Aug. 13, 1963 H. C. IBAUGH ETAL 3,100,653

RUNNING GEAR

Filed July 22, 1960 2 Sheets-Sheet 1

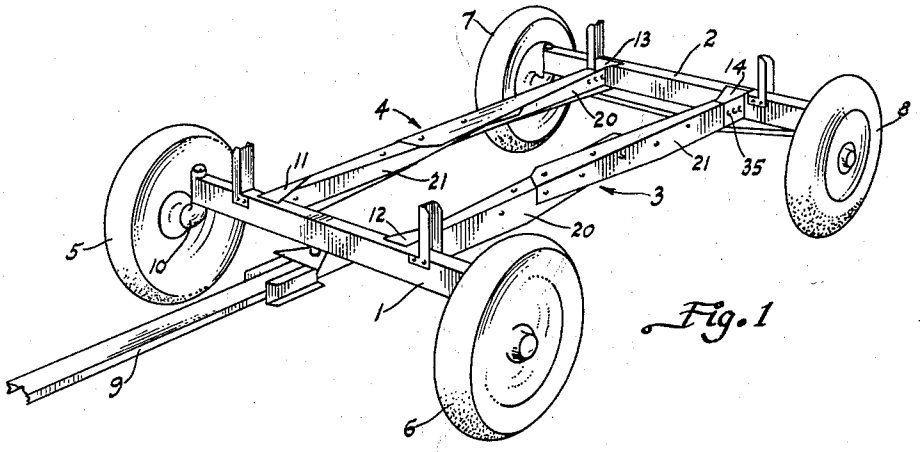

Fig. 1

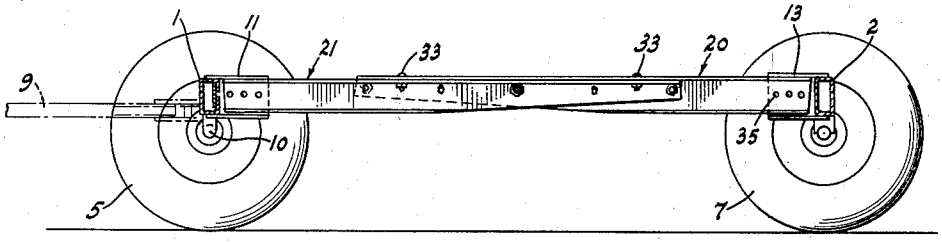

Fig. 2

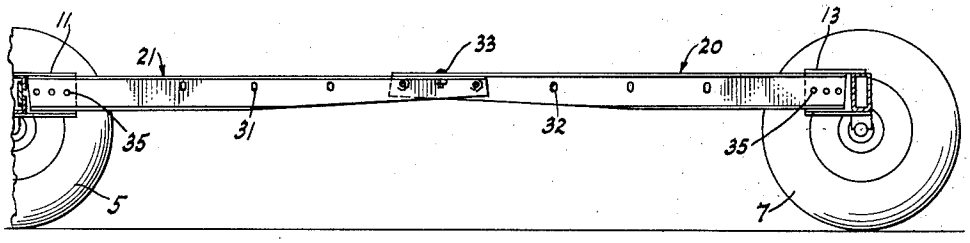

Fig. 3

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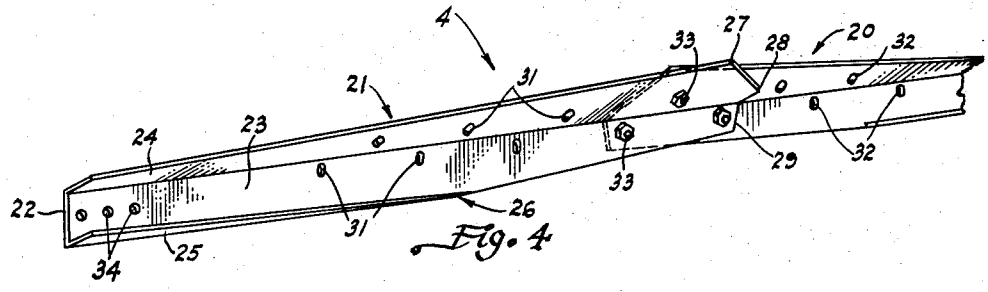

