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POWER UNIT FOR TRAVELING CRANES

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Fig. 1.

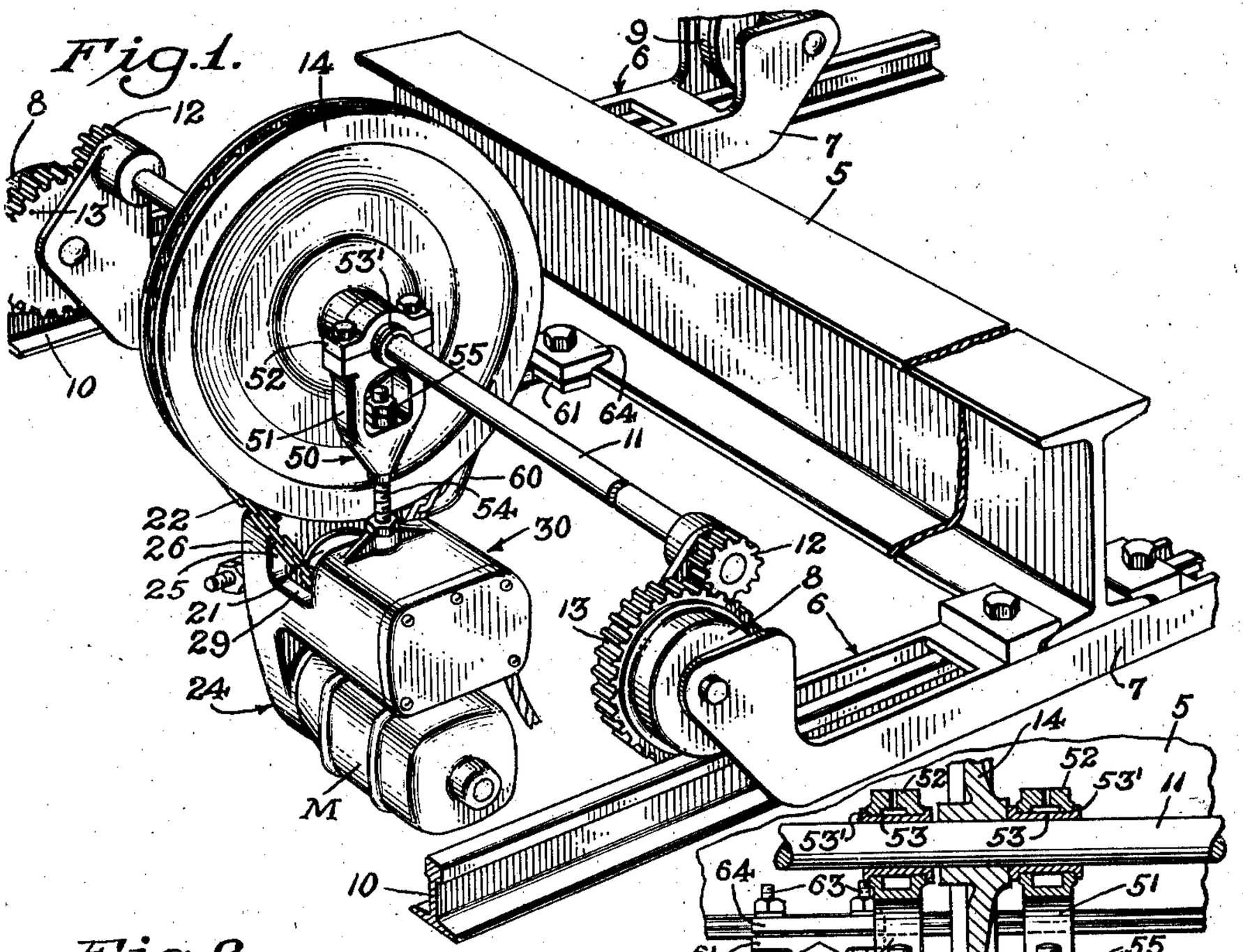

Fig. 2.

