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2,624,132

BULLDOZER ATTACHMENT FOR TRACTORS

Filed June 23, 1948

4 Sheets-Sheet 1

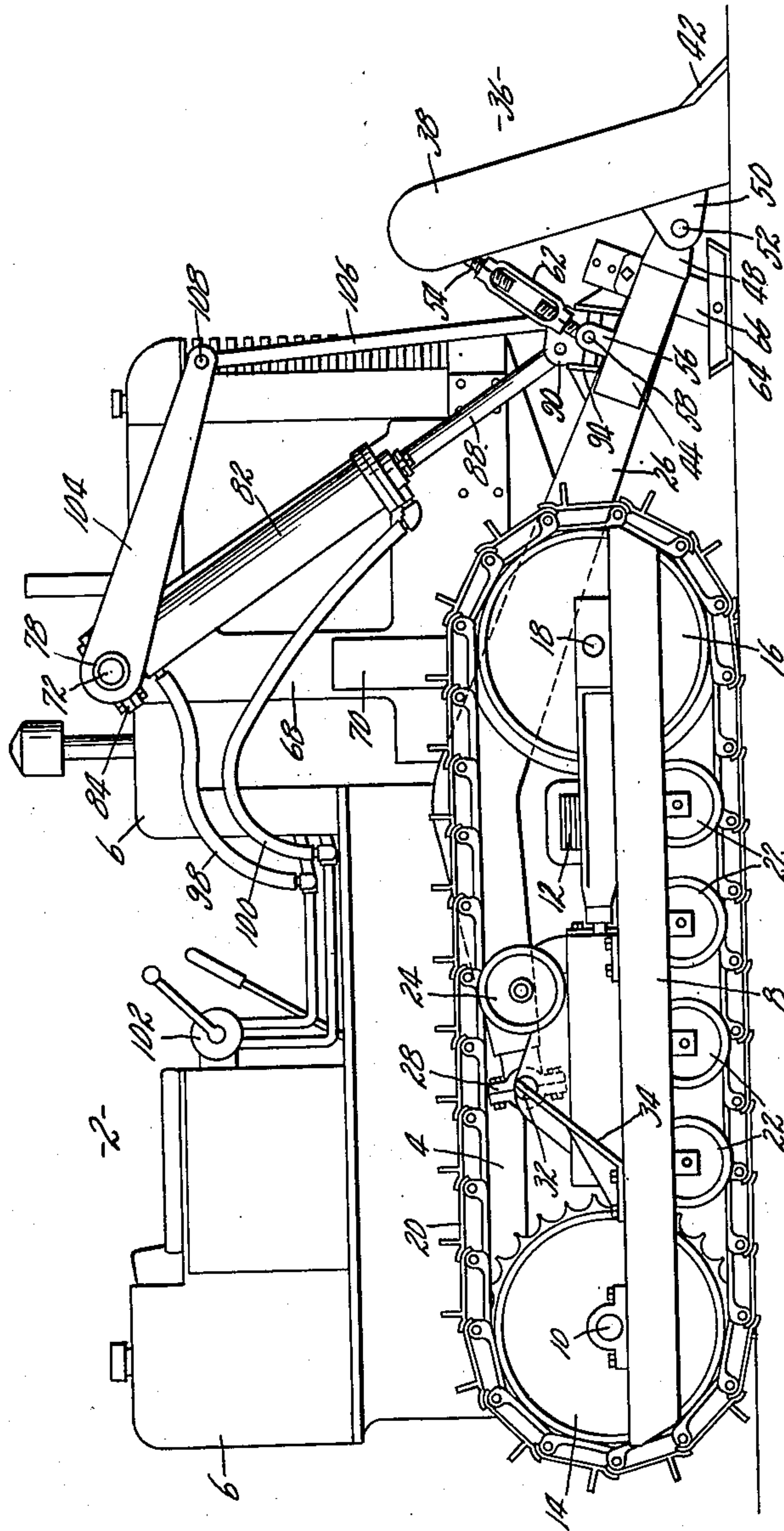


Fig. 1

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4 Sheets-Sheet 2

