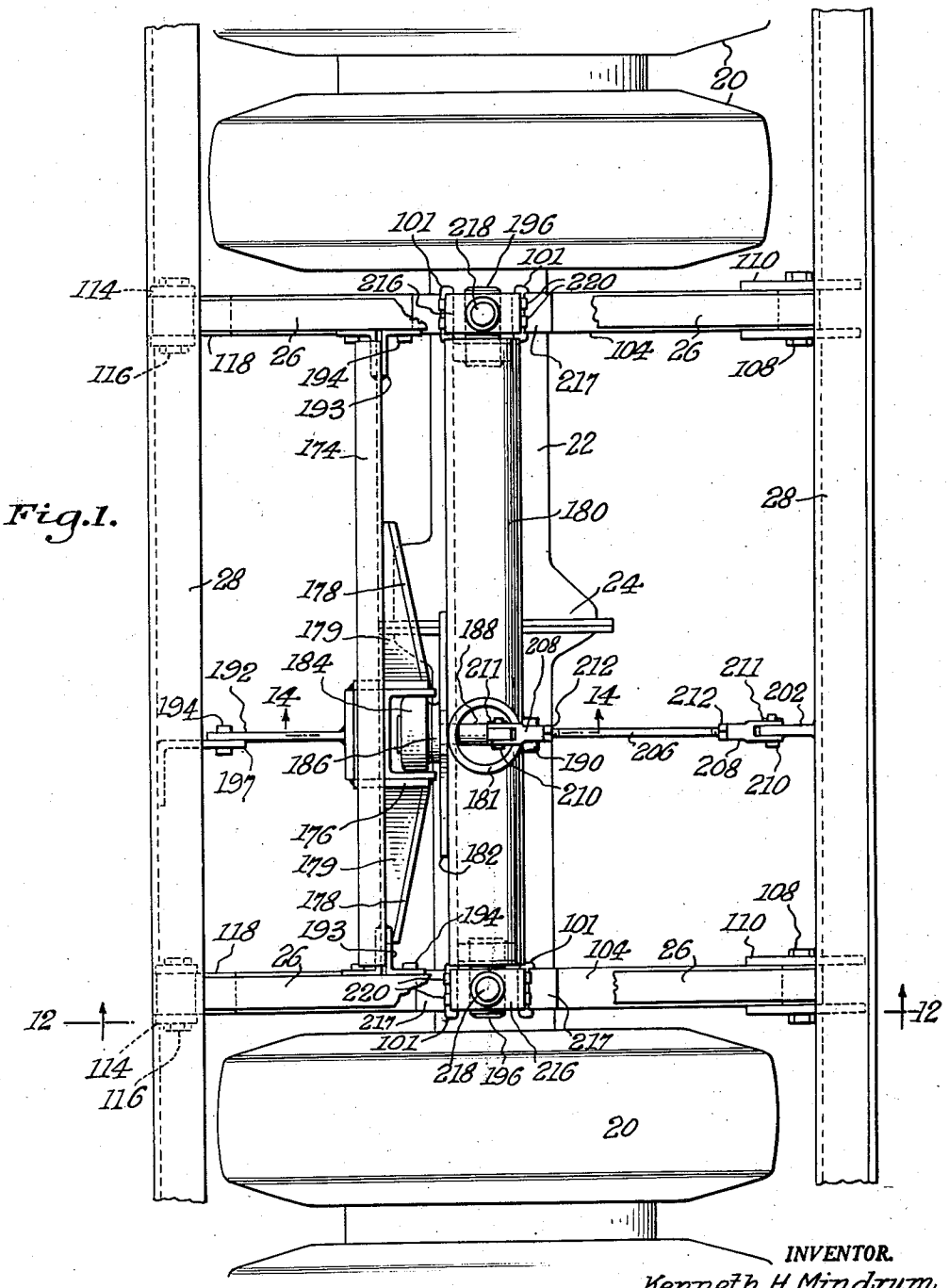
May 6, 1958 K. H. MINDRUM 2,833,553

FRONT AND REAR SUSPENSION SYSTEM FOR TRANSPORTER

Filed March 1, 1957 4 Sheets-Sheet 1

Fig. 1.