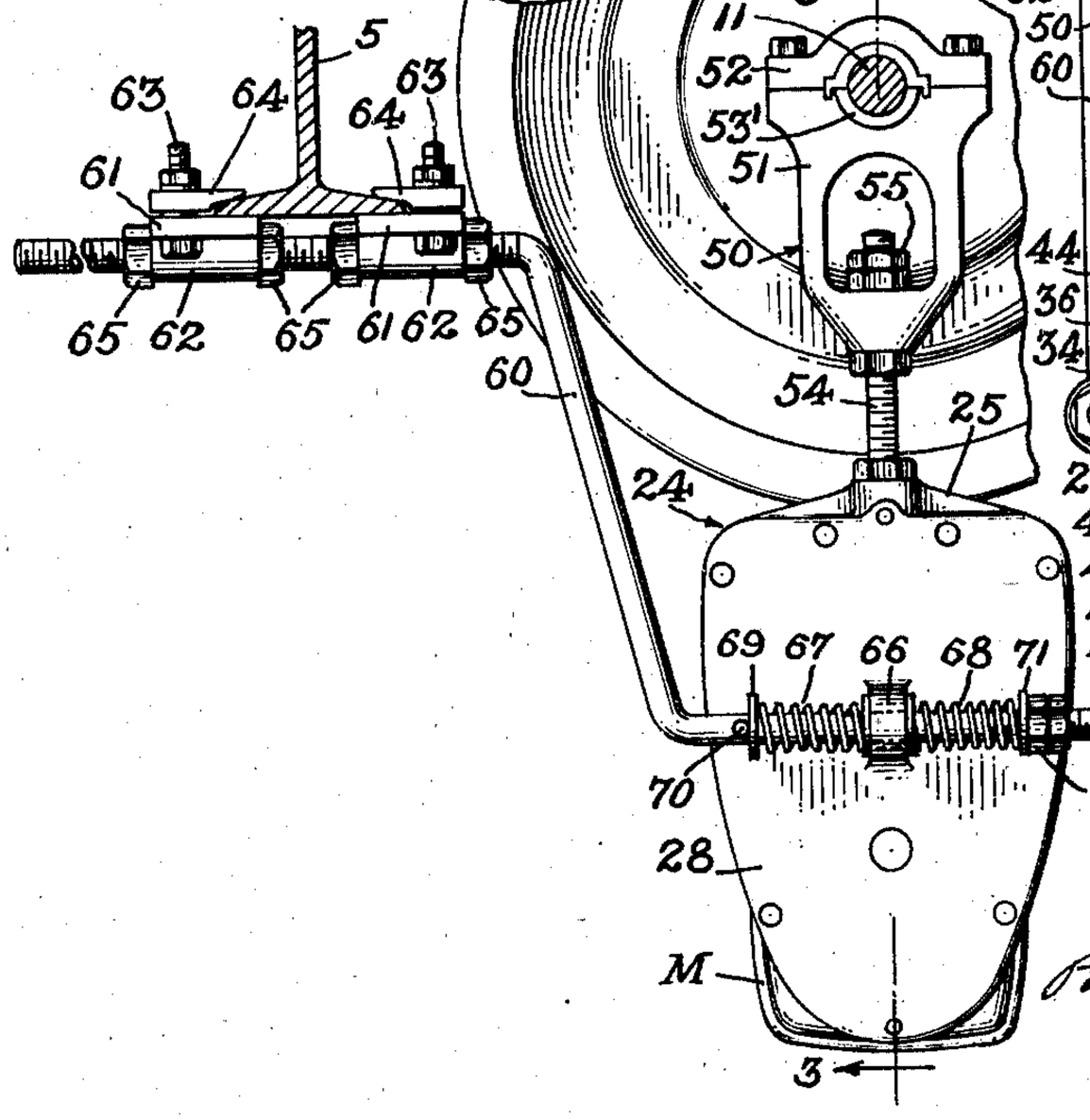

Fig. 3.

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POWER UNIT FOR TRAVELING CRANES

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8 Claims. (Cl. 105—163)

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The invention relates to driving mechanism for traveling bridge cranes or the like and more particularly to a power unit adapted for converting existing manually driven cranes for power operation.

