

March 16, 1926.

F. ACKERMAN

1,576,702

ELECTRICALLY OPERATED BRIDGE CRANE

Filed Dec. 31, 1924

2 Sheets-Sheet 1

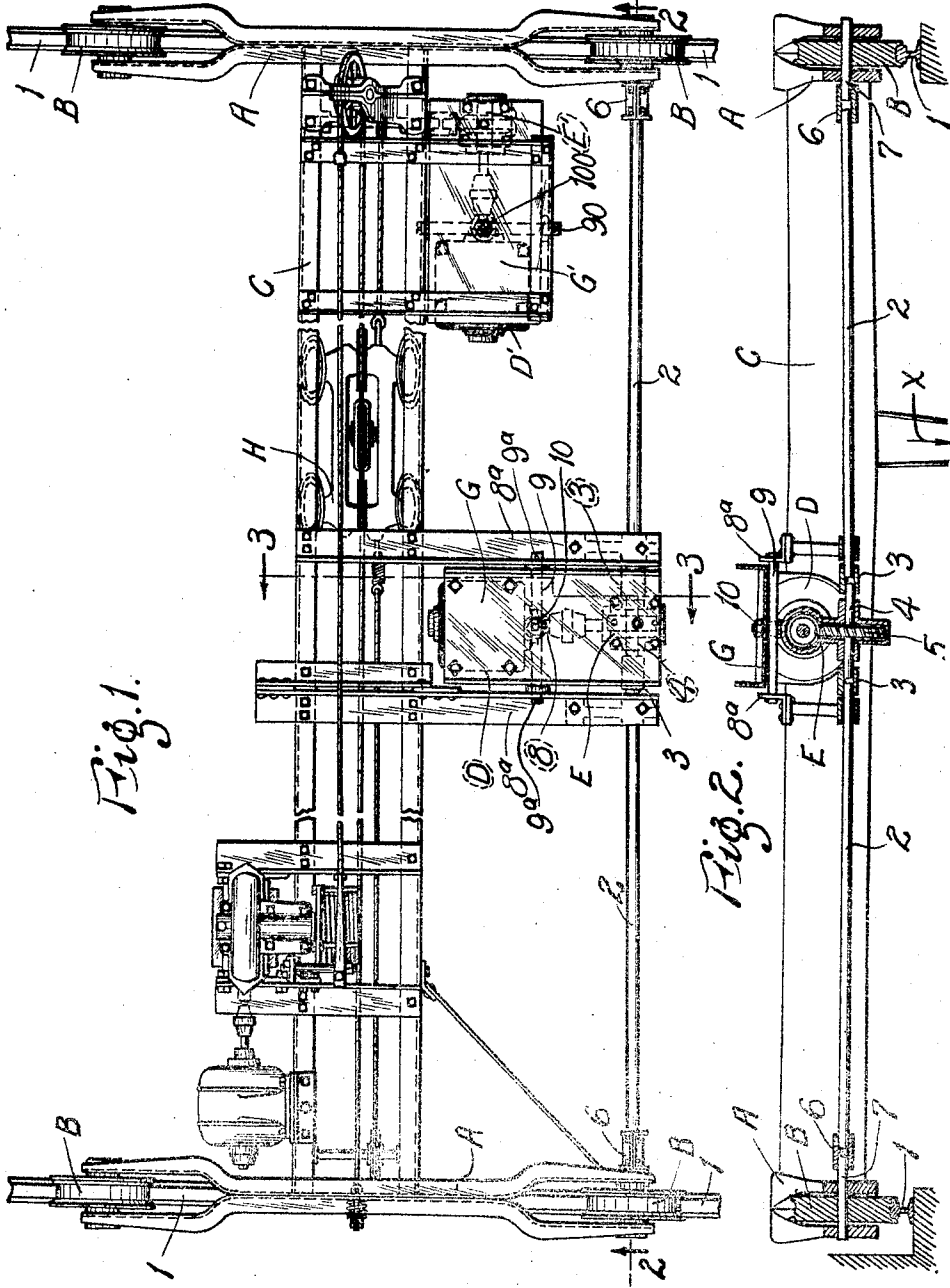


Fig. 1.

Fig. 2.

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Fig. 3.

