June 19, 1923. 1,459,456

H. G. WESTMORE

METHOD OF AND APPARATUS FOR UNITING THE PARTS OF VEHICLE FRAMES.

Filed Sept. 26, 1921

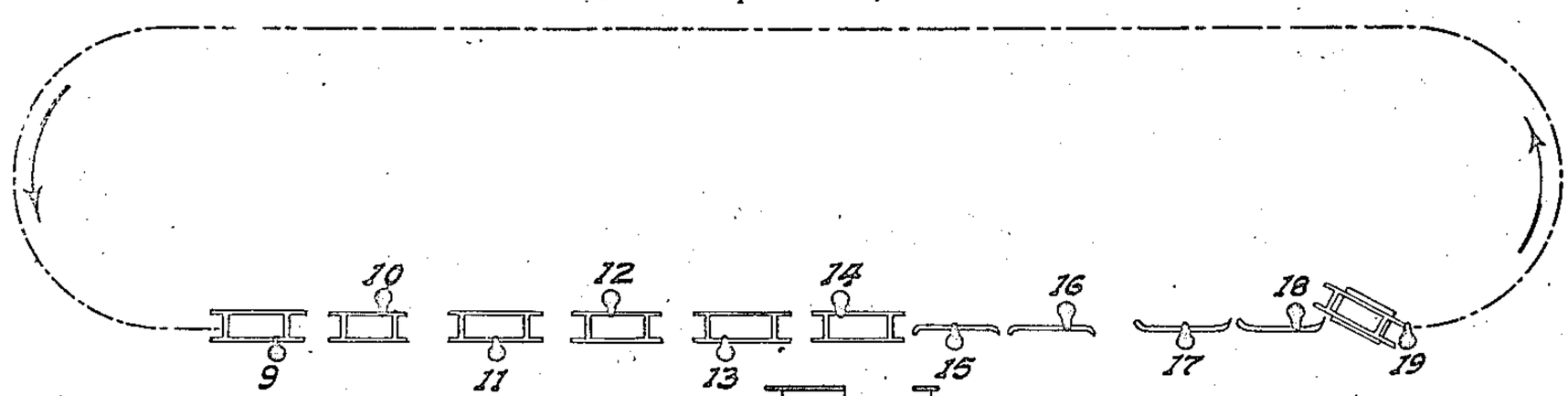


FIG. 1.