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FRONT AND REAR SUSPENSION SYSTEM FOR TRANSPORTER

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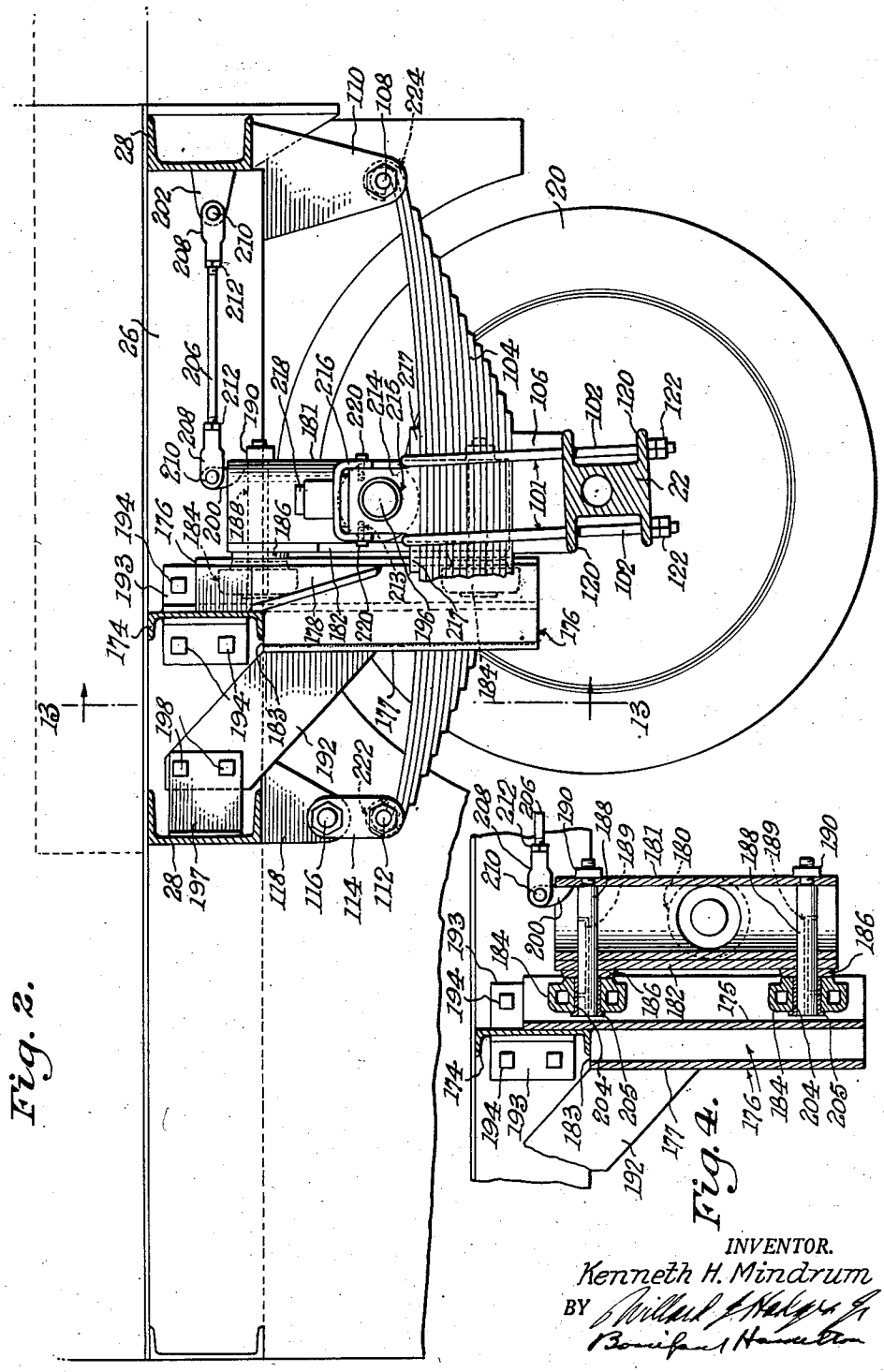


Fig. 2.

Fig. 4.

