateral linkages for operation of said blade element into various operating positions in a substantially vertical direction.

A further object is to provide an arrangement in which the lower links of the linkages constitutes push bars hinged to the vehicle and to the lower portion of the blade element, and with a single hydraulic cylinder-piston structure mounted on the vehicle having leverage connection with the lower links for exertion of power on these links in substantially vertical direction.

Another object is to provide an arrangement in which brace bars are extended from the push links to the outer ends of the blade element, and the leverage operated by the hydraulic means is connected with the push links and the brace bars so that the power for vertically setting the blade element is applied closer to the outer ends of the blade element.

Other and further objects of the invention will become apparent to those skilled in the art from the following detailed description on the annexed sheets of drawings which disclose preferred embodiments of the invention.

On the drawings:

Figure 1 is a side elevation of a power vehicle with the bulldozer or scraper structure thereon;

Figure 2 is a plan view;

Figure 3 is an enlarged section on plane III—III Figure 2; and

Figure 4 is a section on plane IV—IV Figure 3.

The power vehicle to which I have shown my improved bulldozer or scraper assembly applied is a tractor of the type in which the driving engine is in the rear of the vehicle body and the driver's cab is in the front. Briefly describing the tractor, it comprises a frame or body 10 at the rear of which is mounted the engine frame 11 and at the front of which is located the driver's cab

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12 having a seat 13 therein. A rear axle housing 14 supports the track frames 15, and transmission means (not shown) within the axle housing is driven by the engine for drive of the shaft structure 16 which carries the driving sprockets 17. Forwardly of the rear axle housing is a cross-support 18 which extends from the vehicle body to the track frames 15, and on the forward ends of the track frames are mounted the idler wheels 19, endless tracks 20 engaging the sprocket wheels and idler wheels on opposite sides of the vehicle. Track rollers 21 on the track frame engage with the lower runs of the tracks.

Secured to and extending forwardly from the vehicle body 10 at opposite sides thereof are the beams 22 and 23 which near their front ends are spanned by a cross-beam 24 secured against the under sides thereof. This beam structure serves as a support for the bulldozer or scraper assembly.

The blade element of the bulldozer comprises the transversely curved blade 25 reinforced on its middle portion by ribs 26 secured to its rear side, a knife edge structure 27 forming the lower portion of the blade. The blade element constitutes a front link of two linkage quadrilaterals 28 and 29. These linkage quadrilaterals are alike and each comprises an upper link 30, a lower link 31 and an inner link 32, the blade element 25 forming a common outer link for the two linkages. At their front ends the upper and lower links 30 and 31 are hinged to the blade element 25 by pins 33 and 34, respectively. At their rear ends the upper links 30 are pivoted to the upper ends of the inner links 32 by pins 35, and at their lower ends the inner links 32 are pivoted to brackets 36 secured on the lower links 31. The lower links extend rearwardly beyond their connections with the inner links to be fulcrumed on brackets 37 secured to the beams 22 and 23. Brace bars 38 extend between the lower links 31 and the ends of the blade element 25 to stiffen the blade element and form additional support therefor. As shown on Figures 2 and 4, the hinge pins 34, which extend through the inner ribs 26 of the blade 25 are extended laterally outwardly through outer ribs 26' to receive the front ends of the brace bars 38 to hinge connect them with the blade element.

On the forward ends of the beam 22, 23 brackets 39 are secured, links 40 being pivoted at their front ends to the brackets as indicated at 41 and at their rear ends being pivoted to the corresponding inner links 32 as indicated at 42. These links 40 hold the links of the linkage quadrilat-

erals in relative position for the desired tilt or rake of the blade element from the perpendicular.

As best shown on Figure 2, plates 43 span and are secured to the brace bars 38 and the lower links 31 and on these plates brackets 44 are mounted. Bars 45 are pivoted at their lower ends to the brackets 44 and at their upper ends are pivoted to L-shaped levers 46 which extend rearwardly and receive at their rear ends a fulcrum rod 47 extending between and journaled in the upper ends of brackets 48 mounted on the beams 22 and 23. A spacer tube 49 receives the rod 47 and extends between the brackets, as clearly shown on Figure 4. Pins 50 extend through the outer ends of the rod 47 adjacent to the outer sides of the brackets to hold the rod in place.

The beam 24 has upstanding ears 51. A cylinder 52 has the lug 53 extending down between the ears 51 to be hinged thereto by a pin 54. The levers 46 are connected at their bends by a rod 55, a spacer tube 56 receiving the rod and extending between the levers 46. The piston rod 57 extending from the piston (not shown) in the cylinder projects at its outer end into the opening 58 in the spacer tube 56 to receive and to be fulcrumed to the rod 55.

Hydraulic fluid conductors 59 and 60 extend from the lower and upper ends of the cylinder to a valve structure V for which a suitable control C is provided for operation by the driver in the cab. From a pump P fluid is delivered under hydraulic pressure through a conductor 61 to the valve structure for flow to either end of the cylinder by the setting of the valve V by the control C. A reservoir R supplies the fluid to the pump P through conductor 61a (Fig. 2).