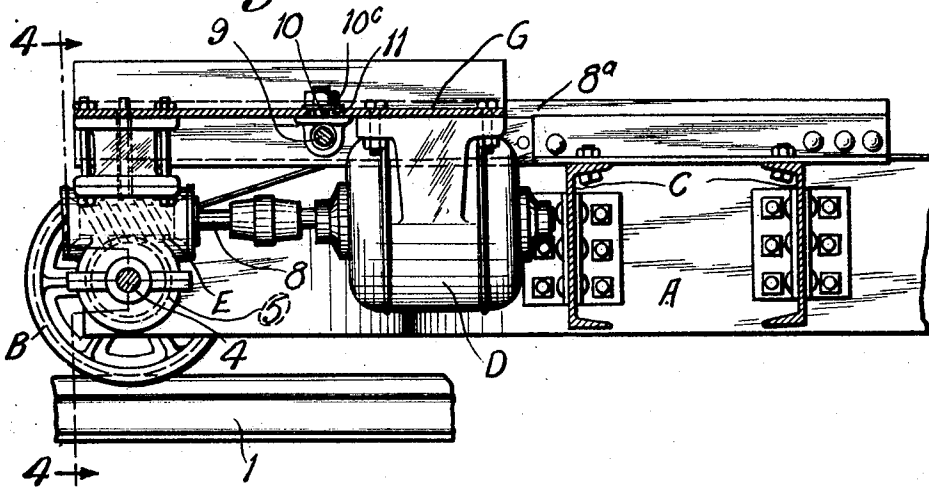


Fig. 4.

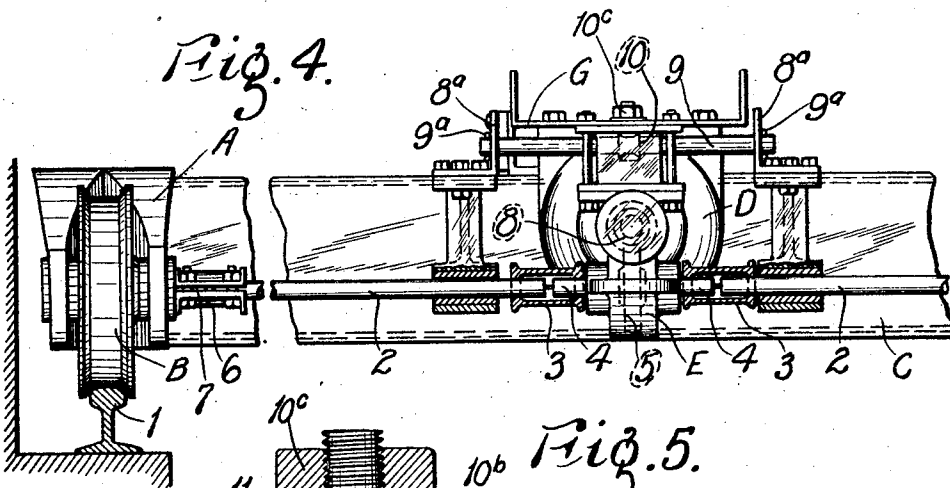
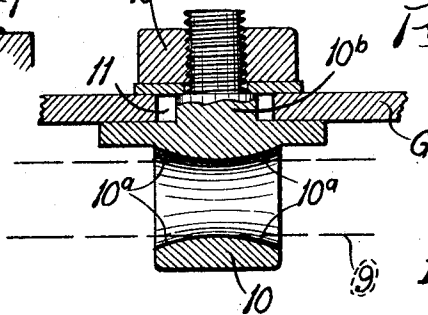


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANK ACKERMAN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO CURTIS & CO. MFG CO., OF
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ELECTRICALLY-OPERATED BRIDGE CRANE.

Application filed December 31, 1924. Serial No. 759,052.

To all whom it may concern:

Be it known that I, FRANK ACKERMAN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Electrically-Operated Bridge Cranes, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to cranes of the type that comprise a transversely-disposed "bridge" connected at its ends to end frames equipped with wheels which travel on an overhead track, and a mechanism for propelling the crane along its track, composed usually of an electric motor and a speed reducing gearing mounted on the bridge and operatively connected with a transversely-disposed shaft that drives the wheels of the crane.