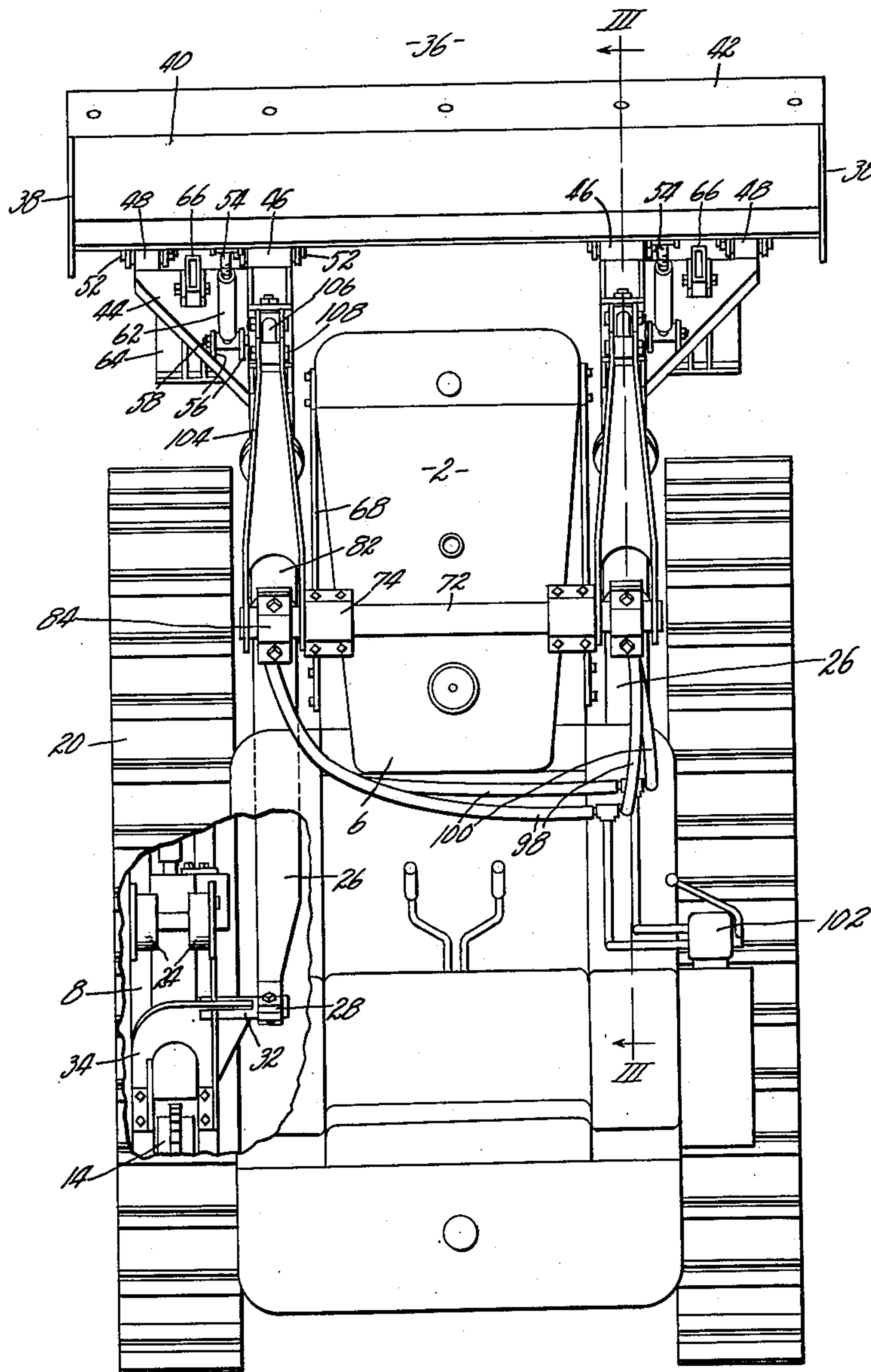


Fig. 2

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4 Sheets-Sheet 3

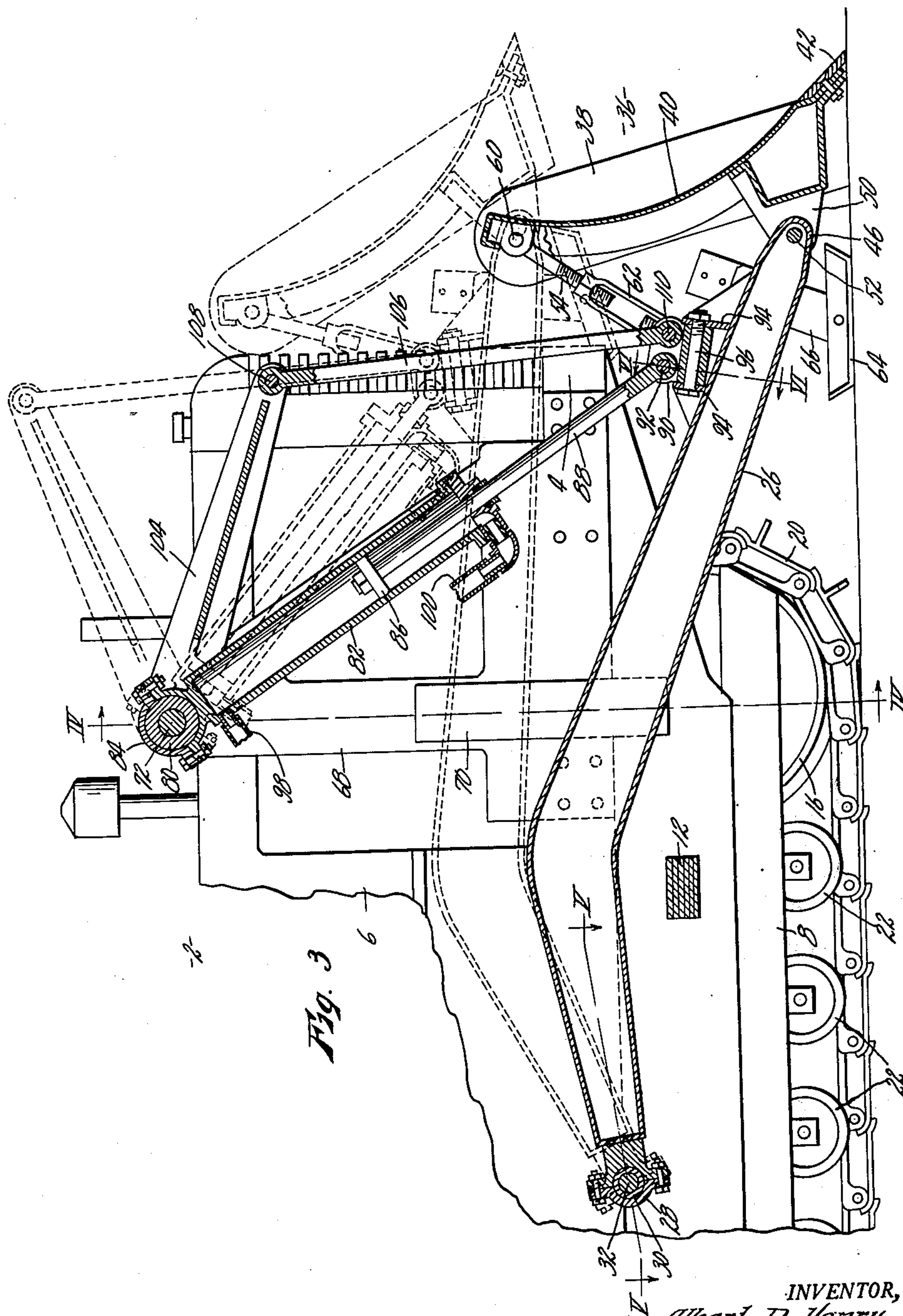


Fig. 3