One object of the invention is to provide novel means for mounting the power unit to the crane structure so that the shock and jar incident to the starting of the motor is effectually absorbed thus insuring smooth, shockless acceleration of the crane.

Another object is to provide a power unit for traveling bridge cranes and the like which is simple and compact in construction, inexpensive to manufacture, and which can be easily and conveniently installed in existing hand operated cranes to convert them for power operation.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawing in which:

Figure 1 is a perspective view of a traveling bridge crane equipped with a power unit embodying the features of the invention.

Fig. 2 is a fragmentary end elevational view of the power unit.

Fig. 3 is a vertical sectional view of the unit taken substantially on the line 3—3 of Fig. 2.

Referring to the drawing, the invention has been shown for purposes of illustration as applied to a traveling bridge crane having a bridge member in the form of an I-beam 5 supported at opposite ends by end trucks 6. Each end truck comprises an elongated frame 7 disposed transversely of the bridge member and clamped or otherwise rigidly attached to the bottom flange thereof. Flanged wheels 8 and 9 journaled on trucks on opposite sides of the bridge member support the crane assembly on an overhead track formed by conventional rails 10.

Cranes of the above general character, as well as other types of cranes, hoists and various material handling devices, are commonly equipped with manually operable means for traversing the crane structure or device on the supporting track. In the exemplary bridge crane, this means comprises a horizontally disposed traverse drive shaft 11 extending generally parallel to the bridge member 5 and journaled at opposite ends on the trucks 6. The shaft is drivingly connected with one wheel of each truck, as for example, the wheel 8, by means of pinions 12 fast on the shaft and arranged to mesh with gears 13 rigid with the corresponding wheels 8 of the respective trucks. Rotation is imparted to the drive shaft by means of an endless chain running over a chain pocket wheel 14 fixed on the shaft. The chain, of course, depends belows the crane structure to permit convenient hand manipulation by an operator standing on the floor.

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The power unit comprising the present invention is particularly adapted for converting manually driven traveling bridge cranes of the type above discussed for power operation. In its preferred form, the unit comprises a rigid frame structure adapted to be suspended from the traverse drive shaft 11 and having driving means such as a chain pocket sheave 21 drivingly connected as by a chain 22 with the hand chain wheel 14 on the traverse shaft. A reversible motor M comprising an element of the unit is arranged to drive the sheave 21 in any suitable manner.

The motor M and other elements of the unit are supported in a compact assembly on the frame which is constructed to provide suitable housings for the moving parts and for the electrical equipment associated with the motor. As herein shown a gear housing 24 is formed by a vertical frame member 25 (Figs. 2 and 3) of generally oval contour having an integral flange 26 extending around one side to define a relatively shallow vertically disposed gear compartment 27. This compartment is adapted to be closed by a cover 28 bolted or otherwise rigidly secured to the flanged member.

Projecting laterally from the frame member 25 on the side opposite the flange 26 and preferably substantially at right angles to the plane of the member is a rigid horizontal frame member or arm 29 terminating at its outer end in a box-like housing structure 30. A control relay R or other control mechanism for governing the operation of the motor M may be mounted in the housing 30. It will be understood, of course, that the control of the motor is effected through the medium of a pendant switch (not shown) or other manually operable circuit controlling device conveniently accessible to the operator of the crane, such manual device acting through the medium of the relay R to open and close the current supply circuit for the motor.

As will be seen by reference to Fig. 3 of the drawing, the housing 30 is formed with an end wall portion 31 substantially parallel to the frame member 25 and spaced therefrom to provide clearance for the sheave 21. A boss 32 integral with the wall portion 31 is recessed to receive a bearing 33 in which is journaled one end of a shaft 34 adapted to support the sheave 21 and to which

the sheave is keyed. The other end of the shaft 34 is arranged to project into the housing 24 through an aperture in a boss 35 on the member 25 and is supported therein by a suitable bearing 36. The housing 30 is dimensioned so that its top wall lies substantially in the same plane as the top of the housing 24 while its bottom wall is located in a plane approximately through the center of the housing 24. Space is thus provided below the housing 30 for the motor M which is preferably mounted directly on the frame member 25 with its shaft 40 projecting into the housing 24. Suitable packing is provided around the motor shaft and the shaft 34 to prevent leakage of oil or other lubricant around these parts.