Notwithstanding the fact that the bridge and end frames of a crane of the type mentioned are rigidly connected together, there is considerable twisting and weaving of the crane members when the crane is in operation, due to variations in the elevation of the rails of the track and irregularities in the wheel tread surfaces of the rails, and there is also considerable deflection or sagging of the bridge, due to changes in the amount and position of the load carried by the trolley that travels on said bridge. In conventional cranes of this type the motor and speed reducing gearing of the propelling mechanism are mounted stationarily on the bridge and rigidly connected to the same. Consequently, the twisting and weaving of the crane members and the variable deflection or sagging of the bridge causes the co-operating parts of the propelling mechanism to bind and to be thrown out of proper alignment, resulting in undue wear and loss of power. Moreover, as the housings of the motor and the speed reducing gearing are connected together and secured to the bridge by numerous fastening devices, it is a difficult task, requiring considerable time, to replace either the motor or speed reducing gearing, if either of said elements becomes defective.

One object of my invention is to provide an electrically-operated bridge crane in which the propelling mechanism for the

wheels of the crane is so constructed and arranged that the twisting and weaving of the crane members and the deflection of the bridge when the crane is in operation will not set up strains in the propelling mechanism that result in loss of power and undue wear on the co-operating parts of said mechanism.

To this end I have devised a bridge crane in which the motor and the speed reducing gearing of the propelling mechanism are combined as a single power unit that is mounted on the bridge of the crane in such a way that it is capable of practically universal movement relatively to the bridge. Accordingly, when the crane is in service the twisting and weaving of the crane members and the deflection of the bridge merely causes a change in the relative position of the power unit and the bridge without, however, destroying the operative relationship between the motor and the speed reducing gearing, or between said gearing and the wheel operating shaft which it drives. In order that the propelling mechanism may be repaired quickly and easily, the wheel operating shaft is composed of sections that are joined by coupling devices to the speed reducing gearing, and the power unit is retained in position on the bridge by a single fastening device that can be removed quickly. Consequently, if the propelling mechanism becomes defective, the power unit can be uncoupled from the wheel operating shaft and removed from the bridge and a perfect power unit quickly substituted for same and connected to the wheel operating shaft in a fraction of the time that is required to disassemble the parts of the propelling mechanism of a conventional electrically-operated bridge crane.

Figure 1 of the drawings is a top plan view of a bridge crane constructed in accordance with my invention.

Figure 2 is a transverse sectional view of said crane, taken approximately on the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view, taken on the line 3—3 of Figure 1, looking in the direction indicated by the arrows.

Figure 4 is a front elevational view of a portion of the crane, partly in section, taken on the line 4—4 of Figure 3; and

Figure 5 is an enlarged detail sectional

view of the eye bolt on the supporting plate of the power unit through which the supporting shaft on the bridge passes.

In the drawings, A designates the two end frames of my improved crane, B designates the wheels on said end frames which travel on the rails 1 of an overhead track and C designates the bridge of the crane that may be of any preferred construction but which is herein illustrated as composed of two transversely-disposed, parallel members connected at their ends to the end frames A. The propelling mechanism of the crane is composed of an electric motor D, a speed reducing gearing E and a wheel operating shaft that transmits movement from the gearing E to the wheels B of the crane, the particular type or kind of motor, speed reducing gearing and wheel operating shaft being immaterial, so far as my invention is concerned. I prefer, however, to use a wheel operating shaft that comprises two sections 2 whose inner ends are joined by couplings 3 to a shaft or spindle 4 secured to the driving element 5 of the speed reducing gearing and whose outer ends are joined by couplings 6 to shafts or spindles 7 secured to two of the wheels B of the crane.

The motor and speed reducing gearing are connected together by a shaft 8 or other suitable means and are attached to a supporting member G which is mounted on the bridge of the crane in such a way that said motor and gearing constitute a power unit which is capable of practically a universal movement relatively to the bridge. In the crane herein illustrated the bridge C is provided with a pair of laterally-projecting supports 8^a that extend parallel to the end frames A and the supporting member G of the power unit is rockably mounted on a horizontally-disposed shaft 9 carried by the supports 8^a and arranged parallel to the bridge of the crane, as shown in Figures 1 and 3. The supporting member G, in addition to being capable of rocking vertically with relation to the bridge about the shaft 9 as an axis, is also capable of a slight vertical rocking movement relatively to the bridge about a horizontal axis at right angles to the shaft 9. It is also capable of a slight horizontal movement relatively to the bridge longitudinally of the shaft 9 in either direction, and is constructed in such a way that it is capable of a slight horizontal movement transversely of the shaft 9 in either direction, and a slight rotary movement in the plane in which said supporting member G lies. The above described movements of the supporting member G of the power unit relatively to the bridge of the crane are made possible by arranging the shaft 9 in an eye bolt 10 on the supporting member G that is provided with an opening for said shaft whose end portions are flared at 10^a, as