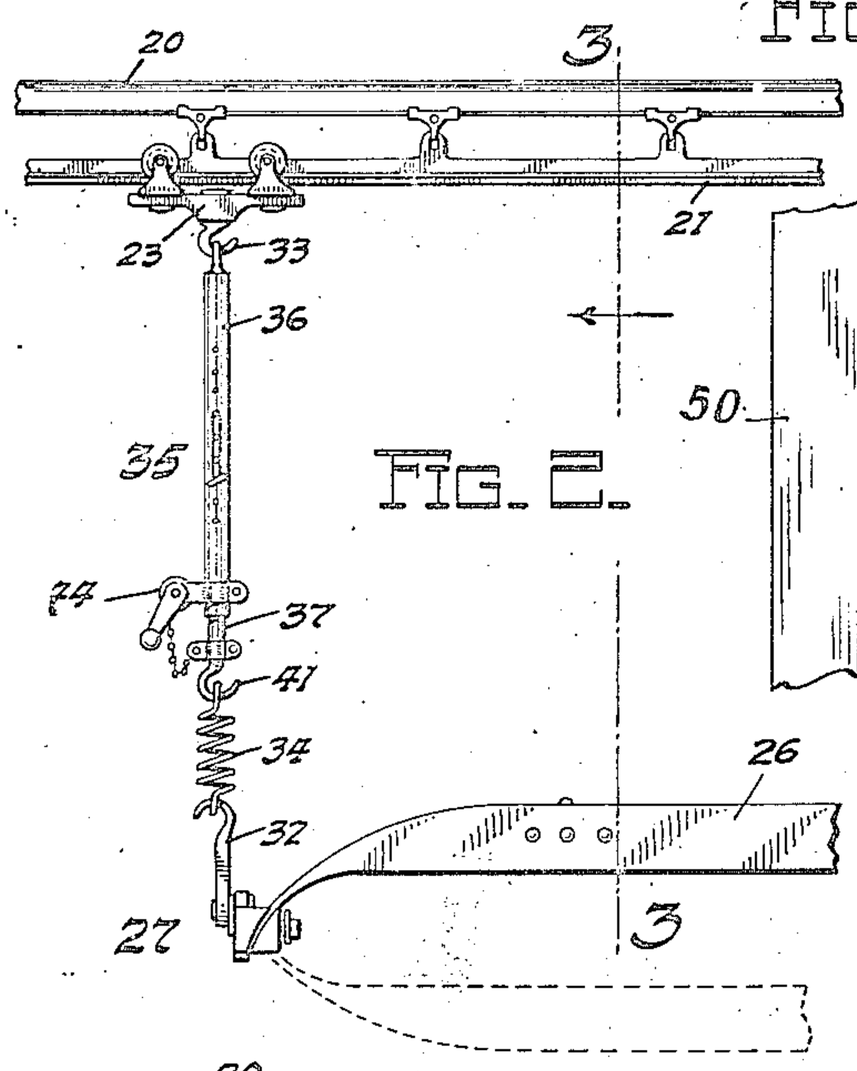
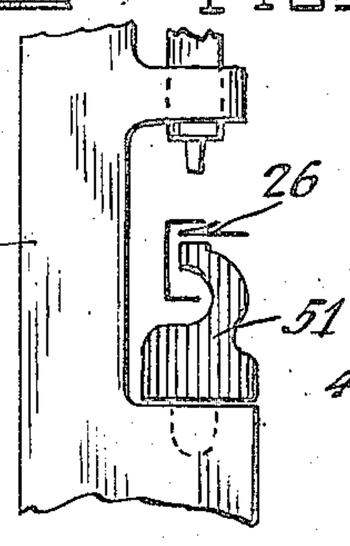


FIG. 2.



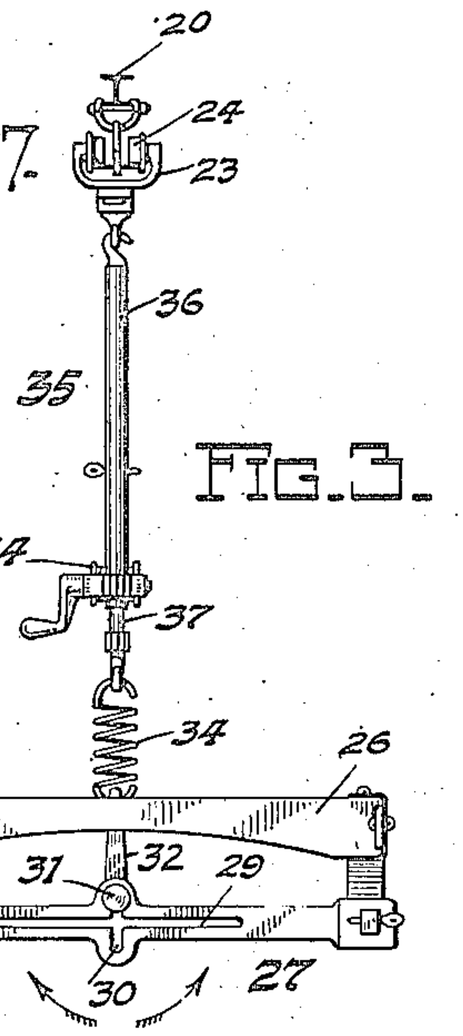


FIG. 3.