The means for drivingly connecting the motor M with the sheave carrying shaft 34 is enclosed in the housing 24. This means as herein shown comprises speed reduction gearing which may be designed to give any desired rotative speed to the sheave 21. The gearing as herein shown includes a pinion 41 keyed to the motor shaft 40 and arranged to drive an idler gear 42 carried on a shaft 43 journaled at opposite ends on the frame member 25 and the cover 28. Idler gear 42 in turn drives a gear 44 keyed to the inner end of the shaft 34 on which the sheave 21 is mounted.

The vertical arrangement of the housing 24 together with its shape conforming generally to the progressively increasing diameters of the pinions and gears of the reduction gear train is advantageous in reducing both the size and weight of the frame structure to a minimum. Moreover, the arrangement of the housing 30 and the motor M at one side of the housing 24 and one above the other, provides a very compact well balanced structure which can be supported in suspended relation from the drive shaft 11 without interfering with the normal use of the crane and without imposing excessive strain on the shaft.

Any suitable means may be utilized for supporting the unit on the shaft 11 in a manner such that the shaft is free to turn relative to the unit. As herein shown, the supporting means comprises a pair of hangers 50 anchored to the frame and spaced apart so as to straddle the hand chain wheel 14 as shown in Fig. 3. Each hanger preferably comprises a yoke 51 having a cap member 52 detachably secured to its upper end. The yoke and cap member are formed with complementary recesses adapted to hold a generally cylindrical bearing member 53 dimensioned for a rotating fit with the shaft 11.

The yokes 51 of the hangers are secured to the frame by hanger rods 54 threaded into bosses formed respectively in the top walls of the housings 24 and 30 of the frame. To enable the unit to be properly positioned for use with hand chain wheels of different diameters, the yokes are apertured to slidably receive the rods and the latter are clamped in place by nuts 55 threaded thereon in opposed relation. Thus the effective lengths of the hanger rods may be varied to regulate the spacing of the sheave 21 with respect to the hand chain wheel as required for any particular installation.

To enable the power unit to be installed on an existing hand operated crane without requiring disassembly of the traverse drive shaft from the crane, the bearing members 53 are preferably of the sectional type. As herein shown, these members are in the form of half bushings, one associated with the yoke and the other with the cap member. The parts can thus be separated for convenient application to the traverse drive shaft without requiring any dismantling of the crane structure.

In order to make the unit universally applicable to the different sizes and types of cranes and comparable chain driven devices, the hangers 50 and their bearing members 53 are separably assembled. More particularly, the half bushings forming the bearing members are loosely mounted in the recesses in yoke and cap member and are adapted to be retained in place after assembly by flanges 53' on the ends of the bushings. In practice, an assortment of interchangeable bearing members, all having the same outside dimensions but varying in their internal dimensions to cooperate with shafts of different diameters will be kept in stock so that a bearing of the proper size may be selected for any particular installation.

The chain 22 running over the sheave 21 and hand chain wheel 14 provides a driving connection whereby the torque of motor M may be transmitted to the shaft 11. With the unit thus supported on the traverse drive shaft, the torque applied to the wheel 14 will tend to swing the unit around the shaft. Due to the mounting of the motor M and other heavy parts of the unit a substantial distance below the axis of the shaft, the weight of the unit is distributed in a manner such as to oppose such rotation.

Means is also provided for yieldably resisting bodily rotation of the unit relative to the supporting shaft and for absorbing the shock and jar incident to the starting of the motor so as to insure smooth, shockless acceleration of the crane or device to be moved. The means employed for this purpose, as herein shown, comprises a rigid bar 60 having opposite end portions offset with respect to each other but substantially parallel. One end of the bar is secured to a stationary part of the crane structure, as for example, the bridge member or I-beam 5 while the other end is yieldably anchored to the frame of the unit. Due to the offset relation of the end portions, the bar may be readily adjusted for use with beams or girders of various depths by turning it through an angle sufficient to provide the necessary vertical spacing between the end portions.