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FRONT AND REAR SUSPENSION SYSTEM FOR TRANSPORTER

Filed March 1, 1957 4 Sheets-Sheet 3

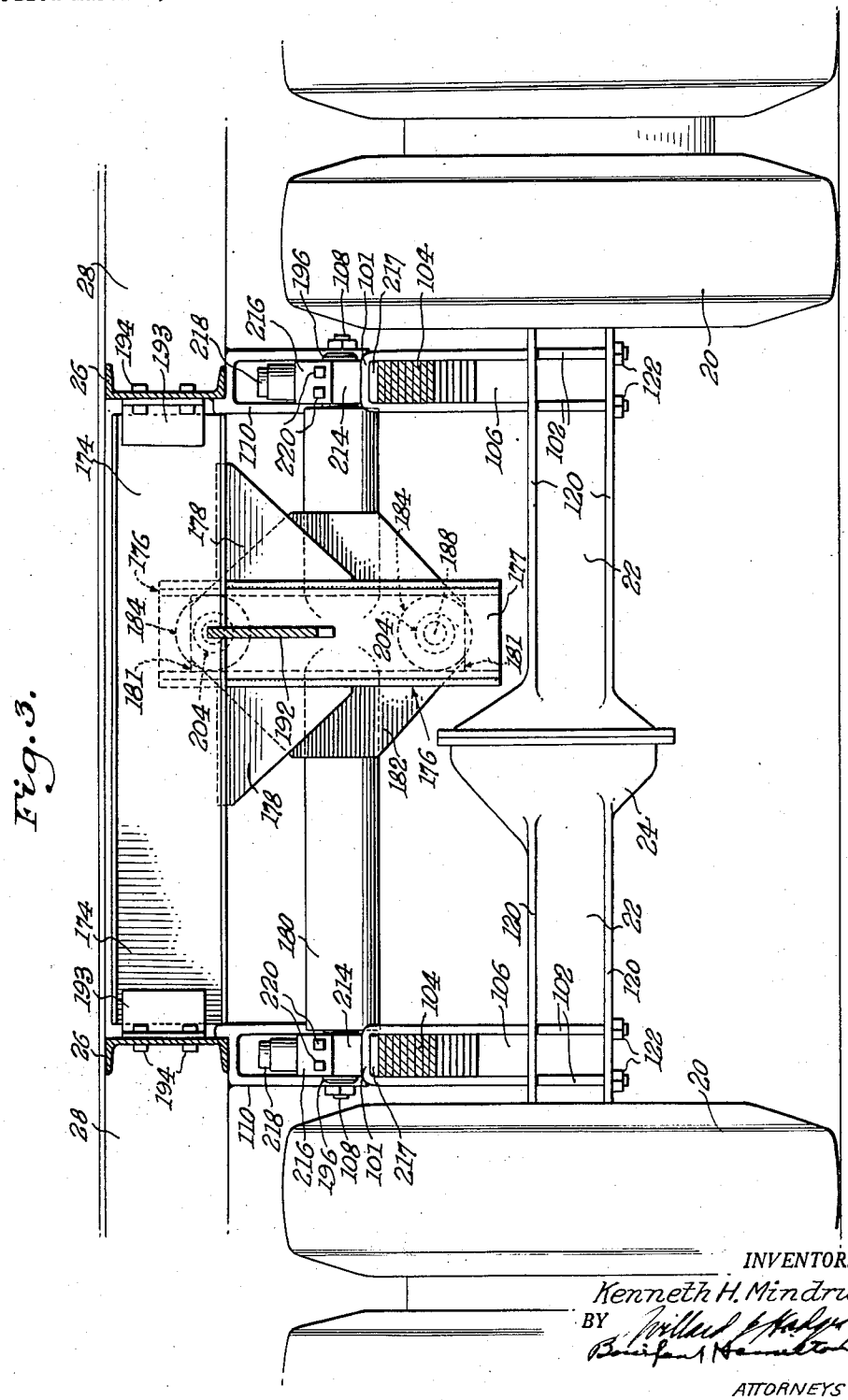


Fig. 3.

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FRONT AND REAR SUSPENSION SYSTEM FOR TRANSPORTER

Filed March 1, 1957 4 Sheets-Sheet 4

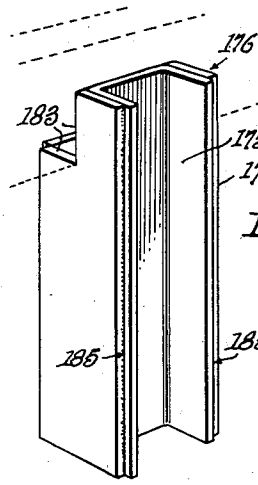


Fig. 6.