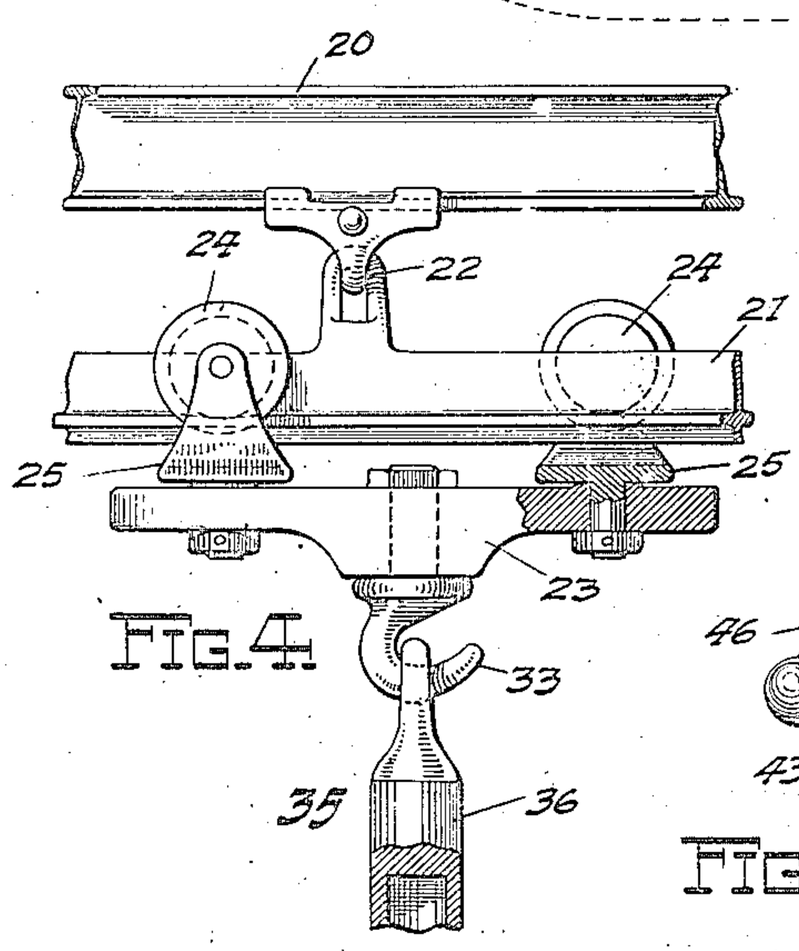


FIG. 4.

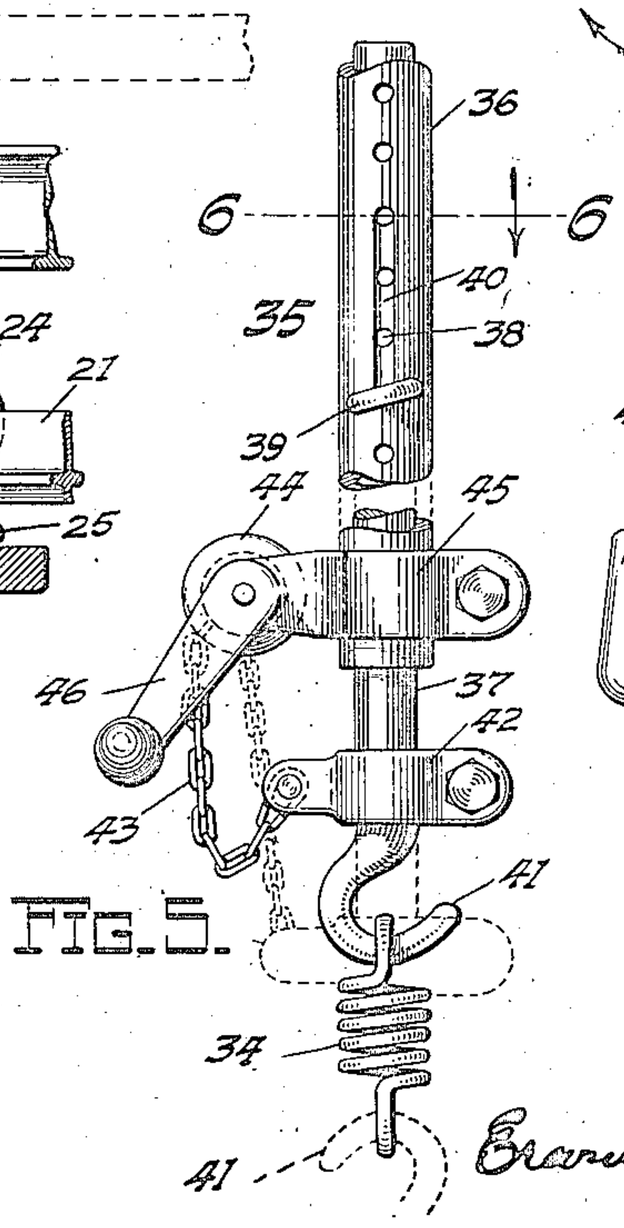


FIG. 5.