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4 Sheets-Sheet 4

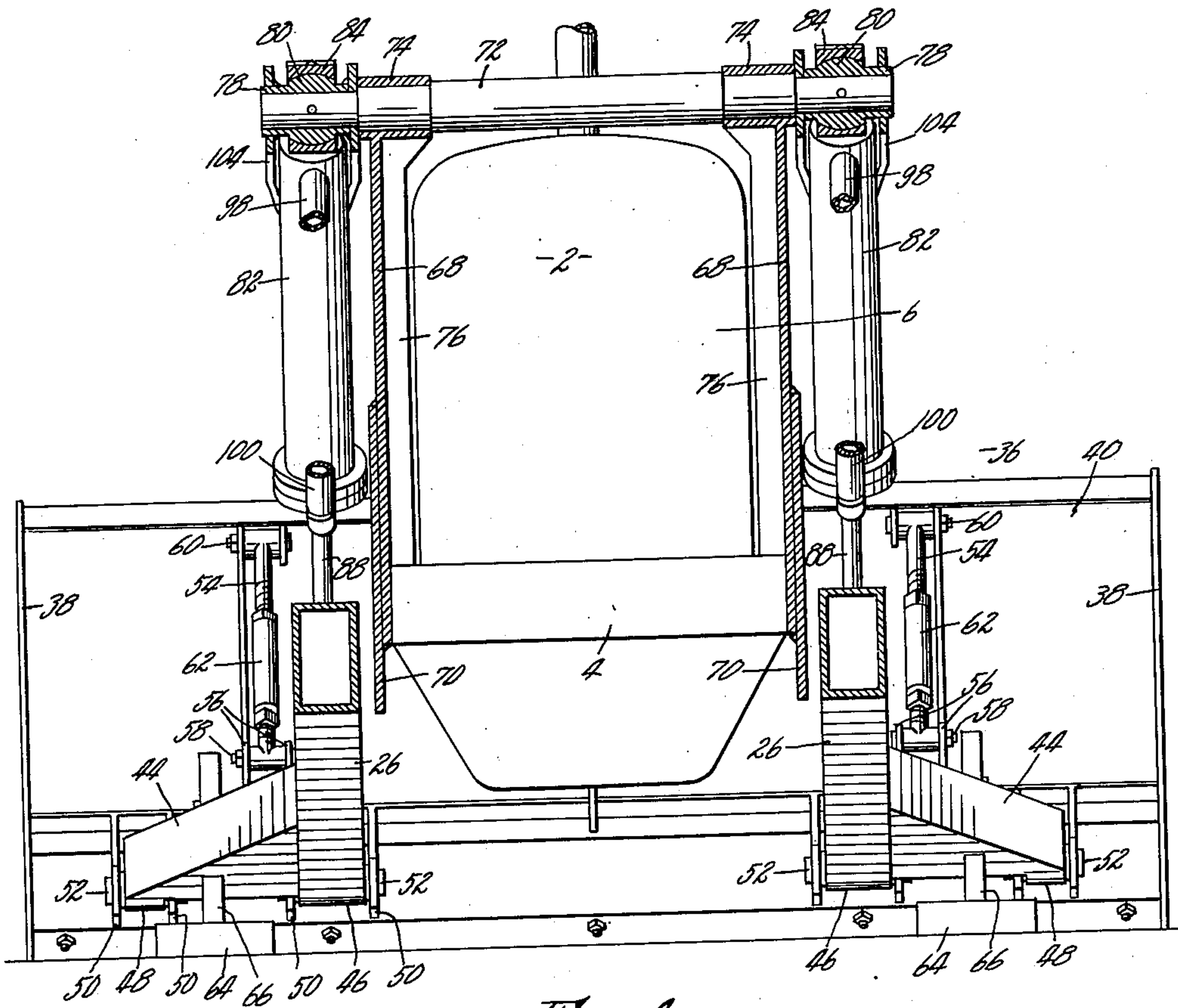


Fig. 4

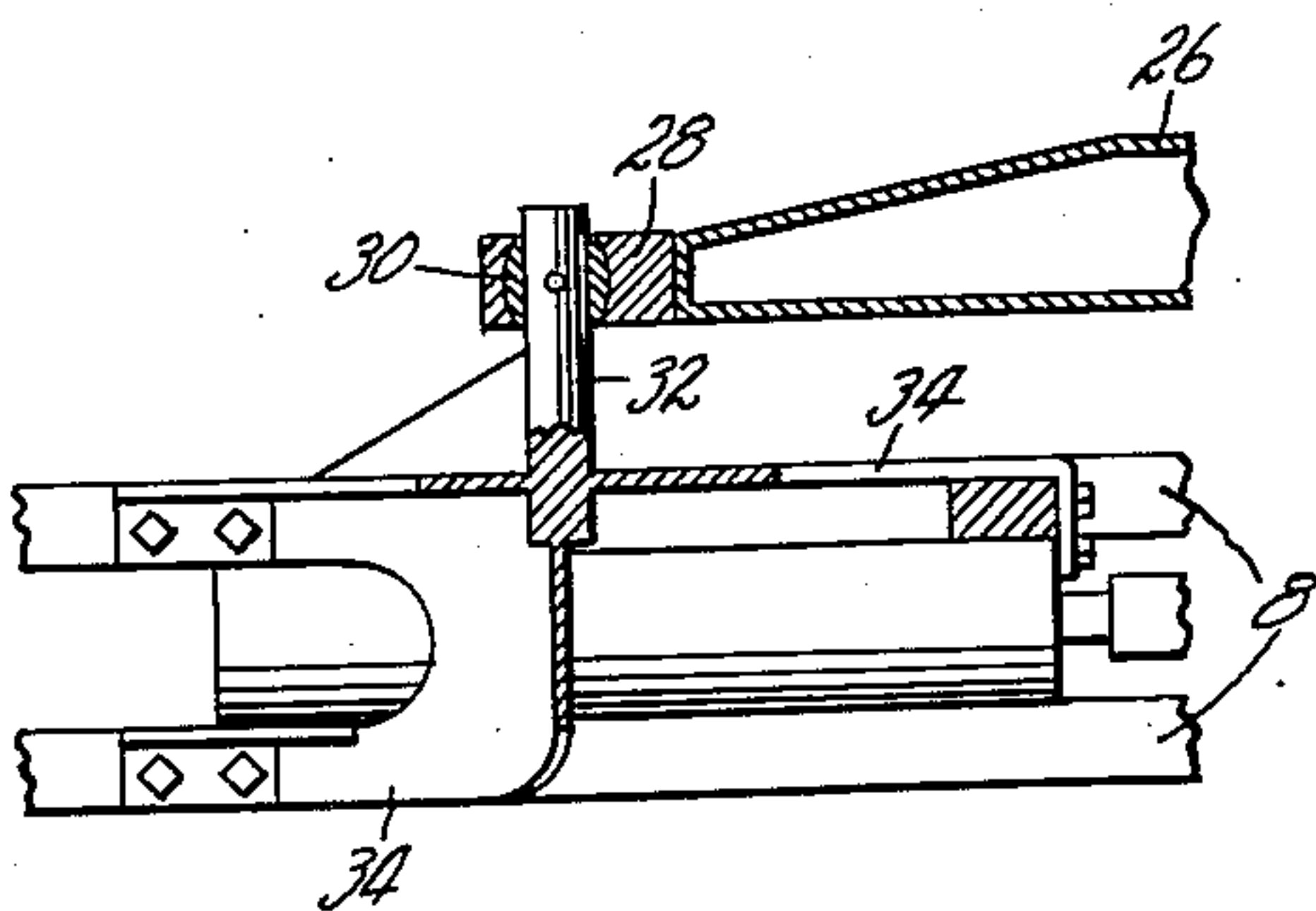


Fig. 5

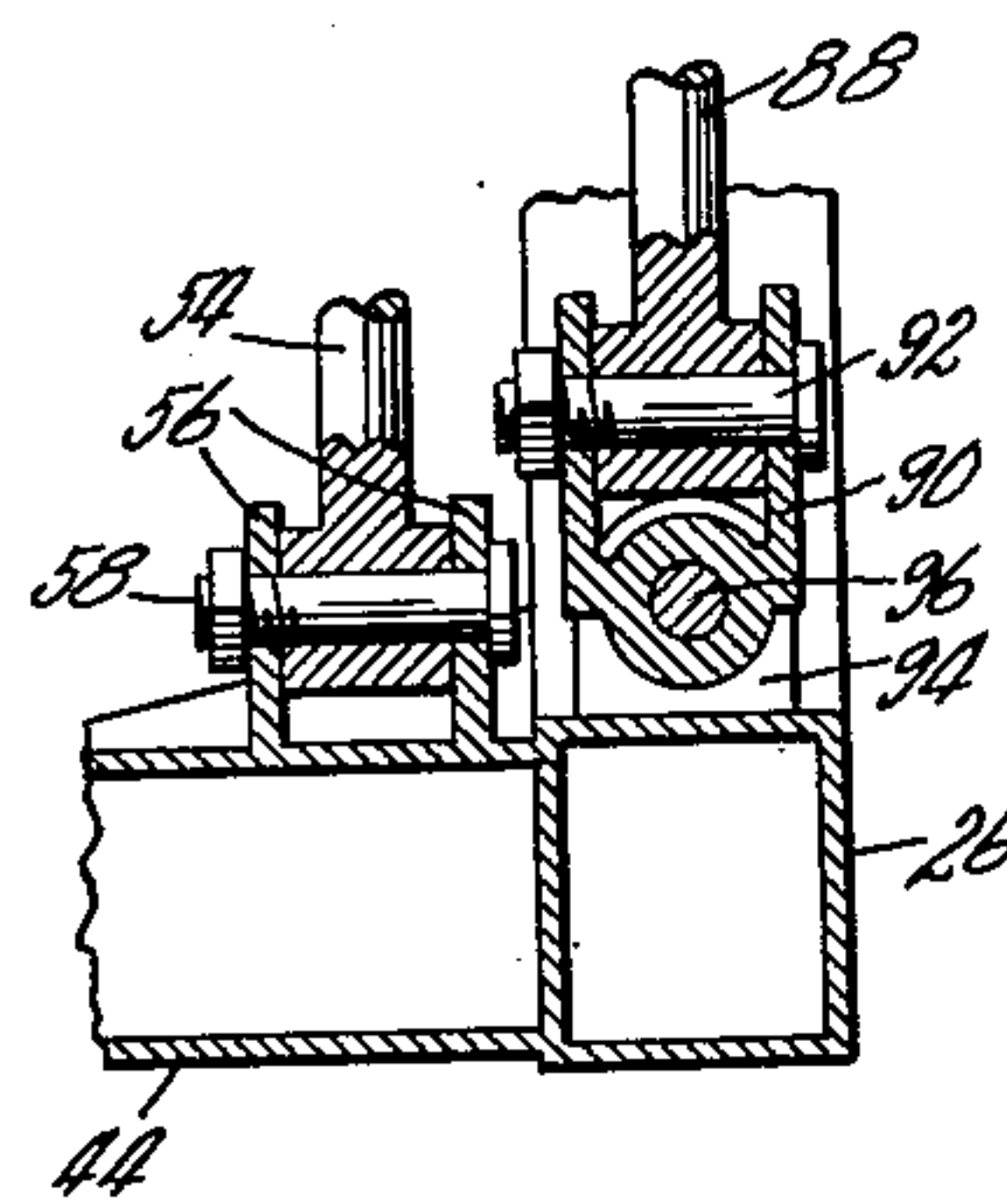


Fig. 6

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## UNITED STATES PATENT OFFICE

2,624,132

## BULLDOZER ATTACHMENT FOR TRACTORS

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4 Claims. (Cl. 37—144)

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This invention relates to new and useful improvements in a bulldozer attachment for tractors, and has particular reference to means for equalizing the vertical movement of the bulldozer blade along the entire length thereof.

