Dec. 15, 1936. B. F. FITCH 2,063,909

TRAVELING CRANE

Filed Jan. 24, 1934 3 Sheets-Sheet 1

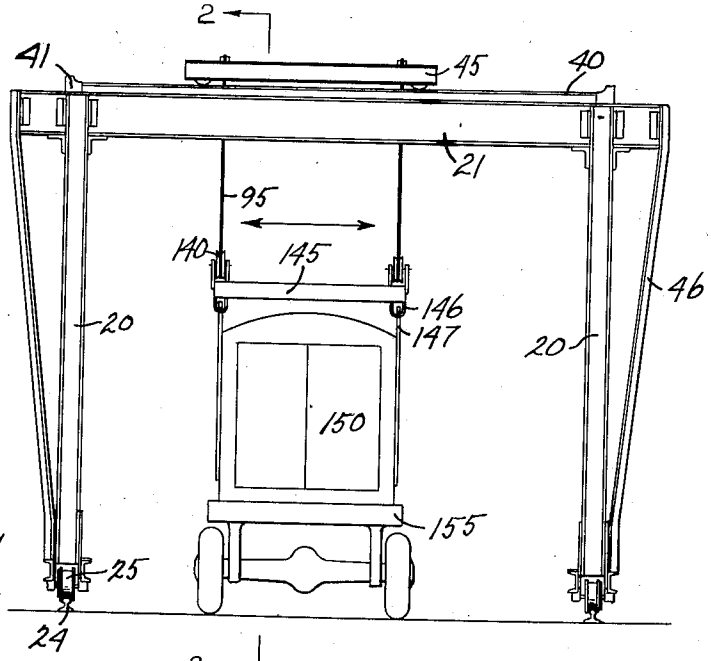


FIG. 1

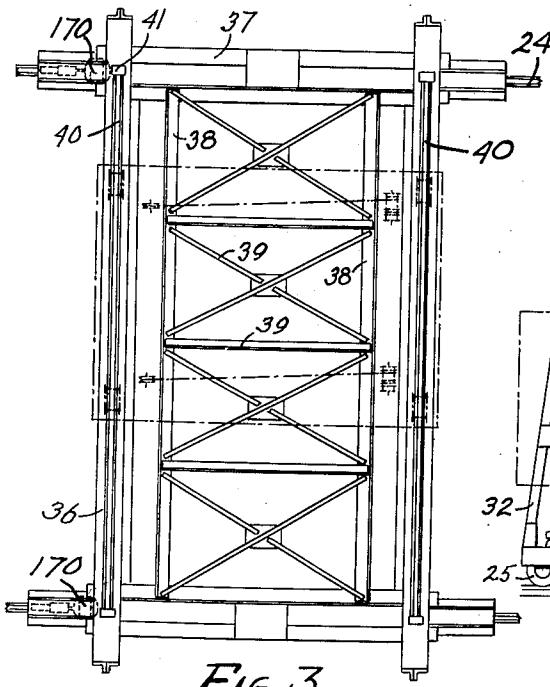


FIG. 3

