

April 1, 1958

J. J. MANGEL
METHOD AND APPARATUS FOR HANDLING ELECTRIC
POLES AND THE LIKE

2,828,872

Filed Sept. 20, 1954

5 Sheets-Sheet 1

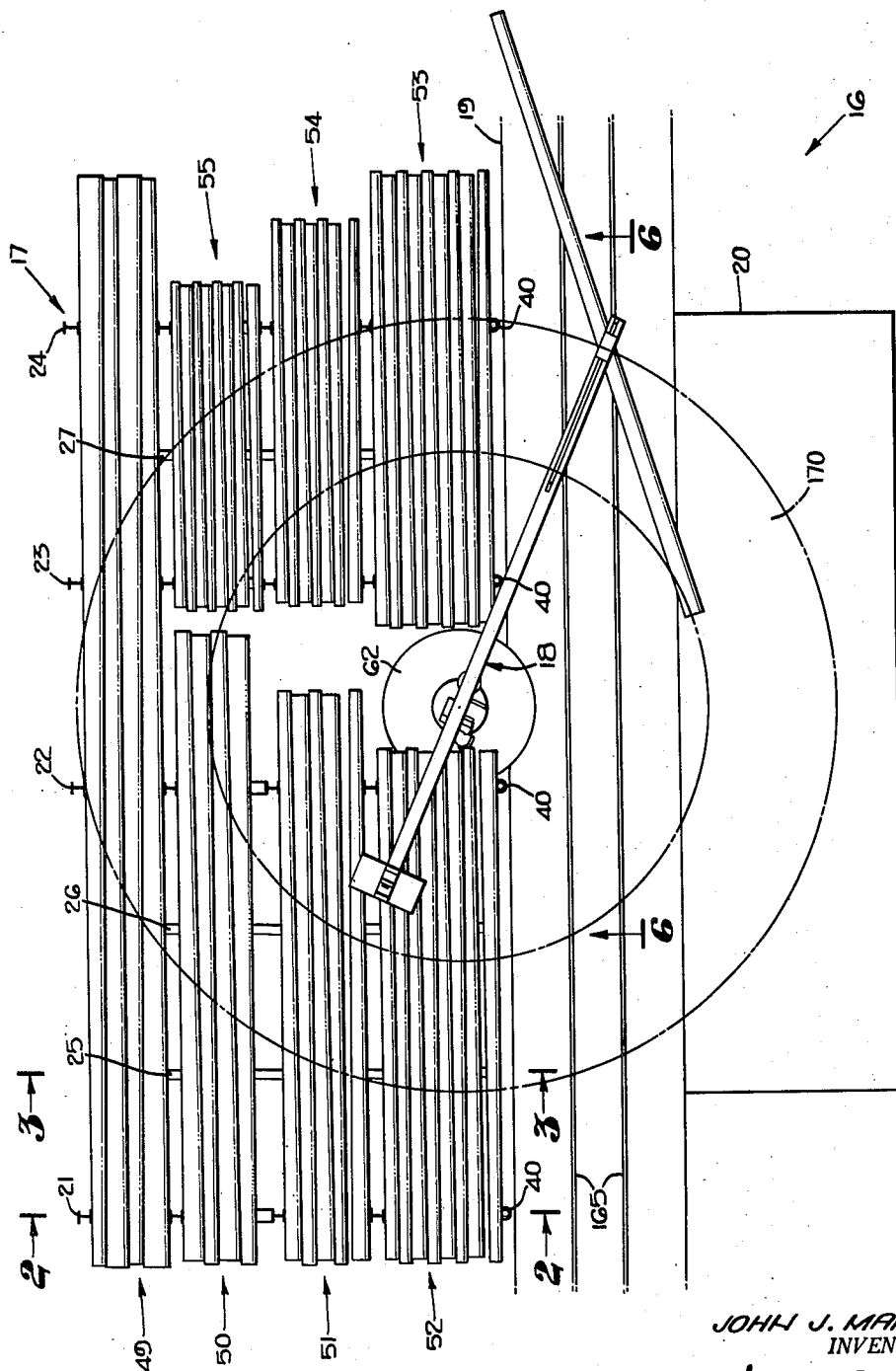


Fig. 1.