In the usual bulldozer attachment for tractors, it is customary to dispose the blade transversely to and just forwardly of the opposite sides of the tractor, being attached at their forward ends to the blade assembly and being pivotally attached at their rearward ends to a portion of the tractor frame, with means attached to the pushbeams or blade assembly for raising and lowering the blade. The pushbeams are usually attached adjacent the rearward end of the tractor to provide substantially vertical movement of the blade as it is adjusted above and below the ground level. With this structure, the pushbeams are of considerable length, and it is obvious that should one end of the blade encounter an obstruction or harder ground, the natural resilience of the pushbeam and blade structure will permit that end of the blade to be elevated, often several inches, which will, of course, cause an uneven cut. On successive passes this error accumulates. This blade tilting occurs especially in bulldozers known generally as "inside" bulldozers, in which the pushbeams are disposed between the tractor body and the tracks, since the connections of said beams to the blade assembly are naturally closer together and therefore present less resistance to tilting of the blade.

Several methods of stabilizing the blade have been tried. Providing extra rigid, welded connections between the pushbeams and blade assembly is only partially effective, and necessarily inhibits the adjustability of the angle of the blade relative to the ground. Rigid braces extending directly between the pushbeams are impractical because of the disposition of the tractor body between the pushbeams, and because of the desirability of placing the blade as close as possible to the forward end of the tractor. Placing a separate hydraulic cylinder to raise and lower each pushbeam will have no equalizing effect, since commonly both of said cylinders are operated by fluid from a common source. The fluid pressure will, of course, be equal throughout the system, and hence the hydraulic cylinders will exert no force tending to level the blade after it has been tilted.

The principal object of this invention is therefore the provision of means whereby the pushbeams and blade of a bulldozer may be main-

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tained substantially level regardless of the forces which may be exerted on the blade by contact with the ground.

Another object is the provision, in a bulldozer attachment for tractors including a pair of pushbeams pivotally attached to the tractor frame and a blade assembly fixed to said pushbeam, of a pair of linkages respectively joining each of said pushbeams to said tractor frame, and a rigid connection extending between corresponding members of said linkage.

A further object is the provision, in a bulldozer attachment of the class described, of a shaft carried rotatably by the tractor frame and extending transversely thereof to connect the pushbeams together. An arm rigidly secured to each end of said shaft has a link pivoted to its free end. The opposite end of each of said links is pivoted to the corresponding pushbeam adjacent the blade assembly.

Other objects are simplicity and economy of construction, efficiency and dependability of operation, and adaptability to be applied to various types of tools other than bulldozers.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the drawing, wherein:

Figure 1 is a side elevation of a tractor with a bulldozer attachment embodying the present invention attached thereto.

Fig. 2 is a plan view of the tractor and bulldozer attachment, with parts broken away.

Fig. 3 is an enlarged fragmentary section taken on line III—III of Fig. 2, with parts broken away, showing the blade assembly at ground level in solid lines, and elevated to the upper limit of its travel in dotted lines.

Fig. 4 is a sectional view taken on line IV—IV of Fig. 3, with parts broken away and with the track elements omitted.

Fig. 5 is a fragmentary section taken on line V—V of Fig. 3.

Fig. 6 is an enlarged fragmentary irregular section taken on line VI—VI of Fig. 3.

Like reference characters apply to similar parts throughout the several views, and the numeral 2 applies to a tractor having a supporting frame 4 and a body portion 6. A track frame 8 is disposed at each side of the tractor frame 4, each of said track frames being pivotally supported adjacent its rearward end by an axle 10 carried by the tractor frame, and resiliently supported adjacent its forward end by a transverse member such as leaf spring 12 extending



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outwardly from the tractor frame. Thus track frames 8 are adapted to be pivoted vertically with respect to the tractor frame about axles 10, as greater or less loads are applied to spring 12 by the tractor frame. A drive sprocket 14 is carried on each axle 10 and is driven by the tractor engine by means not shown. An idler wheel 16 is mounted rotatably on an axle 18 carried adjacent the forward end of each track frame 8. A ground engaging track 20 passes about each drive sprocket 14 and the associated idler wheel 16. Said tracks are further supported by a plurality of truck wheels 22 carried rotatably on the track frames, and by support rollers 24 carried by said track frames and engaging the upper reaches of said tracks.