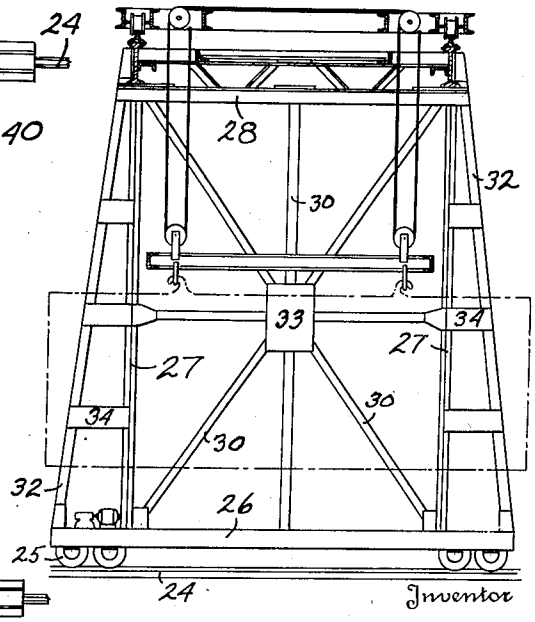


FIG. 2

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TRAVELING CRANE

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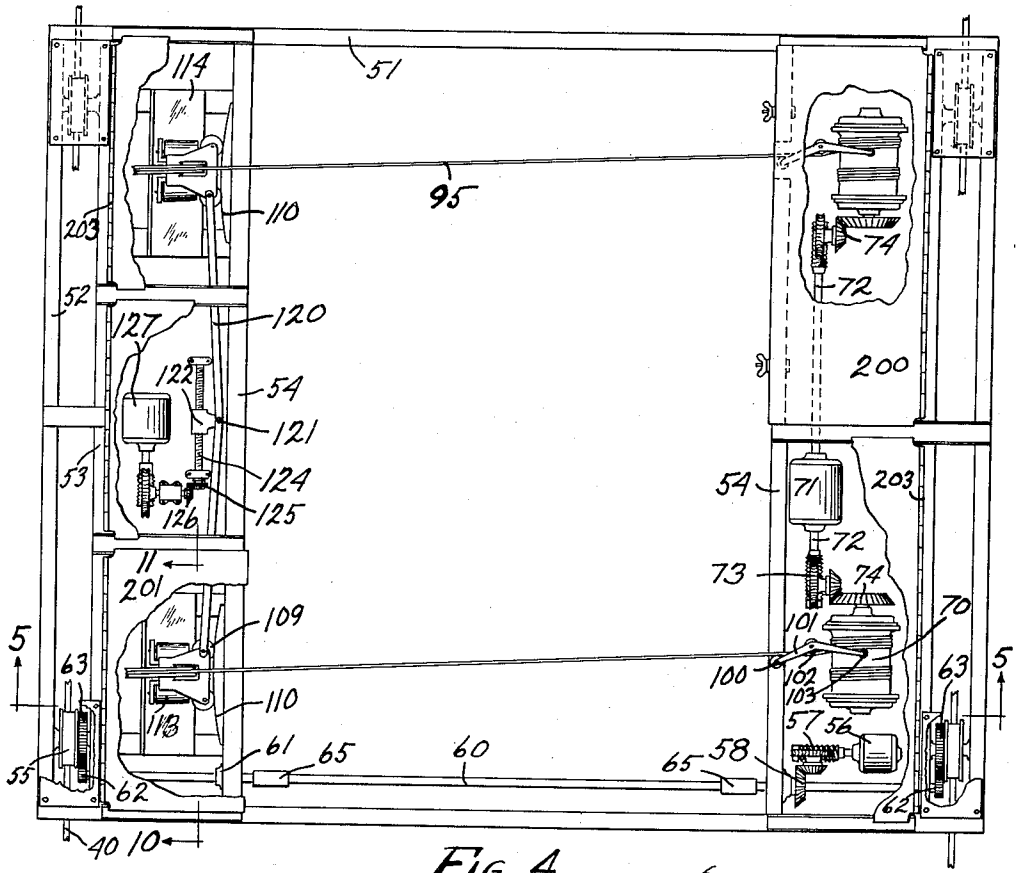