shown in Figure 5, the internal diameter of said end portions being enough greater than the external diameter of the shaft 9 to permit the supporting member G to which said eye bolt is attached to wobble in all directions. The intermediate portion of the hole in the eyebolt 10 through which the shaft 9 passes has a sufficiently loose fit on said shaft to permit the supporting member G to slide longitudinally of the shaft 9 in either direction, and said eye bolt is attached to said supporting member by a shank 10^b thereon that projects through a slot 11 in the supporting member G and which is provided with a retaining nut 10^c. The slot 11 in the supporting member G through which the shank of the eye bolt 10 passes is of considerably greater length than the diameter of said shank, as shown in Figure 3, and accordingly, as the retaining nut 10^c is not set up tight, the supporting member G is capable of a slight movement transversely of the shaft 9 in either direction and is also capable of a slight rotary movement about the shank of the eye bolt as an axis. If desired, the slot 11 can be made wider than the shank of the eye bolt 10, as shown in Figure 5, so as to permit the supporting member G to move slightly relatively to said eyebolt, longitudinally of the shaft 9.

If, when the crane is in operation, the bridge is subjected to a strain tending to deflect it downwardly intermediate its ends, as indicated by the arrow *x* in Figure 2, the supporting member G of the power unit will move relatively to the shaft 9 sufficiently to compensate for this deflection and cause said member G to assume such a position that no injurious strains are set up in the speed reducing gearing or in the wheel operating shaft connected to said gearing. As the deflection of the bridge varies both as to location and degree, the supporting member G of the power unit automatically adjusts itself to the deflection, and consequently, maintains the parts of the propelling mechanism in a position wherein they are not subjected to undue wear or to friction that diminishes the power transmitted to the wheels of the crane. Likewise, when the end frames A and the bridge C of the crane twist and weave, due to variations in the elevation of the rails of the track or inequalities in the surfaces of the rails over which the wheels travel, the supporting member G of the power unit automatically adjusts itself to each changed condition of the crane members, and thus prevents injurious strains being set up in the propelling mechanism. While I have stated that the supporting member G of the power unit is provided with an eye having a flared opening which receives a shaft 9 that is carried by supports 8^a on the bridge of the crane, it will, of course, be obvious that the

eye could be mounted on the bridge of the crane and the shaft that co-operates with said eye mounted on the supporting member of the power unit without departing from the spirit of my invention. In fact, it is immaterial, so far as my invention is concerned what particular type of device is used for sustaining the power unit, so long as said device is of such a type that it functions as a universal joint and permits the power unit to have a universal movement or a substantially universal movement relatively to the bridge.

The above described method of mounting the motor and speed reducing gearing of the propelling mechanism of a bridge crane also makes it possible to quickly repair the propelling mechanism if the motor or speed reducing gearing becomes defective, due to the fact that the motor and gearing are both rigidly mounted on a supporting member that is retained in position on the bridge by a single element, to wit, the shaft 9. In the form of my invention herein illustrated the shaft 9 is positioned in holes in the supports 8^a that are large enough to permit said shaft to be slipped out of the supports 8 quickly and it is retained in operative position in said supports by cotter pins 9^a or other suitable retaining devices.

While my invention is particularly applicable to the mechanism of the crane that is used to propel the crane along its track, it is also applicable to the mechanism used in a crane for operating the trolley H that travels on the bridge of the crane. Therefore, in Figure 1 of the drawings I have illustrated the motor D' and the speed reducing gearing E' that are used to operate the trolley as being rigidly mounted on a supporting member G' that is located at one end of the bridge and sustained on same by a horizontally-disposed shaft 90, carried by the bridge, and an eye bolt 100 on the supporting member G' that is provided with a flared opening through which the shaft 90 passes, said shaft 90 and eye bolt 100 being so disposed that the supporting member G' is capable of practically universal movement relatively to the bridge of the crane.

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

1. A crane provided with a bridge, and a power unit mounted on said bridge in such a manner that it is capable of practically a universal movement relatively to the bridge.