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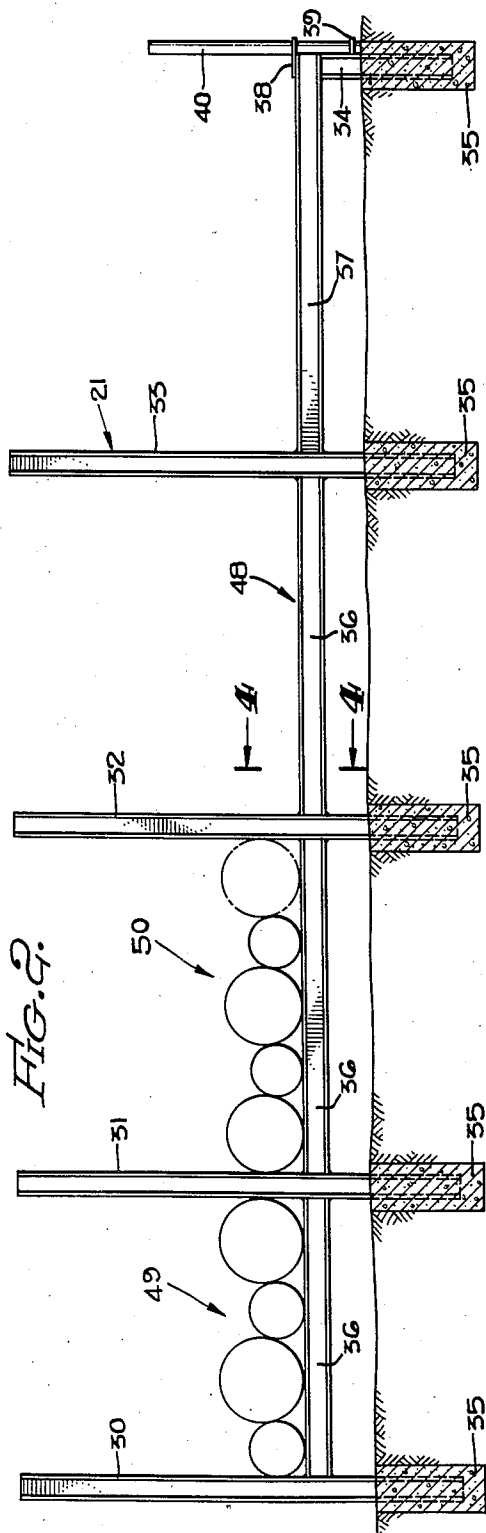


FIG. 2.

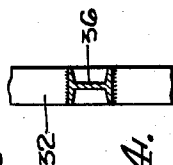


FIG. 4.

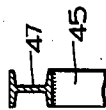


FIG. 5.

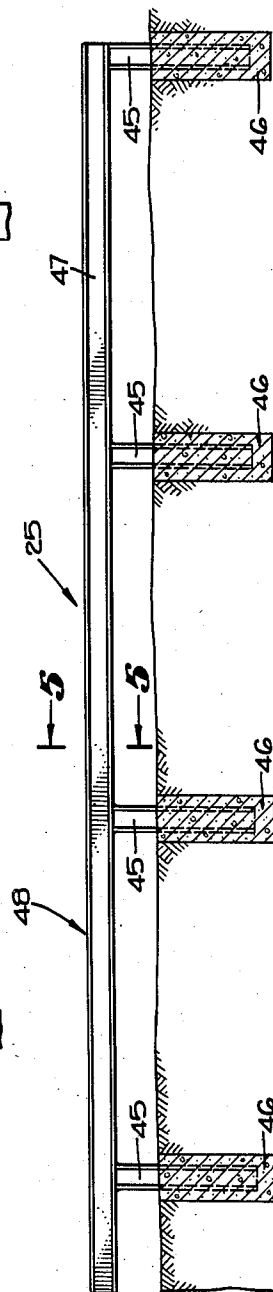


FIG. 3.