Fig. 4

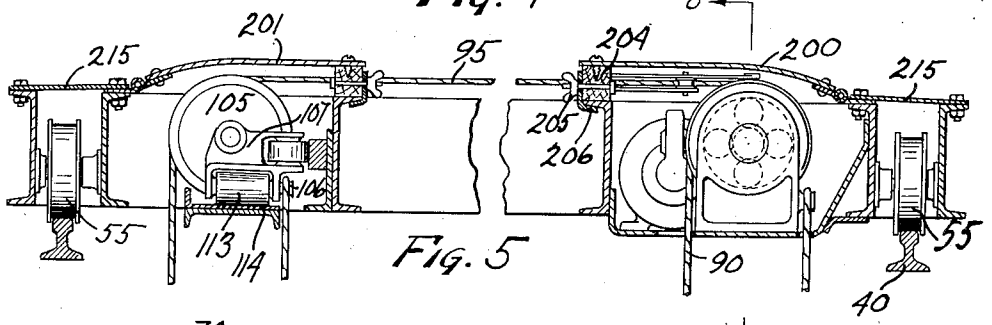


Fig. 5

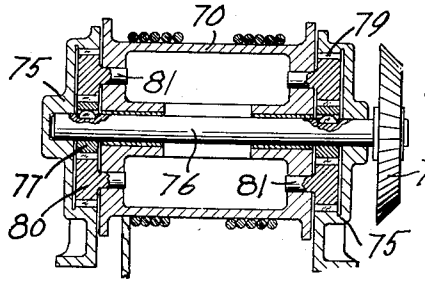


Fig. 6

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TRAVELING CRANE

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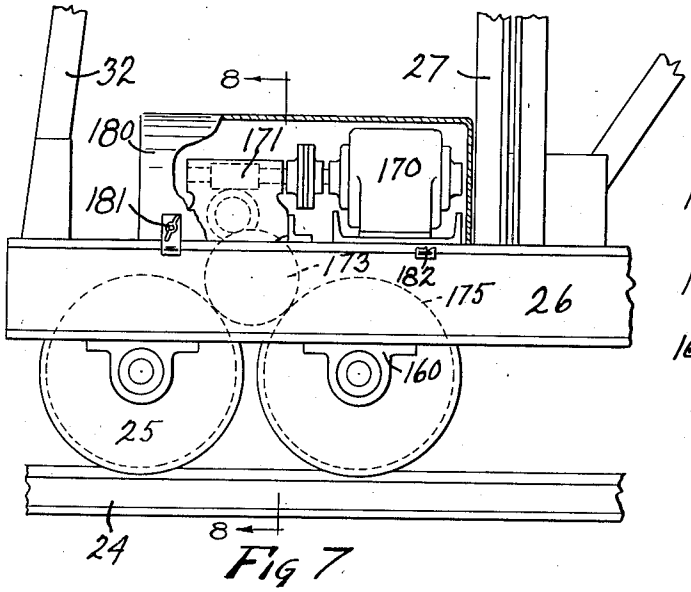


Fig 7

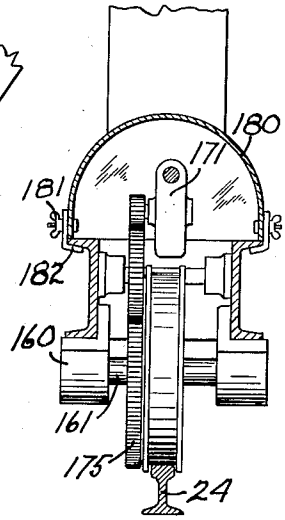


Fig 8

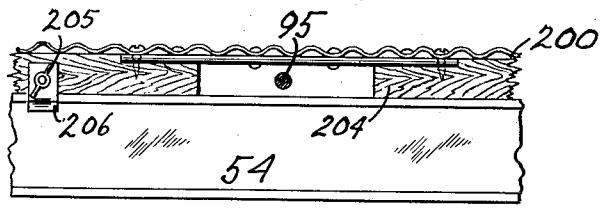


Fig 9

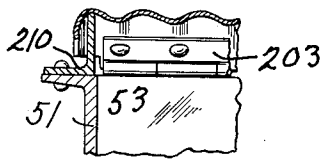


Fig. 10

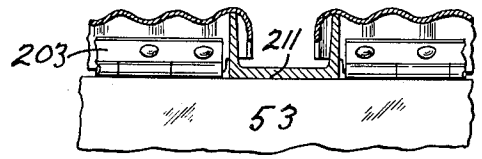


Fig. 11

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Patented Dec. 15, 1936 2,063,909