Fig. 4

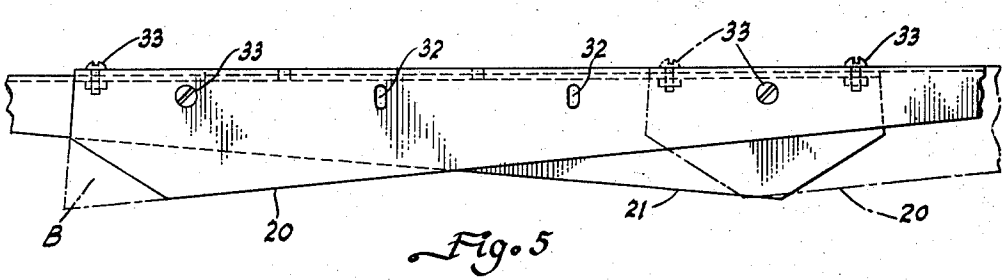

Fig. 5

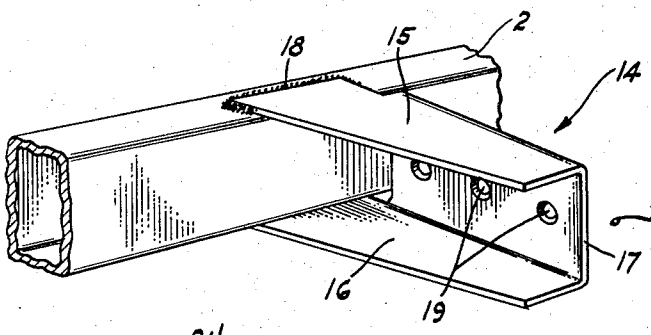

Fig. 6

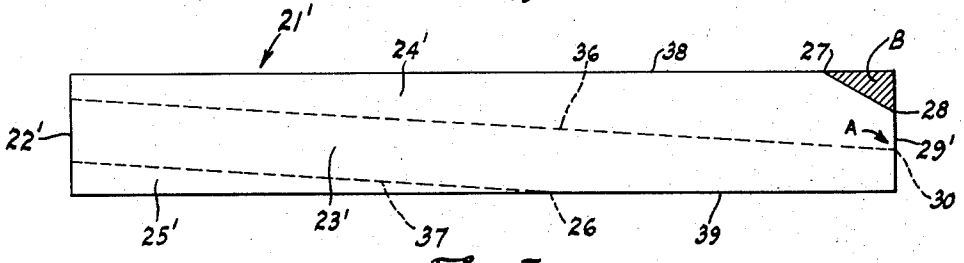

Fig. 7

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RUNNING GEAR

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5 Claims. (Cl. 280—106)

This invention relates to running gear for farm wagons and the like.

It is conventional in the manufacture of wagons, to support the bed and, hence, the cargo, on a pair of transverse axles. Longitudinally extending frame members, or sills, interconnect the axles into a single running gear unit. These sills are provided primarily for the purpose of maintaining the longitudinal spacing between the axles. Although they do not directly support the weight of the cargo, they are subject to various forces as a result of the cargo and movement of the wagon over the ground. For present purposes, these forces may be divided into two general types according to their effect on the sills. The first type of forces attempts to buckle the sills, while the second type of forces attempts to twist each sill about its own axis. Forces attempting to buckle a sill would occur, for example, if a front wheel encountered an obstruction which impeded its forward movement. Inertia of the wagon and cargo would attempt to keep them moving and buckle the sill. Twisting of the sills most frequently occurs when one or more wheels drop into depressions or rise over obstructions, while the remaining wheels rest on relatively even ground.

While it is desirable that the running gear sills resist the buckling forces, proper running gear design requires that they yield in response to torsion. In this way, all four wheels may remain in engagement with the ground, even when rough terrain is traversed. This provides stable, four wheel support for the load at all times and avoids overloading one or more of the wheels.

Under these conditions of required structural deflection, the service life of a wagon running gear depends to a great extent upon its ability to resist fatigue failure in the sills and sill-axle joints. For a given sill, this is accomplished by assuring uniform distribution of the deflection over the entire length of the sill. Where a relatively large deflection occurs over a relatively small portion of a sill, the stress is concentrated and magnified, and results in premature failure. Uniform torsional distribution throughout the wagon sills is a relatively simple matter in fixed wheel base wagons, where each sill is a single frame member. However, in variable wheel base wagons, wherein each sill is made up of a pair of co-extensive overlapping members bolted together, the problem is more complex.