Fig. 5.

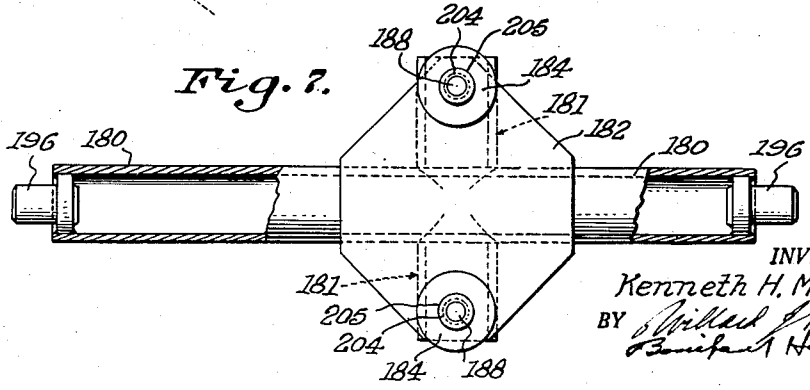


Fig. 7.

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United States Patent Office 2,833,553 Patented May 6, 1958

2,833,553

FRONT AND REAR SUSPENSION SYSTEM FOR TRANSPORTER

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Application March 1, 1957, Serial No. 643,485

4 Claims. (Cl. 280—124)

The present invention provides certain improvements in material loading equipment of a general type wherein a vehicular frame is provided on which is arranged a load-handling fork power-operated for upward, downward, and horizontal movements, so that loads may be picked up from alongside the frame, lifted, drawn inwardly, and deposited on the frame, transported from one place to another, and unloaded onto the ground at the desired destination, or elevated into racks alongside the machine.

In mechanisms of this type, it will be apparent they will be subjected during operating service to very heavy lateral twisting stresses, with a resulting tendency of the machine to tilt towards the side at which the load is being manipulated, so that in the construction of this type, provision has been made to counteract such tilting by the provision of extensible jacks which are thrust out into ground contact as the load is raised and lowered. Even so, however, lateral or transverse stability is a considerable problem, and in machines of the above type, the frame is secured directly to the front and rear axles of the machine for this reason; but because of the fact that the machine is used in many instances as over-the-road transport, the unsprung frame-to-axle mounting results in a very rough riding vehicle for personnel thereon, as will be appreciated readily.

The improvements of the present invention are designed to remedy the foregoing objection, it being an important object of the invention to provide a spring suspension for a machine of the above-indicated character which will provide for the absorption of road shocks without loss of the lateral stability necessary to the side-loading action of the machine. Thus the machine will accommodate itself to road surface irregularities during transport operations, but without loss of the necessary lateral stability when loading and unloading, at which time the machine is stationary and the jacks are in use to add to the stability.

Further objects of the present improved construction include the provision of spring-suspension of simple, strong, and practical construction, as will be understood from the following specification, when taken in conjunction with the accompanying drawings, and the features of novelty will be pointed out in particularity in the appended claims.

In the accompanying drawings:

Fig. 1 is a rear top plan of a modified form of spring suspension construction applied to the rear wheels of the machine;

Fig. 2 is an enlarged longitudinal sectional elevation, taken on the line 12—12 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a transverse sectional elevation taken on the line 13—13 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is an enlarged detailed vertical section view, taken on the line 14—14 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a perspective view of the mounting means for the modified form of spring suspension illustrated in Fig. 1;

Fig. 6 is a fragmentary perspective view of a roller guide track employed in the modified construction; and

Fig. 7 is an elevation view, partly in section, of a modified roller mounting assembly shown in Fig. 5.