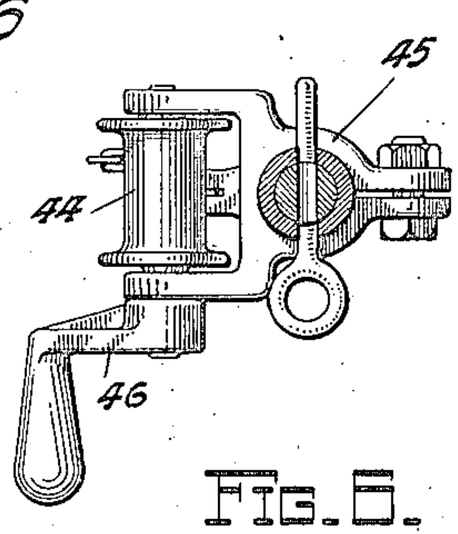


FIG. 6.

WITNESS

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR UNITING THE PARTS OF VEHICLE FRAMES.

Application filed September 26, 1921. Serial No. 503,408.

To all whom it may concern:

Be it known that I, HALWARD G. WESTMORE, a citizen of the United States, and a resident of the city of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented a certain new and useful Improvement in Methods of and Apparatus for Uniting the Parts of Vehicle Frames; and I hereby declare the following to be a clear, exact, and complete description thereof, such as will enable persons skilled in the art to which the invention pertains to make and use the same, reference being had to the accompanying drawing for an understanding of the construction of an embodiment of my invention and the operation thereof.

The invention relates to an improved method of assembling and uniting the pressed steel parts of an automobile or other vehicle frame into a completed structure, and also to an apparatus by means of which my improved method may be carried into effect.

The present rate of production of automobile frames in the plant of the assignee corporation is about two thousand frames per day. The assembling of the side bars, cross bars, and other parts which enter into the construction of so large a number of frames, and uniting such parts into permanent unitary structures, has presented a problem involving elements of time and labor which has induced me to seek some new and simplified methods whereby the production could be increased or economy in cost thereof attained. and my efforts along these lines have resulted in the present invention.

According to existing practices, the frame elements have been assembled in their proper relative positions and temporarily connected by means of rivets, in the semblance of their completed form, prior to upsetting or spreading the rivets to permanently unite the parts. A stack of loosely assembled frames has been loaded upon a truck and taken to the first of a group of riveting machines. By reason of the scattered location of the rivets throughout the frame, and the peculiar conditions affecting most of them, due to their various and somewhat inaccessible locations, it has been necessary to provide several riveting machines in the group, each provided with an anvil specially shaped to perform the generally difficult work of riveting. After the several rivets for which the first riveting machine has been specially designed, have been upset or spread, the truck load of frames has been taken to the next riveting machine and subjected to a like operation upon other and differently located rivets, and this operation is repeated throughout the whole group of riveting machines, until all of the rivets which unite the frame parts have been set in their several positions, and the frame structure completed.

The amount of labor required in carrying out this older process is very great, it being necessary to have a gang of four or more men at each riveting machine, who lift a frame from the truck, carry it to the riveting machine where they manually support it during the operation, and then place the frame on another truck. When filled, the truck is taken to the next machine, where another gang of men performs the second riveting operation, and so on, until the work is completed. The time required for thus separately and repeatedly handling each of the frames in the large number of riveting operations required in completing the frame, has been very great and has involved an item of considerable expense in the outlay for wages. In the little while that my process and apparatus have been in operation, the daily output of completed frames by the same number of men as were formerly employed in the riveting force, has been increased more than one-half, by the use of such process and apparatus.