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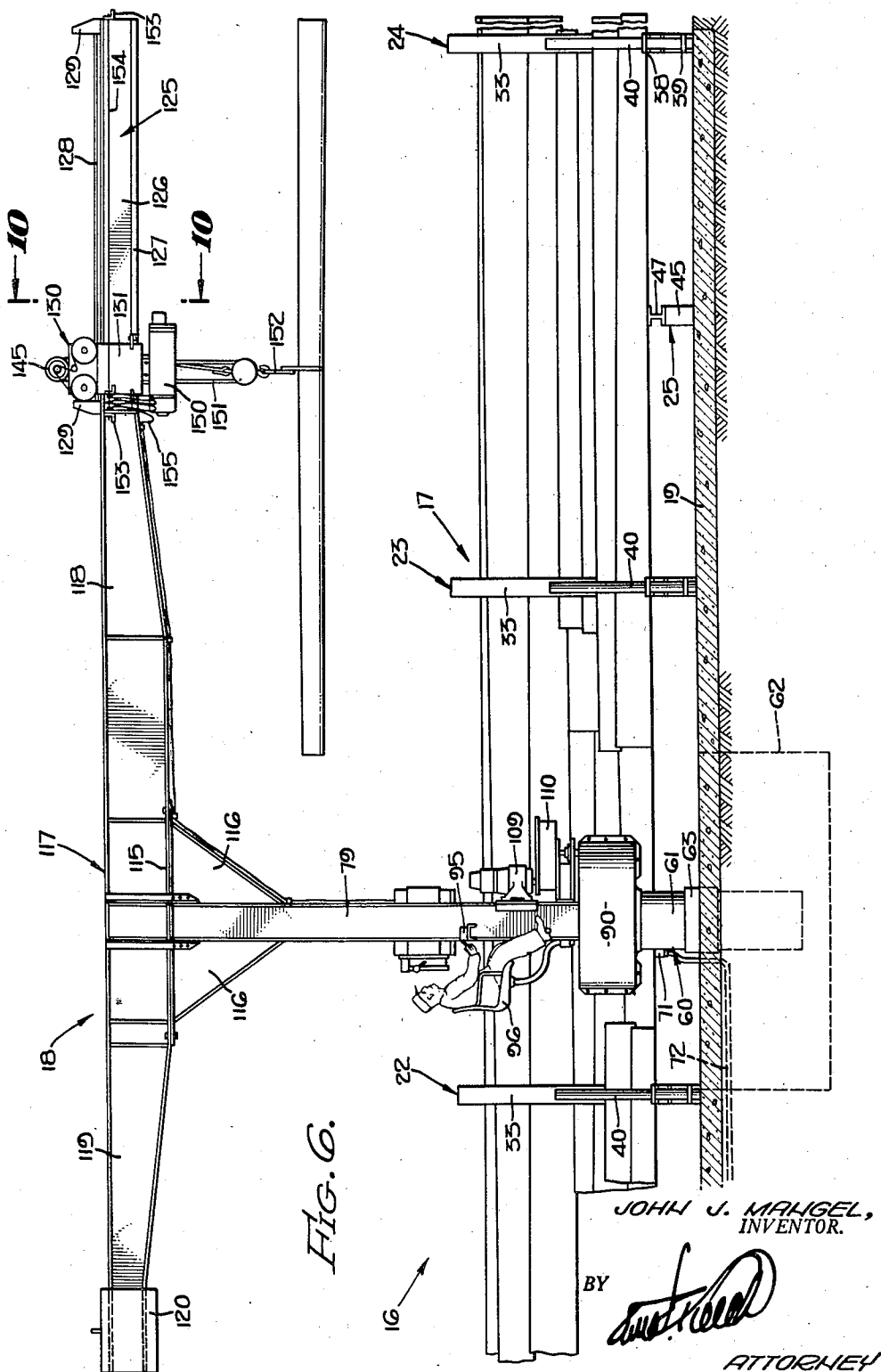
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