UNITED STATES PATENT OFFICE

2,063,909

TRAVELING CRANE

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Application January 24, 1934, Serial No. 708,125

7 Claims. (Cl. 212—13)

This invention relates to a traveling crane adapted to lift and transport demountable automobile bodies with their loads to effect the transferance between different vehicles or between a vehicle and a station platform or support. The traveling frame of the crane may be mounted to move transversely on a bridge carried by elevated supports or may be on top of a gantry, as desired. In either case I have provided four depending cables adapted to be secured at four corners of a rectangle to a demountable automobile body, or to a cradle which may be attached to such body, and I provide means by which two of said cables may be shifted laterally as a unit with reference to the other two, so that area served by the cables may be effectively registered with a truck which need not stand in parallel or right-angle relationship to the crane.

The weaving mechanism just referred to not only enables the crane to operate effectively for engaging or positioning a body with reference to a truck which stands somewhat askew with reference to the crane, but it also enables me to employ, in the raising mechanism, two drums from each of which two of the cables may pass, one depending directly to the load and the other passing laterally and thence over a sheave to the load, since the lateral travel of such cables, as they wind on or off of the drums, may, if desired, be compensated by operation of the weaving mechanism at the other end to correspondingly position the other two cables. Accordingly, the weaving mechanism is available either to cause skewing of the depending cable reaches to register with the correspondingly positioned body, or to prevent the slight skewing which naturally results from the use of cables leading directly from the drums. By reason of this provision, enabling me to have cables depending directly from the drum, I avoid the necessity of guide sheaves for such cables, simplifying the construction and inducing greater efficiency and less wear on the cables, all of which are objects of this invention.

Another object of the invention is to provide a four-cable crane so designed that the raising mechanisms will all be located adjacent the regions of support of the crane, thus minimizing the bending moments in the body of the frame, which must be of considerable horizontal extent to enable the engagement with a large size demountable truck body.

The raising mechanism I have provided, and which is included in this invention, is powerful and at the same time compact, and requires comparatively small space, so that it may be mounted almost entirely within the confines of the crane frame itself.

While my crane mechanism is adapted for mounting in units shiftable on overhead trackways, I prefer to employ a gantry on top of which the crane may travel. My invention has provided a special form of gantry wherein there is a maximum of clearance between the legs, thus reducing the span of the overhead girders carrying the crane proper. Such gantry may bridge a highway and also rail tracks or station platforms or supports, to enable the ready transferance of the raised demountable body.

Another object attained by my invention is the provision of self-locking raising, trolleying and weaving mechanism, and a similar provision for the propelling mechanism for the gantry, thus avoiding the necessity for brakes of any sort.

Still another object is to provide effective weather protection of the different motors and mechanisms driven thereby, so that the crane is suitable for outdoor use.

Finally, economy in construction is an object attained by this invention, since the structure is so designed that it can be readily built out of standard structural shapes, motors, shafts, gearing, etc.

The details of my invention will become apparent from the description about to be given of a preferred embodiment thereof, illustrated in the drawings hereof.

Referring now to the drawings, Fig. 1 is an end elevation of a gantry crane embodying my invention and showing a truck with a demountable body placed therebeneath; Fig. 2 is a section of my improved crane with the truck removed, as indicated by 2—2 on Fig. 1; Fig. 3 is a plan of the top of my crane, showing the frame in dot and dash lines mounted thereon; Fig. 4 is an enlarged plan of the frame, showing the various mechanisms placed therein, and with covers partly broken away; Fig. 5 is a longitudinal section through the frame, as indicated by 5—5 on Fig. 4; Fig. 6 is a longitudinal section through one of the cable drums, as indicated by 6—6 on Fig. 5; Fig. 7 is an elevation of a bottom corner of my gantry crane, showing the means of propelling the crane along its tracks; Fig. 8 is a section through the gantry propelling means, as indicated by 8—8 on Fig. 7; Fig. 9 is a fragmentary elevation, illustrating a cover for mechanism on the frame; Figs. 10 and 11 are fragmentary sections, showing portions of the mechanism cover-

ings, as indicated by the lines designated 10 and 11 on Fig. 4, respectively.