In carrying out my invention, I establish a line of riveting machines in a double row, the machines in the opposed rows being staggered with relation to each other, and pass the assembled frames along the center of such line and between the rows of riveting machines thus formed. In the general construction of these frames, a rivet in one location at the side of the frame, has a complemental rivet similarly located at the other side of the frame, each of which rivets, or it may be a set of rivets at the particular point in the frame, requires an anvil of peculiar formation to enable the riveting operation to be effected. Viewing the frame in its normal or horizontal position, some of the rivets point upwardly and some downwardly, while others point outwardly from each side. It is therefore necessary that the

frame be rotated on its longitudinal axis at times, in order that the several rivets distributed through the frame may be properly positioned in the riveting machines. This laborious work has heretofore been done by hand, and has consumed an undue amount of time, as before stated. The limitations of space, as well as other conditions, render desirable the use, as a rule, of riveting machines in which the plunger carrying the rivet set or punch operates in a vertical plane.

Over the central line of the double row of riveting presses, I hang a track which supports the carrier apparatus for the assembled frames. Wheeled trolleys move along the track and support the frame at a given level in its passage longitudinally through the riveting machines. The carrier for the frame is so constructed that the points of axial suspension and rotation of the frame will be maintained, irrespective of the position of the frame, that is, whether it be horizontal, inverted, or vertical. The anvil of each riveting press will be set at the desired elevation with respect to the floor, and consequently the rivet to be spread will be brought automatically to such elevation, in whatever position of suspension the frame may be at the moment that it is presented to the riveting press. The carriers for the frames are connected with the trolleys which move over the suspended track, by means of yielding connections, which latter will permit entire freedom of movement of the frame when adjusting the latter to seat the rivet in correct position on the horn of the anvil.

In carrying out my improved process, the frame elements, as hereinbefore indicated, are temporarily secured in their respective positions by means of loosely held rivets, and the assembled frame is then placed upon the carriers and started down the line. One frame follows another in close succession, so that the frames move along the line of riveting machines in a continuous procession, such movement being broken by an intermitting period of rest before each riveting machine, to enable the particular riveting operation or operations to be performed thereat. The separate riveting operations performed by the several machines are therefore effected simultaneously during the intermitting periods of rest incident to the movement of the whole number of frames. In actual practice, it requires less than thirty seconds in point of time to spread all of the rivets and permanently connect the parts of an automobile frame into a unitary structure by my improved process.

After the last riveting machine of the line has performed its work, the frame is released from the carriers, and the latter are returned to the point of commencement, for support of another frame in its passage through the riveting machines.

The carriers referred to are constructed as clamps or supports, one for each end of the frame, and each clamp has such peculiar configuration as will adapt it to the support of the particular type of automobile frame that is being made at the time. The bar which forms the main member of the carrier and supports the clamps at its ends, extends the width of the automobile frame, and is provided with a longitudinal and a vertical slot, crossing each other at the mid length of the said bar. The connection of the carrier with its suspending means comprises a pin working in the slots referred to, and when the pin is in one end or the other of either of the slots, the automobile frame will be properly supported in a state of equilibrium, either in horizontal or vertical position, for the riveting machine to act thereon. To change the position of the frame, it is necessary only to rotate the latter so that the supporting pin will pass from the end of one slot to another, as may be desired. Convenient adjusting means for regulating the height of the carriers with respect to the floor have been provided, as will be described in detail hereinafter.

The novel features of my invention will be pointed out in the appended claims.

In the drawing which accompanies and forms part of this specification,

Figure 1 shows in plan the general course of the overhead track which I employ in carrying out my process, and showing also the relative arrangement of the riveting machines with reference to the line of travel of the succession of automobile frames, and the several positions of the latter while in transit along the line.

Fig. 2 is a view in elevation showing a section of the elevated track and one end of an automobile frame, together with a trolley traveling over the track, and the connection between such trolley and the carrier supporting one end of an automobile frame.

Fig. 3 is a view in elevation looking in the direction of the arrow, Fig. 2, and showing the longitudinal and vertical slots in the frame carrier bar.

Fig. 4 is an enlarged detail showing a section of the track and the manner of supporting the trolley thereon, this view showing also certain structural features of the trolley.

Fig. 5 is an enlarged view showing details of the construction of the link connecting the trolley and the frame carrier, and illustrating the means for securing vertical adjustment, so as to support the frame at the desired level.

Fig. 6 is a cross section on the line 6—6, Fig. 5, looking in the direction of the arrow.