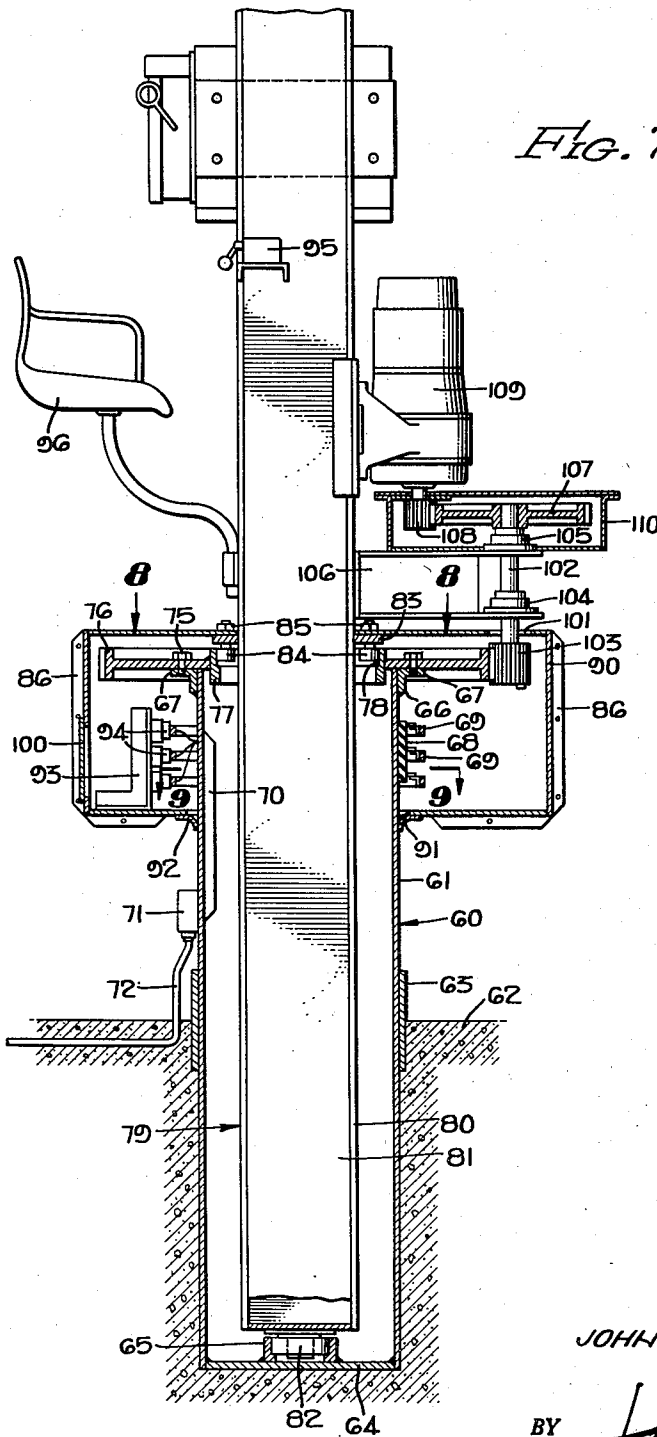
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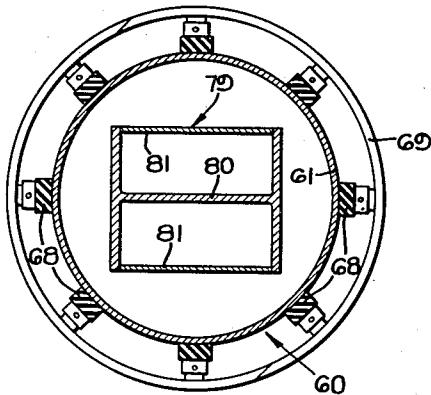