A pair of pushbeams 26 each having a rectangular cross-sectional form are disposed respectively along opposite sides of the tractor, between the tractor frame and the adjacent track 20. At the rearward end of each of said pushbeams, a hollow partially spherical bearing member 28 is rigidly attached, and engages a partially spherically shaped bearing member 30 rigidly mounted on a stub axle 32, thus forming a ball and socket joint as best shown in Fig. 5. Each stub axle 32 is fixed rigidly to a bracket 34 which is bolted or otherwise rigidly fixed to the adjacent track frame 8 just forwardly from drive sprocket 14. The ball and socket joints just described permit axial twisting as well as universal pivotal movement of the pushbeams 26, and tend to relieve torsional strains set up in the pushbeams, which occur principally when the track frames move unequal vertical distances relative to the tractor frame, while at the same time the forward ends of the pushbeams are maintained at equal elevations by the stabilizing device hereinafter described. Pushbeams 26 are angled upwardly intermediate their ends to avoid interference with leaf spring 12.

A blade assembly 36 is disposed transversely in front of the tractor, and comprises essentially end plates 38, an arcuate moldboard 40 extending between and attached to said end plates, and a blade 42 secured rigidly to the lower edge of said moldboard. Pushbeams 26 extend forwardly from the tractor frame, and each beam is provided at its forward end with an outwardly projecting triangular extension 44. A forwardly projecting lug 46 formed at the forward end of pushbeam 26, and a forwardly projecting lug 48 formed at the outer portion of triangular extension 44, are adapted to project between ears 50 secured to the rearward face of moldboard 40 adjacent the lower edge thereof, and are pivotally attached thereto by means of bolts 52. A threaded rod 54 is pivotally secured at its lower end between ears 55 fixed to each pushbeam extension 44, by means of bolt 53. Said rods extend upwardly and forwardly, and are pivotally connected at their upper ends to the rearward face of moldboard 40 adjacent the upper edge thereof, by means of bolts 60. Rods 54 are divided, and provided with turnbuckles 62 intermediate their ends. Blade assembly 36 is thus normally held in rigid relation to pushbeams 26, but by operating turnbuckles 62 to lengthen or shorten rods 54, the rake or angle of the blade assembly relative to the ground may be adjusted. A ground engaging shoe 64 adapted to guide the blade while making thin cuts is carried at the lower end of beam 66, said beam being carried for longitudinal adjustment by pushbeam extension 44.

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A pair of vertically disposed, substantially triangular plates 68 are rigidly secured along their lower edges to tractor frame 4 respectively at either side of the engine compartment of the tractor, and are adapted to support the blade stabilizing structure as hereinafter described. A friction plate 70 is welded to the outer surface of each support plate 68. The pushbeams 26 contact said friction plates in case the blade assembly is forced transversely in either direction. Support plates 68 extend upwardly above tractor body 6, and a heavy torque shaft 72 is carried rotatably in bearings 74 supported at the upper ends of said plates. Each of said plates is provided with an inwardly projecting rib 76 as shown in Fig. 4, said rib being disposed beneath bearing 74 and abutting at its lower end against tractor frame 4. Said ribs strengthen and stiffen plates 68, and brace them against lateral flexing. Shaft 72 is disposed transversely of the tractor and parallel to blade assembly 36, and the end portions thereof extend outwardly beyond the sides of tractor frame 4. To each of the end portions of said shaft a sleeve 78 is rigidly fixed, and each of said sleeves is formed to present the ball portion 80 of a ball and socket connection.

A pair of hydraulic cylinders 82 are disposed respectively at each side of the tractor frame, in the same vertical planes with pushbeams 26. At its upper end each cylinder is formed to present a hollow spherical bearing 84 adapted to engage ball portion 80 of sleeve 78 to complete the ball and socket connection. Each cylinder 82 is provided with a piston 86 and a piston rod 88. Said piston rod extends forwardly and downwardly, and as best shown in Figs. 3 and 6, is pivotally connected at its lower end to a connector 90 by means of bolt 92, said bolt being parallel to shaft 72. Connector 90 is in turn pivotally connected between ears 94 which are fixed rigidly to pushbeam 26 adjacent blade assembly 36, by means of bolts 96. Bolt 96 is disposed transversely to bolt 92, thus providing a universal joint between piston rod 88 and pushbeam 26. The purpose of this universal joint, and the ball and socket connection at the upper end of cylinder 82, is to relieve the cylinders and piston rods of lateral stresses and strains which would otherwise occur when the pushbeams were twisted or forced laterally. Cylinders 82 are double acting, having fluid connections 98 and 100 to the respective ends thereof. Said fluid connections communicate with a suitable control valve 102 by means of which fluid under pressure may be delivered from a suitable source respectively to the lower or upper ends of cylinders 82 to raise or lower blade assembly 36.

A stabilizer arm 104 having an I-section is bifurcated at its rearward end, and the sides thereof rigidly welded to sleeve 78 at either side of each ball and socket joint 80-84. Said arms extend forwardly, and are pivotally connected at their forward ends to the upper ends of links 106 by means of bolts 108. Each of said links is pivoted at its lower end to the adjacent connector 90 by means of bolt 110, as best shown in Fig. 3.