As shown in Figs. 1, 2 and 3, my improved crane is embodied in a gantry comprising two sides 20, and a top portion 21. The sides are composed of structural iron pieces, suitably bound together by angles and gusset plates. In general, a rectangle is formed, comprising a main bottom portion 26, an opposite parallel top portion 28, and sides 27. Internal braces for this rectangle are provided, as members 30, which project inwardly from the corners and the center of the sides to be joined by the gusset plate 33, at their point of intersection. Additional braces 32 are provided, non-parallel to the portion 27, meeting it at the top and intersecting the member 26 at the bottom of the gantry. Suitable plates 34 more firmly fasten the members 32 and 27 together. The gantry is movable along a track composed of rails 24. Suitable flanged wheels 25, mounted at the corners of the sides, ride on these rails and are driven, as will hereinafter be more fully described.

At the top of the gantry or other traveling bridge is a traveling frame 45, which rides on rails 40, with wheel stops 41 at each end thereof. The rails 40 extend at right angles to the rails 24 at the bottom of the gantry frame. The gantry bridge is rectangular in shape, comprising two long sides 36, and two shorter sides 37, the rails 40 being mounted on the sides 36. Included within this top rectangle is the lateral bracing comprising two long members 38 parallel to the members 36 and spaced therefrom, and internal bracing 39, both perpendicular to and diagonal with the long members and secured thereto.

Between the long sides 38 of the lateral bracing and the sides 36 of the top, are long, narrow open spaces. As will be hereinafter described, this space is to allow the cables, which depend from the frame and support the load-engaging cradle, to shift freely as the frame travels. The sides 36 extend beyond the perpendicular sides 20 and reversed buttresses 46 are fastened thereto and also at the bottom of the gantry sides, to brace the entire structure and at the same time leave the space between the sides and the top unimpeded.

The frame 45, which is mounted on the top of the gantry, or on a crane bridge, is most clearly shown in Fig. 4. A rectangular frame work is formed, comprising two end members 51 (parallel to the sides of the gantry) two side members 52 and four intermediate members 53 and 54 parallel with the side members. Between the side members 52 and the adjacent members 53 are wheels 55, supported by bearings on such members and adapted to ride on the guide rails 40 of the bridge. There are four of these wheels, one substantially in each corner of the rectangle forming the frame work. Two of these wheels, one on each track 40, furnish the driving means for the frame across the bridge. A motor 56, through suitable worm gearing 57 and bevel gearing 58 drives a shaft 60, extending across the bridge. At each end of the shaft 60, which is journalled in the frame as at 61, are pinions 62. These pinions engage gears 63 on the wheels 55 to drive the wheels as the motor 56 is electrically excited. To prevent binding, it is desirable to place coupling 65 in the shaft 60.

To reduce the bending moment set up in the end members 51 by the weight of the cradle and its load, as well as the weight of the mechanism in the frame, it is desirable to mount cable drums and pulley sheaves as close to the wheels 55 as possible. Thus, cross members 53 and 54, parallel to the members 52, form a nest in which the various mechanisms of the frame may be placed, including the motor and the gearing necessary to drive the wheels 55.

My invention utilizes but two drums to drive four cables. These drums 70 are driven by an electric motor 71, through a shaft 72, and suitable worm reduction gearing and bevelled gearing 73 and 74. These drums, as shown in Fig. 6, are mounted in frames 75. The bevel gear 74 is mounted on the shaft 76, which, in turn, is journalled in the members 75. Keyed on the shaft 76 are pinions 77. An annular flange 79 of each frame 75 has on its inward face a toothed surface. Several pinions 80 are journalled in the drum 70, as at 81, and are of such size that the teeth of each engage the toothed surface of the flange 79, as well as the pinion 77. Thus, a planetary gear system, as shown in dotted lines, (Fig. 5), is formed, which provides an effectual drive for the drum 70.