FIG. 9.

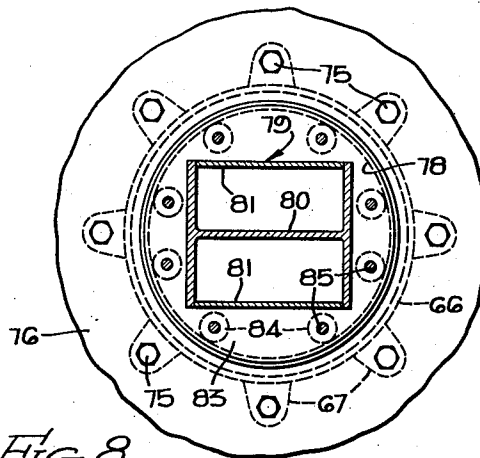


FIG. 8.

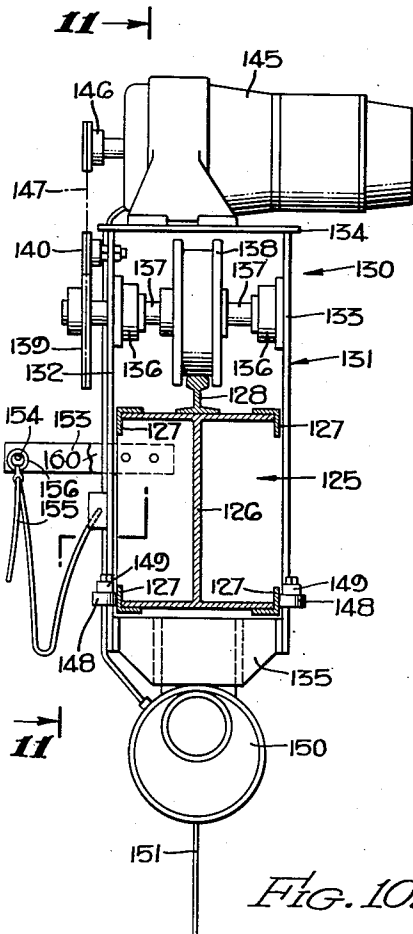


FIG. 10.

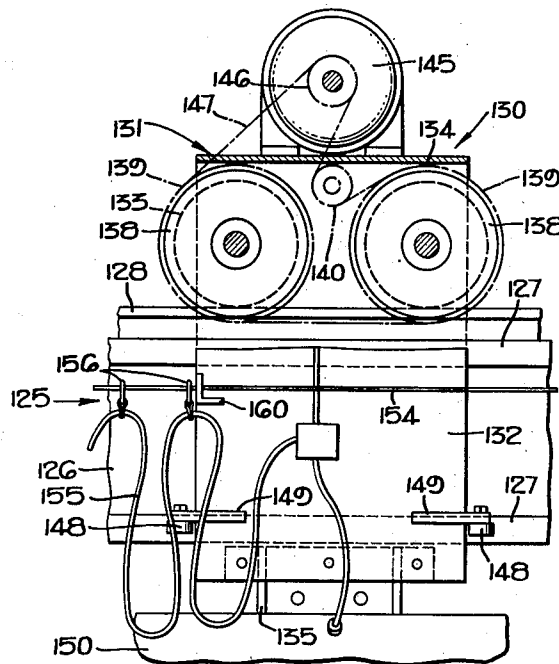


FIG. 11.

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2,828,872

METHOD AND APPARATUS FOR HANDLING ELECTRIC POLES AND THE LIKE

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Application September 20, 1954, Serial No. 457,249

5 Claims. (Cl. 214—16)

This invention relates to the handling of electric poles and material of like lengths and weights and particularly to the storage and dispensing from storage of such poles or other material.