Fig. 7 is a conventional view of a portion of a riveting press, showing one form of

anvil used, and indicating the position of the frame with relation thereto during a riveting operation.

In the drawing, Fig. 1 shows in the broken line the general course of the overhead track and the arrangements of the several riveting machines of the line. The overhead structure is composed of a beam 20, suitably supported at a fixed level, its arrangement, in the present instance, having parallel runs, connected at their curved ends so as to constitute an endless track. Depending from the beam 20 is a track 21, which latter is pivotally connected to the beam as at 22, and so as to have provision for a swinging movement as the assembled frames, supported in the floating manner hereinafter described, vibrate laterally in their passage along the line of riveting machines. The track 21 is formed as an inverted T-bar, or it may be any other form of bar, provided with a run way which supports the rollers of the trolley 23. In the construction illustrated, the web or stem of the inverted T-bar is connected to the beam 20 in such manner that the connection forms the pivotal point 22 for the lateral movement of the trolley track with respect to the beam 20, when the assembled frame is vibrated from side to side. This arrangement permits the wheels 24 of the trolley to remain seated at all times with an even pressure upon the flanges of the track 21. The brackets 25 supporting the wheels 24 are swiveled in the trolley 23, so that such trolley may adapt itself to the curved formation of the supporting rail at the ends of the runs in the overhead system, and in passing from one course to the other.

A portion of an automobile frame is indicated at 26. As hereinbefore described, this frame is composed of the usual previously shaped side bars and cross bars, and other parts, which elements are assembled and temporarily connected by means of rivets loosely placed in the registering perforations in the respective frame elements, and slightly upset at their points to form enlargements which prevent dislodging.

To each end of an assembled frame 26 a supporting carrier 27 is applied. This carrier comprises a bar 28, which is provided at each end with clamps of any appropriate configuration which will enable them to be quickly coupled to and engage the projecting ends or corners of the automobile frame to support the latter. In view of the necessity for the provision of separate clamps especially constructed to permit easy application to automobile frames of different makes, I have not illustrated the specific form of any of such clamps. The matter of their construction however is a very simple one, and it is necessary only to provide a clamp at each end of the bar 28, which will perform the desired function of supporting the automobile frame for longitudinal movement while in a state of suspension. The carrier bar 28 is provided with a central longitudinal slot 29, bisected at its mid-length by a cross slot 30. A headed pin 31, forming the suspension point for the carrier, is passed through the cross bar 28, and is fixed in a hook 32.

The trolley 23 is provided with a depending hook 33, and the said hooks 32 and 33, are connected by means of a contracting spring 34 and an extensible rod 35, the latter parts forming the means of attaching the frame carrier 27 to its supporting trolley 23. It will be understood that two trolleys 23 and two carriers 27, with intermediate connections, constituting a set, will be provided for each frame 26, a carrier bar 28 being applied at each end of the automobile frame.

The extensible rod 35 is formed of telescoping members 36 and 37, the latter being provided with perforations 38 through any one of which may be passed a cotter pin 39 to adjustably fix the length of the rod 35. The outer member 36 of the telescoping connection is slotted for a portion of its length as at 40, to permit the more ready insertion of the cotter pin through a perforation in the inner member 37 of such connection, and to relieve the said pin from the weight of the parts when a change in the position of the pin is desired. A hook 41 at the lower end of the inner sliding member 37 of the connection 35, receives an eye at the upper end of the spring 34.

Clamped about the lower end of the said inner member 37, is a vertically adjustable lug 42, to which is attached one end of a chain 43, the other end of which is passed about a winding drum 44, supported upon a similarly adjustable lug 45, which latter is clamped about the lower end of the outer member 36. By rotating the crank 46 and winding the chain around the drum, the length of the connecting rod may be taken up, and vertical adjustment of the frame carriers 27, with reference to their height from the floor, may be quickly effected in a simple manner. But the winding drum is not essential to the effective operation of my invention, and may be omitted, if desired.