It is desirable, and common practice, for wagon manufacturers to provide a single running gear unit that may be assembled to one of several wheel bases according to the specific needs of a purchaser. This is accomplished by forming each sill of two members which are overlapped and interconnected between the axles; the length of the composite sill depending on the extent of overlap of the two sill members. Holes in the sill members are aligned and receive bolts to lock the members when the desired sill length is obtained. It has been common practice to employ frame members of channel-shaped cross section for sill members. Where these members overlap between the axles the sill takes a more rigid form, thus resulting in a much greater resistance to twisting deflection than the individual members. Hence, substantially all the twisting of the sill is concentrated in the non-overlapping portions of each sill member; that is, the end

portions of the sills adjacent the axles. Fatigue failure of the sills occurs in these highly stressed areas.

Frequently, failure of the running gear occurs at an axle-sill member joint. It has been common practice to connect the sill members to the axles by bolts extending through the flanges of the sill members. The bolt holes create stress concentraiton points in the flanges, the narrowest planar part of the highly stressed portions of the sill members. Since the flanges lie the greatest distance from the neutral axis of the member, they receive the greatest torsional stress when the sill is twisted.

It is the general object of this invention to provide a variable wheel base vehicle running gear design which will provide a highly resilient, long life vehicle frame at little or no increased cost over conventional structures.

It is a further object of this invention to provide a variable wheel base running gear sill design which will increase torsional flexibility of the sill without correspondingly decreasing the axial strength thereof.

Another object of this invention is to provide a novel vehicle running gear sill design wherein sill members are overlapped to provide an adjustable wheel base without materially increasing the rigidity of that portion of the sill consisting of the overlapped sill members.

A further object of this invention is the provision of a variable wheel base vehicle running gear wherein deflection occurs uniformly throughout the length of the sill, notwithstanding the fact that the central portion thereof is composed of two overlapping members.

It is another object of this invention to provide a variable wheel base vehicle running gear sill member design which will have substantially the same axial tensile and compressive strength as channel sill members of the same size, but which will more readily yield to twisting stresses.

Still another object of this invention is the provision of an improved vehicle running gear sill mount.

A further object of this invention is the provision of a new vehicle running gear sill, and method of making the same, wherein the quantity and quality of material employed is the same as that employed for conventional channel type sill members, but wherein the finished sills are more resilient and have a longer service life than conventional channel sills.

A further object of this invention is the provision of a new two-member variable wheel base vehicle running gear sill, and method of making the same, wherein the quantity and quality of material employed is the same as that employed for conventional channel type sill members and wherein the axial tensile and compressive strength of the finished sill is substantially the same as that of a sill made of conventional channel type members, but which has superior torsional properties compared to sills made of conventional channel members.

These and other objects of the invention will become more apparent from the specification and in the drawings wherein:

FIG. 1 is a perspective view of a variable wheel base wagon running gear constructed in accordance with this invention.

FIG. 2 is a vertical section through the longitudinal axis of the running gear of FIG. 1, showing the running gear assembled to its shortest wheel base.

FIG. 3 is a fragmentary vertical section taken on the longitudinal axis of the running gear of FIG. 1, showing the running gear assembled to provide the longest possible wheel base.

FIG. 4 is an enlarged fragmentary perspective view of one of the sills of this invention as seen from a point between and below the sills in FIG. 1.

FIG. 5 is an enlarged fragmentary plan view of the overlapping portions of the sill members, the top member

is shown in solid lines to indicate the shortest obtainable wheel base and in phantom to indicate the longest wheel base.

FIG. 6 is an enlarged perspective view of one of the sill member mounting brackets.

FIG. 7 shows a metal blank from which a sill member is formed.

Referring to the drawings, particularly FIG. 1, there is shown a wagon running gear or undercarriage structure adapted to have a platform or bed (not shown) mounted thereon. The running gear comprises transverse front and rear axles 1 and 2, respectively, left and right longitudinally extending sills 3 and 4, respectively; wheels 5, 6, 7 and 8 and drawbar 9. Conventional steering mechanism (not shown) may interconnect drawbar 9 and movable spindles 10 on axle 1 whereby lateral movement of drawbar 9 will turn the front wheels for steering purposes.

Mounting brackets 11 and 12 are carried by front axle 1 and extend rearwardly therefrom. Rear axle 2 carries mounting brackets 13 and 14. The rear mounting brackets 13 and 14 extend forwardly from rear axle 2 in longitudinal alignment with brackets 11 and 12 on front axle 1. Since all four brackets are identical, the following description of bracket 14, as seen in FIG. 6, will apply equally well to brackets 11, 12 and 13.

Bracket 14 (FIG. 6) comprises top and bottom horizontally disposed flanges 15 and 16 interconnected by an integral vertical web 17. Thus, the brackets are channel-shaped in cross section with their flanges 15 and 16 welded, respectively, to the top and bottom surfaces of the axle as shown at 18 in FIG. 6. A plurality of bolt holes 19 are provided in web 17 midway between flanges 15 and 16. This positioning of the holes places them substantially on the neutral axis of the bracket where torsional stress is at a minimum.