Both of the cable drums, as well as the driving means therefor, are mounted in the nesting space formed between one pair of the parallel structural members 53 and 54. As the gearing 73 and 74 is substantially the same for both drums, it is apparent that the rotative speed of the one will be equal to that of the other. One worm is preferably right-hand and the other left-hand, so that the two drums rotate in the same direction. By the use of a worm reduction gearing system, it is possible to have a self-locking drive, which means that a brake is unnecessary to lock the drum when the motor is stopped.

Two cables are mounted on each drum. One of the cables 90 depends directly downward from the drum to the cradle, and the other cable 95 passes horizontally over a guide sheave and then downwardly to the cradle. Each cable is shown as embracing a sheave on the cradle and then retracing its path upwardly until it is anchored on the frame. By the use of the sheaves on the cradle, a mechanical advantage is set up when the cable 90 is either wound onto the drum 70, or unwound therefrom, but if desired the cables could be anchored to the cradle.

As the drum 70 is rotated, a guiding sheave 100, journalled on a stud rising from one of the frame bars 54, cooperates with an arm 101 pivoted on this stud to direct the movement of the cable 95 either onto or off of the drum, the cable passing between small sheaves 102 and 103 on the arm. The cables 95 cross the bridge to the nesting pocket between the other pair of members 53 and 54, and there pass over sheaves 105, as shown in Fig. 5. After passing over these sheaves, the cables 95 descend to the cradle and there engage as heretofore explained. If they pass around sheaves on the cradle and retrace their direction upwardly, they are fastened to a movable frame 107, which carries the sheave 105, as at 106.

The sheaves 105 and their supporting frames 107 are adapted to move as a unit with respect to the crane frame. Thus, the frame 107, which not only carries the sheave 105, but the cable fastening 106, is mounted on suitable rollers. These rollers are of two kinds; thus, there are rollers 109, mounted to bear against arcuate tracks 110, and rollers 113 slightly tapered and adapted to ride on the plate 114. The taper of these rollers is such that their sides extended would meet at a point substantially underlying the sheave 100 on the opposite side of the bridge. The radius of curvature of the tracks 110 also centers at a point underlying the same sheave

100. Thus, when the sheave 105 and its frame 107 are moved relative to the bridge, there is no change in the length of the cable 95 lying between the sheave 105 and the drum 70, and accordingly the sheave 105 may be readily moved with respect to the frame, without raising or lowering the cradle or changing the elevation of the body supported thereby.

The movable sheaves are adapted to be moved in unison. The two sheave frames 107 are connected by links 120, which, in turn, meet and are pinned at 121. A threaded member 122 carries the pin 121. This member 122 is engaged by the threaded rod 124, journalled in the frame of the bridge. Mounted at one end of this rod is the bevelled pinion 125, which engages a mating pinion 126. This pair of pinions is rotated by the motor 127, acting through suitable worm reduction gearing. Thus, when the motor is electrically excited, the rotative motion is transferred through the gear train to the threaded member 124. The member 122, being non-rotative, is moved along the screw in one direction or the other and moves the links 120, which, in turn, move the sheave 105. The motor 127 is reversible to permit the sheaves 105 to be moved in either direction desired along the track 110.

The four depending cables 90 and 95 support a cradle 145, which, in turn, supports the demountable body to be moved. Referring to Figs. 1 and 2, the cables descend and pass under sheaves 140, thereupon rising again to be anchored at the frame, as already described. As will be seen in Fig. 2, the open space previously mentioned between members 36 and 38 on the top of the gantry, provides suitable operating room for the descending cables which engage the cradle. Mounted adjacent the cable sheaves and on the underside of the cradle are depending hooks 146, which may be rendered adjustable in any suitable manner to engage mating hooks 147 on a demountable body 150. This cradle 145, which is rectangular in shape, may be formed of suitable structural iron pieces, either welded or riveted together, to form a frame work of sufficient strength to retain spacing between the cables and to retain the hooked eyes in such position that they may cooperate with their mating hooks on the demountable body.