In the drawings, I have diagrammatically indicated a line comprising eleven riveting presses numbered from 9 to 19, inclusive, such line of presses being arranged in two parallel rows, with the presses of one row staggered with respect to the presses of the other row. The flexibility in the connections of the carrier with the trolley permits the movement laterally of the frame to position it operatively with respect to the presses at

both sides of the line, during the travel of the frame. But it will be understood that the invention will be efficient with the riveting presses arranged in a single line, that is, all facing the same way. However, I have found that the staggered arrangement of the riveting presses with respect to the line of travel of the assembled frame members is conducive to a larger production, inasmuch as a rivet at one side of the frame has a complemental rivet at the other side of the frame, so that such separately located rivets may be set or spread in succession without changing the position of the frame, when the latter is partaking of its longitudinal movement. The parallel lines of presses are spaced sufficiently to afford a clear and free contiguous passage for the frames, and the latter need to be moved laterally but slightly to position them with relation to the riveting devices.

The riveting presses 50, Fig. 7, are equipped with anvils 51, each of which is so formed and positioned as to be adapted to the performance of its work at a given point upon the assembled frame, and in view of the different conditions affecting the location of the rivets, the several anvils will be so shaped as to enable the horns thereof to be entered in the angles of the frames to receive the heads of the rivets. The assembled frames are placed upon the carriers in succession and started along the line of the riveting presses, each of which, as before explained, will perform its particular riveting operation in succession. While the frames are thus moved in a continuous procession through the line of riveting presses, there will be a momentary interruption of the movement of the frames and the latter are brought to a position of rest in front of the respective riveting presses, to permit the riveting operations to be performed, so that such riveting operations on all of the frames are performed in the same time, although in a divided operation. When the last riveting operation has been performed by press 19, or the last press in the line, the frames are removed in succession from the pairs of supporting carriers, and the latter are returned over the other run of the track to the starting point, and another assembled frame will be placed in suspended position thereon. But these variations do not change materially the plane of movement of the floating pins or journals 31.

The supporting centers 31, for the carriers do not vary their vertical position, except as permitted by the resiliency of the springs 34, or as pressure may be applied to the frame to position the rivet accurately upon the horn of the anvil. The initial tension of the said springs is such that the plane of movement of the succession of frames is maintained while passing through the several riveting presses. With the pin 31 in the upper end of the slot 30, or of the slot 29, when the frame is turned from its horizontal to its perpendicular position, the frame will be in a state of equilibrium. The length of the slots will be such as to enable proper positioning of the frame with relation to the anvil to be effected with the frame in either position. By means of the apparatus, the assembled frames in the various stages of completion of the uniting operations are maintained in a state of free or floating suspension, which, by reason of its flexibility, permits their manipulation, as desired, with the expenditure of little effort and no waste of time. I regard it as important that the suspending points 31 for the frame carriers are maintained in an approximately constant position with reference to the horizontal plane of the movement, for this provision enables the frame to be supported in riveting position, either horizontal or perpendicular, with respect to the riveting devices of the presses, notwithstanding the variation of the height of such devices from the floor. Hence, the men at each riveting press are relieved of the heavy work of lifting the frames and supporting them during the riveting operation, and the facility with which the frames are transported from press to press under my new system has enabled me to increase very materially the output, as compared with the methods formerly practiced.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. A method of forming vehicle frames, which consists in temporarily securing the frame elements in their respective positions by means of loosely held rivets, supporting a plurality of assembled frames in a state of suspension to permit their manipulation, advancing the frames in succession along a line of travel with intermiting periods of rest for all of said frames, and permanently connecting the elements of each frame in a divided operation by progressively spreading the rivets during the successive periods of rest.

2. A method of forming vehicle frames, which consists in temporarily securing the frame elements in their respective positions by means of loosely held rivets, supporting a plurality of assembled frames in a state of suspension to permit their manipulation, advancing the frames in succession along a line of travel with intermitting periods of rest for all of said frames, and permanently connecting the elements of each frame in a divided operation by progressively spreading the rivets during the successive periods of rest; like riveting operations on the succession of frames being performed at the same stopping point.

3. A method of forming vehicle frames, which consists in positioning the several frame elements with respect to each other, temporarily securing said elements in their respective positions by means of loosely held rivets, supporting a plurality of assembled frames in a state of suspension to permit their manipulation, advancing the frames in succession along a line of travel with intermitting periods of rest for all of said frames, and permanently connecting the elements of each frame in a sub-divided operation performed during the periods of rest, wherein the connecting rivets at different points in the frame are spread at different stopping points, like riveting operations on the frames being performed at the same stopping point.