When the vehicle is driven forwardly for operation of the scraper structure, the lower links 31 will function as push beams for engagement of the scraper blade with the terrain which is to be operated upon. The upper and inner links 30 and 32 and the intermediate links 40 will then function to hold the upper portion of the blade element to maintain the proper tilt or rake thereof from the perpendicular.

On Figure 3 the full lines show the scraper structure in an intermediate position. If it is desired to lower the scraper structure, the valve V is set by the control C for flow of hydraulic fluid through the conductor 60 into the upper end of the cylinder for inward movement of the piston, and this movement of the piston is transmitted through the rod 55 to the levers 46 whose downward swing is transmitted through the bars 45 to the push links 31 for downward movement of the scraper structure, the short dot lines on Figure 3 showing the down position of the scraper structure. If it is desired to raise the scraper structure, the valve is set for flow of hydraulic fluid through the conductor 59 to the lower end of the cylinder for upward swing of the levers 46 and upswing of the push links 31, the long dot lines on Figure 3 showing the upper portion of the scraper structure. With the blade element supported and guided by the linkage quadrilaterals, the blade element will substantially retain the same tilt or rake through its scraping range above and below the tractor ground line and will tilt forwardly above the scraping range to more freely discharge dirt. Thus while the blade will move substantially in a vertical line when swung to its various scraping positions, it is preferably tilted above the scraping range. For example the blade rake controlling links 30, 32 and 40 are preferably arranged so that they will hold the blade vertical

through a scraping range from about 12 inches below tractor ground line to about 12 inches above ground line and then tilt the blade forwardly about 15° as it rises above the scraping range. With the hydraulic power transmitting connection shown, the bars 45 will, during swing of the scraper structure into various positions, transmit the hydraulic power substantially in vertical direction to the push links of the linkage quadrilaterals, thus utilizing to a maximum extent the hydraulic power from the hydraulic ram or cylinder-piston structure.

Some of the push power applied by the vehicle to the push links will be applied to the ends of the blade element through the brace bars 38, and with the brackets 44 mounted on the cross plates 43, the hydraulic power transmitted through the bars 45 to the brackets will be borne conjointly by the push links and the brace bars. The push force against the blade element by the vehicle and the hydraulic force for vertical setting of the blade element is thus distributed along the blade element by the connections therewith of the push links and the brace bars.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A bulldozer structure for application at the front of a power vehicle, comprising a blade element, push bars at opposite sides of the vehicle body hinged thereto and extending forwardly therefrom and connected with said blade element, brace bars extending diagonally outwardly from said push bars and connected at their outer ends with said blade element, a support spanning each push bar and its brace bar and secured thereto, brackets on said supports, a lever structure fulcrumed at its inner end on the vehicle body, power transmission bars between the outer end of said lever structure and said brackets, a hydraulic power device on the vehicle body connected with said lever structure at an intermediate point thereof for swinging said lever structure vertically for transmission of the hydraulic power through said transmission bars and brackets to said push bar structures for vertical swing thereof for operation setting of the blade element.

2. In combination with a power vehicle comprising a body and propulsion means therefor, a bulldozer structure located in front of the vehicle body and comprising a blade element, push bars at opposite sides of the vehicle hinged at their rear ends thereto and extending forwardly therefrom for hinge connection with the lower portion of said blade element, a linkage assembly connecting the upper portion of said blade element with said push bars, guide links between said linkage assembly and the vehicle body for co-operation to determine the rake of the blade element when moved vertically with said push bars, a lever structure fulcrumed at its inner end on the vehicle body, transmission bars depending from the forward end of said lever structure to said push bars, and a hydraulic power device mounted on the vehicle body and connected with said lever structure at an intermediate point thereof whereby, upon swing of said lever structure by said hydraulic device, hydraulic power will be transmitted through said transmission bars to said

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push bars for swing of said bars and operation setting of said blade element.

3. In combination with a tractor comprising a body and propulsion means, therefor, a bulldozer attachment for the front of the tractor comprising a blade element, a support for said blade embodying a pair of linkage quadrilaterals of which said blade element constitutes the outer link, the lower links of said linkage quadrilaterals being hinged at their rear ends to the tractor body to constitute push bars for the blade element, guide links between said linkage quadrilaterals and the tractor body for co-operating with the linkage quadrilaterals to determine the rake of the blade element during vertical movement thereof, a lever structure fulcrumed at its inner end on the tractor body, transmission bars depending from the forward end of said lever structure to said linkage quadrilaterals, and a hydraulic power device mounted on the tractor body and connected with said lever structure at an intermediate point thereof whereby, upon swing of said lever structure by said hydraulic device, said push bars will be swung for operation setting of said blade element under control of said linkage quadrilaterals and guide links.

4. In combination with a tractor having supporting beams extending forwardly from its body and intermediate the tractor wheels, a bulldozer structure comprising a blade element, push bars pivoted at their inner ends on said supporting beams and connected at their outer ends with the blade element, brackets on said supporting beams, arms pivoted to and extending forwardly from said brackets and links extending down from the forward ends of the arms and connected with said push bars, a rigid cross connection between said arms intermediate their ends, a supporting plate mounted on and extending between said supporting beams, and a hydraulic power device extending between said supporting plate and said cross connection for effecting vertical swing of said arms and thereby vertical swing of said push bars and with the blade element thereon.