It is apparent that by moving the sheaves 105, it becomes possible to move one side of the rectangular cradle in one of the directions indicated by the arrow in Fig. 1. Thus, if the body 150 is not directly suspended over the supports on the truck body 155, this slight lateral movement or weaving will often be sufficient to effect such positioning, and thus avoid the necessity for repositioning the truck chassis.

The gantry crane, as shown in Fig. 1, is considerably smaller than may be employed. As heretofore mentioned, the height of the sides 20 may be sufficiently increased to allow one body 150 to be raised above an adjacent body and moved thereover to be deposited on the other side of the latter. Such a change does not affect my invention. Further, the top 21 may be sufficiently widened to provide more spacing between the sides 20, making it possible to accommodate a variety of body supports beneath the top of the gantry. These supports may include loading platforms or conveyances, such as trucks, railroad cars and even ships, as desired.

Means are provided to move the entire gantry crane along the tracks 24, on which it rides. On the underside of the bottom member 26 are journals 160. These journals support shafts 161, which, in turn, carry flanged wheels 25, engaging the track members 24. There are two of these wheels 25 at each of the four corners of the gantry frame, four wheels to each rail.

The two pairs of wheels adjacent one side of the frame are adapted to be driven, one pair of wheels on each rail. Mounted on the members 26 over the wheels is an electric motor 170. This motor is connected to worm reduction gearing 171, and this, in turn, to an intermediate gear 173. Gears 175 are mounted on the wheels 25 beneath and engage the gear 173. Thus, rotation of the motor 170 drives the wheels 25 along the rail 24, moving the gantry crane. Due to the drive through a worm and its mating pinion, a self-locking brake is provided as soon as the motor 170 is cut out of the circuit to which it is connected.

Mounted over each of the two driving mechanisms are protective hoods 180. This hood may be of any shape although I prefer to make it arcuate, with the ends closed. When placed over the mechanism, this hood rests on the member 26 and is securely locked thereto by wing nuts 181, which clamp angles 182 to underlying portions of the members 26.

It is desirable to furnish covers for the raising and weaving mechanisms on the crane frame, to protect them from snow or water. These covers are hinged to the frame so as to be readily raisable, but when closed are adapted to make a tight connection with the frame. I find it most satisfactory to provide two covers 200 over the raising mechanism at one side of the frame and three covers 201 over the different elements of the weaving mechanism at the other side of the frame. The covers at the two sides are similar, except as to length.

To give the covers sufficient stiffness without undue increase in weight, I prefer to make the body of them of corrugated sheet metal, the length of the ridges and valleys of the corrugations extending in the direction from the hinge to the free edge of the cover. Each cover is connected to the crane frame by a piano hinge 203, one leaf of which is riveted to the cover body, the other leaf of which is bolted to the top of the upper flange of the corresponding frame cross beam 53. Secured to the underside of the covers at their free edges are wooden strips 204, which are adapted to rest on top of the upper flange of the cross beams 54 when the covers are in its active position. The wooden strips 204 are interrupted in the proper region to allow the passage of the horizontal cable reaches 95, as shown in Figs. 4 and 9.

Each cover may be locked in closed position by means of wing nuts 205, which screw onto bolts mounted in the wooden strips and act against clips 206, which may underhang the flange of the beams 54. The natural incline on the underside of this flange causes the clips to pull down on the cover as the nuts are turned into place to make a tight connection.

At their ends, the cover sheets are flanged downwardly to extend over suitable upstanding frame flanges, as, for instance, the flanges of the angle bars 210 adjacent the sides of the crane frame or the flanges of the channel 211, where the ends of the two covers are adjacent, as shown in Figs. 10 and 11. I also provide fixed cover plates 215 over the frame supporting wheels and the gearing, these plates being slightly inclined to

shed water away from the piano hinges of the covers.