Referring more particularly to the drawings, it will be noted that the structural features constituting the present improved construction are illustrated as being embodied in a power-actuated and power-driven mobile loading machine which is itself a prime mover. However, it will be understood that the improvements are not limited to incorporation into this particular machine nor into this particular type of machine, and the following description of the improved spring mounting construction is intended to be regarded as a general vehicular installation in any embodiment which includes a main chassis frame that is reinforced by spaced, longitudinally and transversely extending reinforcing beams. The improvements of the present invention may be applied to both the rear and front wheels and axles therefor, as will be described in particularity hereinafter. It will be understood that the illustrated embodiments are incorporated in a heavy and rugged vehicle which is subjected to severe and very rugged torsional stresses and strains during service operations, thereby requiring a highly rugged character of mechanical installations embodying the present improvements.

Figs. 1, 2, 3, 4, 5, 6, and 7 illustrate an embodiment of the improved and novel rear spring suspension means of the load carrier. Reference numeral **20** indicates dual rear wheels mounted on rear axle **22** which includes differential housing **24**. As indicated previously, although the illustrated embodiment shows the improved and novel suspension means on the rear of the load carrier, it is understood that it is equally applicable to the front. This embodiment permits the portion of the loader chassis above the rear axle **22** to have up and downward movements and is restrained from lateral movements by a pivoted roller carrying tubular cross beam means **180** having a plurality of rollers **184** that oscillate upwardly and downwardly in a fabricated channel guide retaining means **176** rigidly carried by a chassis member **174** to give lateral stability to the loader chassis during loading and unloading from a side position of the loader. This embodiment also allows, through an equalizing rod member **206**, longitudinal cooperation of the pivoted roller means with any longitudinal shifting of the loader chassis and guide means **176** with respect to the rear axle **22**. The rear spring suspension means shown by this embodiment comprises a rear axle **22** having spacer blocks **106** thereon which carries two spaced parallel semi-elliptical leaf spring assemblies **104**. In this embodiment the rear spring assemblies **104** rest upon spacer blocks **106** on rear axle **22**. Immediately above these spacer blocks **106** on top of each spring assembly **104** is positioned a block **214** having a central bearing means **215** to engage end member **196** of pivoted roller support member **180**, and said member **214** also contains near the top of its vertical sides a female thread means **213** for securing thereon by bolt means **220** a retaining means **216** for rubber bumper means **218**. The lower portion of member **214** terminates in clamping shoulders **217** against spring assembly **104** which is secured by clamping U-bolt **101** by legs **102** which pass through flanges **120** of axle **22** and are secured in clamping engagement to said axle member **22** by lock nut means **122**. Each of the two semi-elliptical spring assemblies **104** are connected at the rear end by upturned eye member **224** by stub pivot shaft **108** to spaced bracket **110** which is secured by weldments to chassis members **26** and **28**. The front end of each semi-elliptical spring assembly **104** terminates in up-

turned eye loop member **222** which is pivotally connected by front pivot shaft **112** by companion shackle members **114** which are each in turn pivotally connected by pivot pin member **116** to bracket member **118** which in turn rigidly secured by weldments to member **28** of the loader chassis. The extended ends of guide support member **174** terminate as weldments to bracket members **193** which are in turn rigidly fastened by bolt means **194** at each end to members **26** of the loader chassis, enabling member **174** to be easily removed and serviced. Intermediate the ends of member **174**, fabricated guide member **176** is secured by weldments and triangular plate members **178** and **179** to the transverse support member **174**. Guide member **176** in Fig. 2 is welded to forward brace member **192** which is in turn secured by bolt members **198** to bracket member **197**, which is in turn secured by weldment to member **28** of the loader chassis. The pivoted roller support member **180** is pivotally connected by pivot pins **196** in bearing blocks **214** which are rigidly and fixedly juxtaposed by spring assembly **104** to the rear axle **22** through clamping U-bolts **101**. Member **180** supports by weldments a cross member **181** which carries above and below member **180** two roller means **184** by bearing pins **188** which terminate at one end in a bearing means **204** which supports rollers **184** by a spacing member **186** juxtaposed between roller member **184** and cross support plate member **182** and tubular cross member **181**. The tubular cross member **181** is laterally reinforced by weldments to member **180**. The roller pin support member **188** passes through plate member **182** and tubular member **181** and terminates in a securing lock nut **190**. Thet top portion of tubular cross member **181** is secured rearwardly by weldment to lug member **200** which is pivotally connected by pin member means **210** secured by a cotter pin **211** to clevis member **208** threadedly connected and secured by lock nut **212** on equalizing rod member **206** which is further threadedly connected at the other end of member **206** to a lock nut and another clevis member **208** which is pivotally connected by pin member **210** to bracket **202**, member **210** terminating at one end in a cotter pin **211**, the bracket **202** being welded to member **28** of the chassis.