While any suitable means may be utilized for securing the bar in place, it is preferable to clamp the bar to the bridge member so as to avoid drilling or other machine operations on the member. The clamping means, as herein shown, comprises a pair of opposed clamping devices each including a base plate 61 having a transverse centrally disposed sleeve portion 62 adapted to slidably receive the bar 60. Adjustably secured to the base plate, as by bolts 63, is a clamping plate 64 having its inner lower edge recessed to extend over and cooperate with the flange of the I-beam 5 as shown in Fig. 2. It will be understood, of course, that the clamping means may be applied to the upper flange of the beam if desired.

The clamping devices may be variably positioned and locked in place for cooperation with I-beam flanges of different widths. Such positioning and locking is effected by means of nuts 65 threaded on the bar 60 and positioned to engage opposite ends of the sleeve 62. With the clamping devices properly positioned the clamping plates may be forced into clamping engage-

ment with the flange of the beam by tightening the bolts 63.

The other end of the anchoring bar 60 is adapted to be yieldably connected to the frame of the unit so as to permit limited rotation of the unit relative to the shaft in either direction. In the exemplary form disclosed the bar projects through an aperture in a lug 66 integral with the cover plate 28 and projecting laterally therefrom. The yieldable connection between the bar and the lug is provided by a pair of coiled compression springs 67 and 68 encircling the bar and interposed between the lug and stationary members fixed to the bar on opposite sides of the lug. Thus, spring 67 bears against a collar or washer 69 mounted on the bar and held against endwise movement thereon by a pin 70. The spring 68 bears against a similar collar or washer 71 on the other end of the rod which is held against movement by a nut 72.

When the motor M is started to run in either direction the torque applied to the wheel 14 tends to rotate the unit as a whole, thus compressing one or the other of the springs 67 and 68. The resistance to such compression increases progressively so that the motor torque is applied gradually to the shaft 11 to accelerate the crane smoothly and with complete absence of shock. The use of rheostats or comparable speed controllers is thus unnecessary and smooth starting of the crane is insured at all times. Moreover, the motor M may be of a relatively inexpensive single speed type which materially reduces the cost of the unit.

It will be apparent from the foregoing that the invention provides a power unit of novel and advantageous construction by which a wide variety of manually operated traveling bridge cranes and comparable chain driven devices may be readily converted for power operation. The unit is simple and compact and interferes in no way with the normal operation of the crane. By reason of the novel mounting of the unit and the means provided for absorbing the shock and jar incident to the starting of the driving motor, smooth, shockless acceleration of the crane is obtained even though a simple, inexpensive single speed motor is employed and complicated expensive starting equipment such as rheostats and the like are dispensed with. Thus, the unit is relatively inexpensive and yet capable of efficient operation in driving bridge cranes and the like. Due to the simple manner in which the unit is applied, it may be installed on existing cranes by relatively unskilled labor and without requiring any modifications or changes in the crane structure and, in fact, without drilling or other machine operations.

I claim as my invention:

1. A power unit for a traveling bridge crane or the like having a horizontally disposed transverse drive shaft with a hand chain wheel fast thereon, said unit comprising a rigid frame structure, hangers anchored to said frame structure in spaced relation each including a bearing element engageable with the drive shaft on opposite sides of the chain wheel and operative to support the unit on the shaft, a shaft journaled on said frame structure, a sheave fast on said last mentioned shaft, an endless driving chain connecting said sheave with said wheel, a motor secured to said frame structure, and means drivingly connecting said motor with the shaft carrying said sheave.

2. A power unit for a traveling crane or the like of the type having a traverse drive shaft, said unit comprising, in combination, a frame including a housing having a side wall, a frame member rigid with said wall and projecting therefrom substantially at right angles to the plane of the wall, said frame member terminating in a second housing having an end wall disposed substantially parallel to the side wall of said first housing, axially alined bearings in said walls, a shaft supported in said bearings, a sheave fixed to the shaft intermediate the bearings, a motor secured to the side wall of said first housing below said frame member, speed reduction gearing enclosed within said first housing drivingly connecting said motor with said shaft, means for supporting said frame on the traverse drive shaft of the crane, and means for drivingly connecting said sheave with the traverse drive shaft.