It will be seen that the bottom supporting plates which extend beneath the raising mechanisms and their motor and the corresponding plate beneath the weaving motor, together with the frame beams and the top covers, effect a substantial enclosure of such mechanisms. The comparatively slight horizontal openings beneath the covers, through which the cables **95** pass, are small enough to be negligible and moreover are not in the region of any of the motors.

It will be seen from the description given that I have provided an effective out-of-door traveling crane or gantry in which the raising mechanism, trolleying mechanism, and weaving mechanisms are all effectively weather-protected. The raising mechanism is powerful and is effectively carried adjacent the supports for the crane frame, so that bending moments in the central region of the frame are avoided. This raising mechanism, as well as the trolleying and weaving mechanisms, are so devised that they require comparatively little head room, the depth of the whole mechanism being only slightly greater than that required for the side beams of the requisite length. It should also be noticed that when the power is cut off, all of the mechanisms are self-locking, avoiding the necessity for brakes.

Reference is made to my divisional applications No. 743,869, filed September 13, 1934, and No. 744,214, filed September 15, 1934 for claims on the planetary driven drum and the gantry features respectively.

Having described my invention, I claim:

1. A crane of the class described, comprising a frame movable on a bridge, said frame having rectangularly spaced sides with two members intermediate of two opposite sides, closely adjacent respective sides and parallel therewith, cable actuating mechanism disposed horizontally between one of said intermediate members and the adjacent parallel side, a sheave disposed horizontally between the other of said intermediate members and the side adjacent thereto, and a cable passing from the actuating mechanism over the sheave.

2. A crane of the class described, comprising a frame with downwardly open and upwardly closed housings extending along two opposite sides, winding mechanism in one of said housings, a sheave in the other housing, two cables leading from the winding mechanism, one of them depending directly through the open bottom of the housing containing the winding mechanism and the other leading over the sheave and through the bottom of the housing containing the sheave.

3. A crane of the class described, comprising a rectangular frame having parallel horizontally spaced side members in pairs on opposite sides of the frame, two axially spaced drums and a driving means for said drums in the horizontal plane of the side members and between the members of one pair, two axially spaced sheaves between the other pair of members and in the horizontal plane thereof, a cable depending beneath each of said drums and a cable leading from each drum to one of said sheaves, passing over said sheaves and extending therebeneath.

4. A crane of the class described, with a movable rectangular frame comprising two sides and two ends, and having cables depending therefrom, with four intermediate members fastened to the ends and parallel with said sides, each of said sides forming with one of said intermediate members supports for wheels whereby said frame is movable, each of said first-mentioned intermediate members cooperating with a respective one of the other intermediate members to form spaced supports, and means carried by said supports by which said cables are moved relative to said frame, said means being disposed in horizontal planes between said spaced supports.

5. In a traveling crane, the combination of a frame, a drum mounted therein, two cables on said drum, one depending directly from the drum and one extending horizontally, a sheave on the frame over which the latter cable depends, means for rotating the drum to wind in both cables simultaneously, and means associated with the drum for continuously compacting the horizontal cable against previously wound reaches thereof on the drum.

6. A crane of the class described, comprising a frame adapted to be movably mounted on a bridge, said frame including a drum with two cables thereon, one depending directly from said drum to support a load and being movable in a direction lengthwise of the drum as it unwinds therefrom, the other cable passing over a sheave and then depending below said sheave to support the load, said sheave being shiftable laterally parallel to the axis of the drum, and means for shifting the sheave to compensate for said movement of the first mentioned cable.

7. A crane of the class described, comprising a movable frame having spaced parallel sides, two drums mounted in axial alignment adjacent one side, each with two cables thereon, one cable on each drum depending directly therefrom to support a load, the other cable on each drum extending to a respective sheave adjacent the opposite side of the frame and depending from the sheave to support the load, said sheaves being movable substantially parallel to the axes of the drums, and means to shift the sheaves simultaneously to compensate for shifting movement of the first mentioned depending cables as the same unwind from their drums.

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