Left and right sills 3 and 4 are each made up of two overlapping sill members 20 and 21. (See FIG. 1.) The two sill members 20 are identical and the members 21 are the identical counterparts of sill members 20. Each sill member has one end mounted in one of the brackets 11, 12, 13 or 14 and the other end overlapping the end of a co-extending sill member counterpart. The wagon wheel base may be varied by changing the extent of overlap of the sill members in a manner, per se, well known.

Superior torsional characteristics are derived from the novel shape of sills 3 and 4, which may best be seen in FIG. 4. Since the sill members are all either identical or identical counterparts, only one member 21 will be described in connection with FIG. 4.

One end 22 of sill member 21 is channel-shaped in cross section having a vertical web portion 23 and integral horizontally extending top and bottom flanges 24 and 25. The bottom flange 25 becomes progressively narrower along the length of member 21 away from end 22 and terminates at a point 26 intermediate the ends of the member. The top flange 24 becomes progressively wider along the length of member 21 to a point 27 adjacent end 29 which is opposite end 22. It will be seen that at point 26, the cross section of member 21 changes from channel-shaped to L-shaped. From point 26 vertical web 23 becomes progressively narrower to the end 29 of member 21. Top flange 24 which has a maximum width at point 27, tapers rather sharply to a point 28 at end 29 of the sill member. A number of bolt holes 31 are provided at spaced intervals in top flange 24 and vertical web 23 of member 21. The spacing of holes 31, like the shape of the sill member, is the same as the spacing of holes 32 in sill member 20 (FIG. 4). The exact number and spacing of these holes will depend upon the variety of wheelbases the running gear is designed to provide. When the sill members are set to provide the desired wheel base, the holes 31 and 32 are aligned to receive bolts 33 which lock the sill members in place. As seen in FIG. 5, the bolts 33 are staggered to reduce stress concentration. Also, in FIG. 5 may be seen the relative extent of overlap between members 20 and 21 for the shortest (member 20 shown in solid lines) and the longest (member 20 shown in phantom) obtainable wheel bases.

The holes 34 in vertical web 23 adjacent end 22 are located midway between top and bottom flanges 24 and 25 and are adapted to register with holes 19 in mounting brackets 11 through 14 (see FIG. 6) when flanges 24 and 25 of the sill member are inserted between flanges 15 and 16 of the mounting bracket, as seen in FIGS. 1 through 3. This locates the sill member mounting bolts 35 substantially on the neutral axis of the channel-shaped end 22 of the sill member. Hence, torsional forces acting on the mounting bolts are at a minimum.

The numeral 21', in FIG. 7, indicates a long narrow rectangular sheet metal plate, or blank; whose opposite short edges are numbered 22' and 29', respectively, and whose opposite long edges are numbered 38 and 39, respectively. This is the sheet stock from which sill member 21, as seen in FIG. 4, is made. Applicants have previously employed blanks of the same size and shape in making vehicle running gear sill members of channel-shaped cross section. This was accomplished by folding portions of the blank along edges 38 and 39 upwardly ninety degrees along fold lines parallel to edges 38 and 39. Thus, forming flanges of uniform width extending the full length of blank 21'.

The same blanks are employed in making applicants' new improved running gear sill with the following changes as shown in FIG. 7: the fold line 36 which defines top flange portion 24' is not parallel to edge 38; instead, it intersects short edge 29' which is opposite edge 22', at point 30 and defines an acute angle A therewith. Fold line 37, which defines bottom flange portion 25', extends parallel to fold line 36 but intersects long edge 39, which is adjacent edge 22', at point 26.

The sill member is formed by bending portion 24' of blank 21' downwardly ninety degrees relative to portion 23'. The bend is made along broken line 36 (FIG. 7). Portion 25' is bent upwardly ninety degrees, relative to portion 23', along broken line 37. Thus, top and bottom parallel flanges 24 and 25 and web portion 23 (see FIG. 4) are formed. The cross hatched corner B (FIG. 7) between points 27 and 28, is cut from the blank merely to avoid sharp projections, as shown in phantom, at B (in FIG. 5).

From FIG. 7 it will be seen that applicants' new improved sill members, although having a rather complex shape, may be readily formed from the same stock and by the same bending equipment as conventional channel sill members. This is accomplished merely by canting the stock relative to the flange bending machine so that the first flange fold line intersects the opposite short sides of the blank and the parallel second flange fold line intersects one short side and adjacent long side.