3. A power unit for a traveling crane or the like having a horizontally disposed traverse drive shaft, said unit comprising, in combination, a frame structure including members defining a pair of housings, a horizontal member rigidly connecting said housings, a shaft journaled in the respective housings, a sheave fixed to said shaft intermediate the housings, a motor carried on one of said housings, speed reduction gearing enclosed in said one housing drivingly connecting said motor with the sheave carrying shaft, control means enclosed in the other of said housings for controlling the operation of said motor, a hanger anchored to each of said housings, said hangers having bearing elements engageable with the drive shaft of the crane to support the frame structure, and means drivingly connecting said sheave with the drive shaft.

4. A power unit for a traveling crane or the like having a horizontally disposed traverse drive shaft, said unit comprising, in combination, a frame structure including members defining a pair of housings, a horizontal member rigidly connecting said housings, a shaft journaled in the respective housings, a sheave fixed to said shaft intermediate the housings, a motor carried on one of said housings, speed reduction gearing enclosed in said one housing drivingly connecting said motor with the sheave carrying shaft, control means enclosed in the other of said housings for controlling the operation of said motor, a hanger anchored to each of said housings, said hangers having bearing elements engageable with the drive shaft of the crane to support the frame structure thereon, and a flexible member drivingly connecting said sheave with the drive shaft, said hangers being adjustable to regulate the tension of said flexible member.

5. A power unit for a traveling crane or the like having a horizontally disposed transverse drive shaft, said unit comprising, in combinaation, a vertically disposed frame member, a flange around the edge of said member projecting from one side thereof to define a relatively shallow housing, a horizontally disposed frame member projecting from the other side of said vertical member, means forming a second housing integral with said horizontal member, said second housing being spaced laterally of said first housing, a shaft journaled on said housings and having a sheave fixed thereon intermediate the housings, a motor secured to said vertical frame member below said horizontal frame member, speed reduction gearing in said first mentioned housing drivingly connecting said motor with the sheave carrying shaft, motor control-

ling means in said second housing, means attached to said housings for supporting the frame structure on the traverse shaft of the crane, and means drivingly connecting said sheave with the traverse shaft.

6. A power unit for a traveling crane or the like having a horizontally disposed drive shaft, said unit comprising, in combination, a frame structure including a pair of laterally spaced frame members, a horizontal member rigidly connecting said frame members, a shaft, a sheave fixed to said shaft, bearings carried by said frame members positioned to support said shaft on opposite sides of said sheave, a motor mounted on one of said frame members, speed reduction gearing connecting said motor with said shaft, means cooperating with said one frame member to form a housing enclosing said gearing, other bearings engageable with the drive shaft of the crane to support said frame structure thereon, a flexible member drivingly connecting said sheave with the drive shaft of the crane, and means connecting said other bearings to the respective frame members for adjustment toward and from the members to regulate the tension of said flexible member.

7. A power unit for a traveling crane or the like having a traverse drive shaft, said unit comprising, in combination, a frame structure including a pair of laterally spaced rigidly connected members, a drive shaft journaled at opposite ends in said members and adapted to be drivingly connected with the traverse shaft, a motor supported on one of said members, speed reduction gearing carried by one of said members for connecting said motor with said drive shaft, and means rigid with said frame structure for supporting it in suspended relation to said traverse shaft, said supporting means being adjustable to vary the spacing of said drive shaft from the traverse shaft.

8. The combination with a power unit adapted to be mounted in suspended relation from the traverse drive shaft of a traveling crane having a flanged bridge member, of a torque arm connecting between said unit and the bridge member comprising a generally crank-shaped bar including a pair of parallel oppositely facing end sections and a central section angularly disposed with respect to said end sections, means yieldably connecting one end section of said arm with said unit at a point spaced substantially from its point of suspension, and clamping means connecting the other end section of said arm with the flange of the bridge member, said clamping means being adjustable longitudinally of the bridge member and said arm being rotatable relative to the clamping means and to said unit so as to hold said unit in an upright position irrespective of the depth of the bridge member.

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