4. A method of forming vehicle frames, which consists in positioning the several frame elements with respect to each other, temporarily securing said elements in their respective positions by means of loosely held rivets, supporting a plurality of assembled frames in a state of suspension to permit their manipulation, advancing the frames in succession along a line of travel with intermitting periods of rest, and permanently connecting the elements of each frame by a sub-divided operation performed during the periods of rest, wherein the connecting rivets at different points in the frame are spread at different stopping points.

5. A method of forming vehicle frames, which consists in positioning the several frame elements with respect to each other, temporarily securing said elements in their respective positions, supporting a plurality of assembled frames in a state of suspension to permit their manipulation, advancing the frames in succession along a line of travel with intermitting periods of rest for all of said frames, and permanently connecting by riveting the elements of each frame in a sub-divided operation performed during the periods of rest, wherein the connecting rivets at different points in the frame are spread at different stopping points, like riveting operations on the frames being performed at the same stopping point.

6. A movable carrier for supporting an assembly of automobile frame members, comprising pivotally supported bars for supporting the frame, said bars having a longitudinal slot and a cross slot, bisecting each other at a central point of the bar, and a supporting pin working in the end of the slots in the bar and forming the journal about which the frame may be axially rotated and presented in a state of equilibrium at different levels for riveting operations.

7. A conveyor for supporting the assembled members of a frame pending riveting operations thereon to permanently connect such members into a rigid and unitary structure, such conveyor comprising an overhead rail, a trolley supported thereon, and means depending from the trolley to support the said frame members in position for setting the rivets therein, in combination with a line of riveting presses adapted to progressively set the rivets in the passage of the frames along the line.

8. In a frame riveting apparatus, a plurality of riveting presses arranged to afford a contiguous line of travel therealong, and an overhead trolley system provided with means for suspending the assembled members of an automobile frame in floating position for action of the riveting presses to connect the said assembled members into a permanent and unitary structure, said presses acting in succession to progressively unite the frame members as the latter are moved along the line of travel.

9. In a frame riveting apparatus, a line of riveting presses, an overhead trolley system, a connection depending from each trolley and a carrier supported by the said connection, the said carrier being adapted to support the assembled members of an automobile frame in position for action by the several riveting presses to unite the frame members into a rigid structure as they pass along the line, the said presses effecting different riveting operations upon different parts of the frame in succession.

10. In a frame riveting apparatus, a plurality of riveting presses, an overhead trolley system, connections from the rolleys for supporting the assembled members of an automobile frame in position for action by the riveting presses thereon to unite the said frame members into a rigid structure, the said carriers being provided with means whereby the frame is supported in position for action upon anvils at different levels, and the said presses performing different riveting operations in succession upon the frame as the latter is moved along the line of travel.

11. In a frame riveting apparatus, riveting presses arranged at each side of a line of travel, a trolley system having depending connections extending to the line of travel, frame carriers supported by the said connections and adapted to present the assembled members of an automobile frame in position for the action of the riveting presses to unite such frame members into a rigid structure, the connections between the carriers and the support for the trolley being flexible to permit the carriers to be moved toward the presses at either side of the line.

12. In a frame riveting apparatus, riveting presses arranged to afford a line of travel, in combination with a trolley system provided with approximately constant points of suspension movable in sub-

stantially one plane for supporting the frame for longitudinal movement in the different riveting positions of the latter, whereby the riveting operations may be effected upon the frame in both its horizontal and vertical positions without materially changing the line of travel thereof.

13. In a frame riveting apparatus, a line of riveting presses, in combination with a trolley system for conveying frames along the line of presses, the trolley system being provided with pendant means supporting floating journals, as 31, which travel in a substantially fixed path, and frame carriers supported upon the said journals to permit the floating frames to be rotated into positions for different riveting operations by the presses in the line.

In testimony whereof, I have signed my name at Milwaukee, this 13th day of September, 1921.

H. G. WESTMORE.

Witnesses:
W. F. WOOLARD,
E. W. BURGESS.