Thus, it will be seen that the stabilizer mechanism comprising links 106, arms 104, and torque shaft 72, will not interfere with the raising and lowering of the pushbeams by cylinders 82, as illustrated by the solid and dotted line views in Fig. 3, but will effectually prevent any un-



equal vertical movement of the pushbeams, and will thus maintain blade assembly 36 substantially in the plane of the tractor frame. For example, if one end of the blade should strike harder ground and be forced upwardly, this movement will be transmitted to the nearer pushbeam, thence through the associated link 106 and arm 104, through torque shaft 72, and through the farther arm 104, link 106, and pushbeam 26 to the opposite end of the blade assembly. Furthermore, since shaft 72 is supported by bearings 74 adjacent each end, and said bearings are supported by plates 68, a portion of the stress exerted on either stabilizer linkage will pass directly to the tractor frame through plates 68. This decreases the effective lever arm through which the weight of the tractor exerts a force tending to tilt the blade assembly whenever an upward force is exerted adjacent one end of said blade assembly.

Although a specific embodiment of my invention has been disclosed, it is apparent that many minor variations of construction and operation could be made without departing from the spirit of the invention.

What I claim is:

1. A bulldozer attachment for tractors comprising a pair of pushbeams adapted to be disposed respectively along opposite sides of a tractor and adapted to be connected pivotally at their rearward ends to a portion of said tractor, a blade assembly disposed transversely in front of said tractor and carried by said pushbeams, a shaft carried rotatably by the frame of said tractor parallel to said blade assembly, hydraulic means for raising and lowering said pushbeams disposed at each side of said tractor, said means comprising a hydraulic cylinder, piston, piston rod, and pressure connections to said cylinder, said cylinder being pivotally connected to said shaft and said piston rods being pivotally connected to said pushbeams adjacent said blade assembly, links pivotally connected to said pushbeams adjacent said blade assembly and extending upwardly therefrom, and arms rigidly secured to said shaft, the free ends of said arms being pivotally attached to the upper ends of said links.

2. A bulldozer attachment for tractors comprising a pair of pushbeams adapted to be disposed respectively along opposite sides of a tractor and adapted to be connected pivotally at their rearward ends to a portion of said tractor, a blade assembly disposed transversely in front of said tractor and carried by said pushbeams, a shaft carried rotatably by the frame of said tractor parallel to said blade assembly, hydraulic means for raising and lowering said pushbeams disposed at each side of said tractor, said means comprising a hydraulic cylinder, piston, piston rod, and pressure connections to said cylinder, a ball and socket joint connecting said cylinder to said shaft, a universal joint connecting said piston rod to the associated pushbeam adjacent said blade assembly, links universally pivoted to each of said pushbeams adjacent said blade assembly and extending upwardly therefrom, and arms rigidly secured to said shaft, the free ends of said arms being pivotally attached to the upper ends of said links.

3. A bulldozer attachment for tractors comprising a pair of pushbeams adapted to be

disposed respectively along opposite sides of a tractor and adapted to be connected pivotally at their rearward ends to a portion of said tractor, a blade assembly disposed transversely in front of said tractor and carried by said pushbeams, a shaft carried rotatably by the frame of said tractor parallel to said blade assembly, hydraulic means for raising and lowering said pushbeams disposed at each side of said tractor, said means comprising a hydraulic cylinder, piston, piston rod, and pressure connections to said cylinder, a ball and socket joint connecting said cylinder to said shaft, a connector pivotally connected to said piston rod on an axis parallel to said shaft, said connector being pivotally carried by the associated pushbeam on an axis at right angles to said last named axis to provide a universal connection, a link pivotally connected to each of said connectors and extending upwardly therefrom, and arms rigidly secured to said shaft, the free ends of said arms being pivotally connected to the upper ends of said links.

4. In combination with a tractor having a frame and having track frames carried by said frame for independent vertical movement relative thereto, a bulldozer attachment comprising a pair of pushbeams adapted to be disposed respectively along opposite sides of said tractor between said frame and track frames, ball and socket joints connecting the rearward ends of said pushbeams to said track frames, a blade assembly disposed transversely in front of said tractor and carried by said pushbeams for pivotal movement on a horizontal axis, means for adjusting the angle of said blade assembly relative to said pushbeams, a shaft carried rotatably by the frame of said tractor parallel to said blade assembly, hydraulic means for raising and lowering said pushbeams disposed at each side of said tractor, said means comprising a hydraulic cylinder, piston, piston rod, and pressure connections to said cylinder, a ball and socket joint connecting said cylinder to said shaft, a connector pivotally connected to said piston rod on an axis parallel to said shaft, said connector being pivotally carried by the associated pushbeams on an axis at right angles to said last named axis to form a universal joint, a link pivotally connected to each of said connectors and extending upwardly therefrom, and a pair of arms rigidly connected to said shaft, the free ends of said arms being pivotally connected respectively to the upper ends of said links.

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