2. A crane provided with a bridge, a power unit on said bridge consisting of a motor and a gearing directly connected together, and means for enabling said power unit to assume different positions relatively to the bridge when the bridge deflects and the crane members twist and weave while the crane is in operation.

3. A crane provided with a bridge, a power unit, and means for mounting said power unit on the bridge in such a way that the deflection of the bridge and the twisting and weaving of the crane members when the crane is in service exerts no force on said power unit in a way tending to set up injurious strains in same or in the parts driven by said unit.

4. A crane provided with a bridge, a motor and a gearing combined to form a power unit, and a universal connection between said power unit and bridge.

5. A crane provided with a bridge, a power unit, and a universal joint for suspending said power unit from the bridge.

6. A crane provided with a bridge, a power unit, and a connection between said elements comprising a shaft on one of said elements and a part on the other element that is oscillatingly mounted and slidingly mounted on said shaft.

7. A crane provided with a bridge, a power unit comprising a motor and a gearing directly connected together, a supporting member which carries said motor and gearing, and a connection between said bridge and supporting member arranged to permit said member to rock vertically in a plurality of different directions at substantially right angles to each other.

8. A crane provided with a bridge, a power unit comprising a motor and a gearing directly connected together, a supporting member which carries said motor and gearing, and a connection between said bridge and supporting member arranged to permit said member to rock vertically in a plurality of different directions at right angles to each other and also twist or turn slightly in a horizontal plane.

9. A crane provided with a bridge, a power unit consisting of a motor and a gearing, a supporting member that carries said motor and gearing, and a part on the bridge on which said member is oscillatingly mounted and slidingly mounted.

10. A crane provided with a bridge, a power unit, and means for mounting said power unit on said bridge comprising a horizontal shaft on one of said elements and an eye on the other element slidingly mounted on said shaft and provided with an opening for said shaft that is flared at its ends.

11. A crane, comprising a bridge, end frames equipped with wheels, and a propelling mechanism for driving said wheels comprising a transversely-disposed shaft and a power unit operatively connected with said shaft and mounted on said bridge in such a way that it is capable of moving relatively to the bridge to compensate for the deflection of the bridge and the twisting and weaving of the crane members when the crane is in service.

12. A crane provided with a bridge, end frames connected to said bridge and equipped with wheels, a transversely-disposed wheel operating shaft arranged substantially parallel to the bridge, and a power unit operatively connected with said shaft and joined to the bridge by a universal connection, for the purpose described.
13. A crane provided with a bridge, end frames connected to said bridge and equipped with wheels, a propelling mechanism comprising shaft sections connected to wheels of the crane, and a power unit detachably connected to said shaft sections and mounted on the bridge in such a way that it is capable of moving relatively to the bridge in a sufficient number of different directions to compensate for the deflection of the bridge and the weaving and twisting of the crane members when the crane is in service.
14. A crane provided with a bridge, end frames connected to said bridge and equipped with wheels, a propelling mechanism comprising a power unit and a transversely-disposed wheel operating shaft, and means for pivotally mounting said power unit on said bridge comprising a part that is adapted to be removed so as to enable said power unit as an entirety to be disconnected from the bridge.
15. A crane provided with a bridge, end frames connected to said bridge and equipped with wheels, a propelling mechanism comprising a transversely-disposed wheel operating shaft and a power unit detachably connected to said shaft, and means for mounting said power unit on the bridge in such a way that it is capable of rocking vertically relatively to the bridge in a plurality of different directions and is also capable of a slight horizontal movement relatively to the bridge in a plurality of different directions.
16. A crane provided with a bridge, end frames connected to said bridge and equipped with wheels, a wheel operating shaft arranged substantially parallel to the bridge, a power unit detachably connected to said shaft composed of a motor and a gearing directly connected together, a supporting member for said motor and gearing, a supporting shaft on the bridge arranged at one side of same in parallel relation thereto, and an eye on said supporting member surrounding said supporting shaft and provided with an opening that is flared at both ends.
17. A crane, comprising a bridge, end frames connected to said bridge and equipped with wheels, supports projecting laterally from the bridge, a wheel operating shaft disposed substantially parallel to the bridge, a power unit detachably connected to said shaft, and means for mounting said power unit on said supports in such a way that it is capable of rocking vertically relatively to the bridge in a plurality of different directions and is also capable of moving horizontally relatively to the bridge in a plurality of different directions.

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