5. A bulldozer structure for application at the front of a power vehicle, comprising a blade element, push bars at opposite sides of the vehicle body hinged thereto and extending forwardly therefrom and connected with said blade element, brace bars extending diagonally outwardly from said push bars, a plate spanning each push bar and its brace bar and rigidly secured thereto, a hydraulic ram carried by the vehicle, a frame fulcrumed at its inner end on the vehicle body and having a cross bar intermediate its ends acted on by said ram for vertical swing of said frame, and links extending downwardly from the outer end of said frame and pivoted at their lower ends respectively to said plates for transmitting the swing of said frame to said push bars.

6. In combination a tractor, push beams pivoted on the tractor extending forwardly therefrom, an implement blade extending across the front end of the tractor having its lower portion pivoted on the push beams, first links pivotally connected to the upper portion of the blade and extending rearwardly therefrom toward the tractor, second links pivoted to the rear ends of the first links and to the push beams, first arms pivoted on the push beams and extending upwardly therefrom, second arms pivoted on the first arms and extending rearwardly therefrom, pivots connecting the rear ends of the second arms to the tractor, a hydraulic jack interposed between the tractor and the second arms for raising and low-

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ering the push beams and blade relative to the tractor, and means connecting the second links and tractor to hold the blade in the same vertical plane as it is raised and lowered throughout its tilting range and to tilt the upper end of the blade forwardly as the blade is raised above its tilting range.

7. In combination, a tractor having an operator's cab at the front end thereof and an engine behind the cab, an implement blade extending across the front of the tractor in closely spaced relation to said operator's cab, push beams on each side of the tractor pivotally connected at their rear ends to the tractor and at their front ends to the lower end of the implement blade, upper push links on opposite sides of the tractor pivoted at their front ends to the upper end of the blade, fulcrums for said upper push links, means responsive to raising and lowering of the blade for shifting said fulcrums relative to the push beams to control rake of the blade, levers on opposite sides of the tractor pivoted at their rear ends to the front end of the tractor and projecting forwardly therefrom, a rigid power transmission link pivoted on the front end of each lever and depending therefrom, means pivotally connecting the lower ends of the power transmission links with the push beams, double acting hydraulic jack means pivoted on the front end of the tractor and connected to the levers intermediate the ends of the levers for positively raising and lowering the blade relative to the tractor, and means in the cab of the tractor for operating said jack means whereby an operator in said cab will have full vision of material engaged by the implement blade during scraping operation and can more efficiently control the position of the blade.

8. In combination, a tractor having an operator's cab at the front end thereof, an implement blade extending across the front end of the tractor closely adjacent said operator's cab, push beams pivoted on the front end of the tractor in spaced relation adjacent the sides of the tractor and extending forwardly therefrom for a relatively short distance, pivots connecting the forward ends of the push beams with the lower end of the implement blade, relatively short push links overlying the push beams pivotally connected to the upper portion of the blade to co-operate with the push beams for holding the blade in upright position, fulcrums for said push links, means responsive to raising and lowering of the blade for shifting said fulcrums relative to the push beams to control rake of the blade, lift levers fulcrumed on the front end of the tractor and extending forwardly therefrom, rigid power transmission links pivoted on the front ends of said levers and pivotally connected to the push beams, double acting hydraulic jack means pivoted on the front end of the tractor and connected with said lift levers intermediate the ends thereof in spaced relation from the lever fulcrums and power transmission links to swing the levers for raising and lowering the blade relative to the tractor, and a valve in said operator's cab controlling fluid flow to said hydraulic jack means whereby the operator can readily view the working of the blade and easily control action of the blade to obtain efficient operation.

9. In combination with a propulsion vehicle, an implement blade extending across the front of the vehicle, a lower push link pivotally connecting the vehicle and lower portion of the blade, a guide link pivoted on the vehicle, an

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upper linkage connected to said guide link, said lower push link, and the upper portion of the blade, a lift lever fulcrumed on the vehicle, a hydraulic jack pivoted on the vehicle and pivotally connected to the lift lever for swinging the lever about its fulcrum, and a power transmission link pivoted on the lever in spaced relation from the fulcrum and jack pivot for raising and lowering the blade in response to swinging movements of the lever, said pivotal mounting for the jacks effecting straight-line application of force to the lever in all positions of the lever throughout its arc of travel, and said guide link controlling said upper linkage for regulating the rake of the blade.

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10. In combination with a propulsion vehicle, an implement blade extending across the front of the vehicle, a lower push link pivotally connecting the vehicle and lower portion of the blade, an upper push link pivotally connected to the blade, a fulcrum for said link, means responsive to raising and lowering of the blade for shifting said fulcrum relative to the lower push link to control the rake of the blade, a lift lever fulcrumed on the vehicle, means on the vehicle for swinging said lever about its fulcrum, and means between the lever and blade for translating swinging movements of the lever into raising and lowering movements of the blade.

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