Fig. 6 of this embodiment shows in detail the fabrication of roller guide member **176** before weldment to structural member **174**. The roller guide member **176** is fabricated by an inner channel member **175** being disposed within an outer notched channel member **177** in such a manner that the channel recess of the inner channel member **175** opens outwardly from channel member **177**. Channel members **175** and **177** are secured together by weldments **185**. Outward channel member **177** is notched at its topmost end by indentation **183** having two sides meeting to form an included angle of substantially 90 degrees. The sides of notched recess **183** are welded to structural member **174** as shown in Figs. 1, 2, 3, 4 and 5. In Fig. 4 the outer channel member **177** of fabricated member **176** is secured longitudinally by weldment to longitudinal guide brace member **192**.

Fig. 7 of this embodiment shows the transverse roller mounting assembly composed of a tubular roller support trunnion member **180** carrying intermediate its ends by weldments a vertical tubular member **181** extending below and above tubular member **180**. The weldments between tubular members **180** and **181** are further reinforced by a gusset plate member **182** of octagonal shape being welded to tubular members **180** and **181**. The outer ends of tubular member **180** terminate in a pressed arbor fit or weldment enclosing an enlarged stepped cylindrical portion of pivot pin **196** within said outer ends of member **180**.

Figs. 4, 5 and 7 show the manner of mounting roller members **184** to tubular cross member **181** and gusset plate member **182** by bearing pin member **188** piercing by a suitable fit tubular member **181** and gusset plate

member **182**, one end of pin member **188** terminating in a thread means and secured to nut means **190**, the other end of pin member **188** piercing and carrying a circular plate spacer member **186** and said other end of member **188** piercing and being securely fixed to and within a tubular bearing member **204** having an outwardly radially extending cylindrical shoulder portion **205** of bushing or bearing member **204**. Pin member **188** has internal lubricating means **189** for roller members **184**. Roller members **184** are carried on bearing member **204** between its shoulder portion **205** and spacer member **186**.

Figs. 2, 4 and 5 show the manner in which roller members **184** are carried and may reciprocate vertically within roller guide means **176** due to spring deflection to allow oscillation of the axle with respect to the chassis only in the vertical direction.

It is to be understood that the spring suspension structure shown may be used in front axle, single or dual rear axles, and in any combination thereof.

While the present invention has been described specifically as embodied in a loader structure of the type previously described, it will be understood that the present improvements actually are adapted for general application to wheeled vehicles generally, wherever resilient mountings for the wheels are found to be desirable and it will be understood that it is intended and desired to embrace within the scope of this invention such modifications and changes as may be necessary to adapt it to varying conditions and uses as may come within the expected purview of one skilled in the art and as defined by the scope of the appended claims.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. In a vehicle having a chassis including a transverse bracing member and an axle resiliently mounted beneath said transverse member, the improvement including spring assemblies connected to the chassis and supporting said axle, channel means secured to said transverse member above said axle, normally intersecting tubular members supported on said spring assemblies parallel to said transverse member, linking means interconnecting said tubular members and said chassis, guide means secured to said tubular members and engaging said channel means for limiting the motion of said tubular members to a vertical path and permitting oscillation of the axle with respect to the chassis.

2. In a vehicle having a chassis including a transverse bracing member, spring assemblies suspended from said chassis and supporting an axle in parallel relation between said transverse member and on one side thereof, a channel secured perpendicularly to said transverse member above said axle, normally intersecting tubular members supported on said spring assemblies for rotation about an axis parallel to said transverse member, pivotal linking means interconnecting said normally intersecting tubular members and said chassis, vertically aligned roller means carried by a vertical one of said normally intersecting tubualr members and engaging said perpendicular channel for limiting the motion of said tubular members to a vertical path and permitting oscillation of the axle with respect to the chassis.

3. A construction as recited in claim 2 wherein the open side of the channel faces said normally intersecting tubular members.

4. A construction as recited in claim 2 wherein said linking means interconnects the vertical one of said normally interconnecting tubular members and said chassis.

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