From the foregoing it will be seen that at any given point along the length of applicants' improved running gear sills, the amount of material available to resist buckling (with the exception of the small corner B in FIG. 7) is the same as that of a channel member formed from the same blank. However, the cross sectional shape of each sill member changes along its length to compensate for the increased rigidity resulting from the overlapping of the sill members. Thus, applicants' invention provides an overlapping two-member running gear sill having substantially the same resistance to buckling as conventional channel member sills, while permitting torsional deflection to be evenly distributed throughout the sill length.

The ends of the sills which are connected to the axles by mounting brackets 11, 12, 13 and 14 are channel-shaped in cross section whereby the flanges interlock with the mounting bracket flanges to resist twisting in the joint. The mounting bolts 35 are located substantially on the neutral axis of the sill members to reduce the torsional stress thereon to a minimum and eliminate bolt hole stress

concentration points in the narrow top and bottom flanges where torsional stress is greatest.

While this invention has been described in connection with a single embodiment thereof, it will be understood that it is capable of further modification. This application is intended to cover any variations, uses or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which it pertains, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention, what we claim is:

1. In a vehicle running gear, a front axle, a rear axle, a first sill member and a second sill member, means connecting one end of each sill member to one of said axles respectively, the other ends of said sill members being overlapped at a point intermediate said front and rear axles, and means interconnecting said other ends of said sill members, each sill member comprising a vertical web portion having top and bottom flanges thereon, said flanges being of substantially the same width at said one end of the members, one of said flanges becoming progressively wider along the length of the member, the other flange becoming progressively narrower along the length of the member and terminating at a point intermediate the ends thereof whereby said one end of each of said sill members is channel-shaped in cross section and said other end is generally L-shaped in cross section.

2. A vehicle running gear comprising first and second parallel axles, first and second parallel sills interconnecting said axles to form a generally rectangular frame structure, each of said sills comprising first and second elongate sill members, each of said sill members having a vertical web section and top and bottom integral flanges whereby said sill members are channel-shaped in cross section at one end, one of said flanges progressively diminishing along the length of said member to a point intermediate the ends of said member whereupon the cross sectional shape of said member changes from channel-shape to L-shape, the L-shaped portions of two sill members being overlapped to form one sill, means interconnecting said overlapped sill members and means connecting the channel-shaped ends of said sill members, respectively, to said axles.

3. A vehicle running gear comprising a front axle, a first sill member having a front end connected to said front axle and extending rearwardly therefrom, said sill member being channel-shaped in cross section at said axle and changing gradually to an L-shaped cross section toward its rear end, a rear axle, a second sill member connected to said rear axle and extending forwardly therefrom, said second sill member being channel-shaped in cross section at said rear axle and changing gradually to an L-shaped cross section toward its forward end, portions of the L-shaped sections of said first and second sill members being overlapped intermediate said front and rear axles, and means interconnecting the overlapped portions of said first and second sill members.

4. In a vehicle running gear, a front axle, a rear axle, first and second spaced channel-shaped brackets on each axle, a pair of spaced parallel sills, each sill connecting one bracket on said front axle to one bracket on said rear axle and comprising a pair of elongate coextensively disposed overlapping sill members, one end of each sill member being mounted in one of said channel-shaped brackets, said one end of each member having top and bottom flanges and an interconnecting web, means connecting the web of each sill member to its mounting bracket at a point midway between said top and bottom flanges, one of said flanges becoming progressively narrower along the length of said member away from said one end and terminating short of the other end of the sill member, said web and the other flange extending the full length of said member and overlapping the web and corresponding flange of the other of said pair of coextending sill members and means interconnecting the overlapping portions of said sill members.

5. In a vehicle running gear, a front axle, a rear axle, a pair of spaced channel-shaped brackets on said front axle extending toward said rear axle, a pair of spaced channel-shaped brackets on said rear axle extending toward and in alignment with said front axle brackets, first and second sill members, respectively, having one end mounted in said front axle brackets and extending rearwardly therefrom, third and fourth sill members, respectively, having one end mounted in said rear axle brackets and extending forwardly therefrom, portions of said third and fourth forwardly extending sill members, respectively, overlapping portions of said first and second rearwardly extending sill members and being interconnected therewith, said one end of each sill member being channel-shaped in cross section, said sill members changing from channel-shaped to L-shaped cross sections intermediate the ends thereof whereby the overlapping portions of said members are L-shaped in cross section.

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