Electric power companies, because of the wide areas covered by their power lines find it necessary to decentralize the function of supplying poles, transformers and wire for use in erecting extensions of their lines. To this end, substations for these materials are set up at suitable centers scattered through the system. These substations supply the line extension materials needed from day to day in their respective areas and are replenished from time to time by shipments from a central supply yard.

The common practice heretofore has been to unload these heavy material units arriving at the substations by various expedients, the poles generally being removed from the trucks by gravity onto low racks provided therefore. Mobile cranes based at the central supply yard are used in loading the outgoing trucks and sometimes accompany the latter to assist in the unloading at the substation. This is a very expensive piece of equipment, however, which requires a specialist to operate it and the limited use for it at any particular substation does not warrant basing a mobile crane at each substation. The day-to-day handling of power line materials at the substation has therefore been done by the aid of gravity ramps, power cable winches, truck powered lifts, and like expedients.

These operations are relatively hazardous to the men employed thereon and a way has long been sought to make these safer, which would not be prohibitively expensive.

The present invention has the objectives of providing for these substations a method of and apparatus for storing power line poles, transformers, drums of wire and the like which will:

(1) Eliminate the hazardous operation heretofore employed in effecting such storage.

(2) Be relatively inexpensive in first cost and low in maintenance cost.

(3) Reduce the amount of labor heretofore required to effect such storage.

(4) Facilitate the storing of poles so that these will be preserved in straight condition.

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(5) Employ a much smaller land area to effect such storage than that required by the methods in current use.

The manner of accomplishing the foregoing objects as well as further objects and advantages will be made manifest in the following description taken in connection with the accompanying drawings in which

Fig. 1 is a plan view of a preferred embodiment of the invention in a compact pole and transformer storage yard.

Fig. 2 is an enlarged vertical sectional view of the pole rack of the invention taken on the line 2—2 of Fig. 1, and showing a bin forming frame having bin separating posts.

Fig. 3 is view similar to Fig. 2 taken on the line 3—3 of Fig. 1 and showing a bed frame of the type employed between longitudinally adjacent bin forming frames.

Fig. 4 is an enlarged fragmentary detail view taken on the line 4—4 of Fig. 2.

Fig. 5 is a similar detail view taken on the line 5—5 of Fig. 3.

Fig. 6 is an enlarged sectional view of the pole rack and pillar jib crane of the invention taken on the line 6—6 of Fig. 1 (but with the traveling hoist carriage at the opposite end of the radial track therefor than is shown in Fig. 1).

Fig. 7 is an enlarged vertical sectional view of the mounting means and rotary drive mechanism of the pillar jib crane of the invention.

Fig. 8 is an enlarged horizontal sectional view taken on the line 8—8 of Fig. 7 and shows the manner of mounting the master crane rotating gear on the base casing.

Fig. 9 is a similar view taken on line 9—9 of Fig. 7 and shows the mounting of one of the electric collector rings on said base casing.

Fig. 10 is an enlarged vertical section taken on line 10—10 of Fig. 6 and shows the crane carriage and hoist unit of the invention.

Fig. 11 is a side elevational view of Fig. 10, partly shown in section as indicated by line 11—11.

Referring specifically to the drawings, the apparatus of the invention is there shown, for illustrative purposes, as embodied in a storage yard 16. This yard is particularly designed for the storage of electric power line poles of seven different standard lengths as well as transformers, drums of wire and cable and other heavy equipment items used in connection with said poles.

The yard 16 includes a pole rack 17, a pillar jib crane 18, a roadway 19 and a transformer platform 20 all of which are mounted in the earth of the yard area.

The jib crane 18 is mounted approximately in the center of the yard area; the pole rack 17 occupies approximately one half of said area; and the roadway 19 and the transformer platform 20 occupies the other half of said yard area. The roadway, for reasons to be made clear hereinafter, is preferably located, as shown in Fig. 1, between the pole rack 17 and the platform 20.

The pole rack 17 includes four parallel bin forming frames 21, 22, 23 and 24 and three intermediate bed frames 25, 26 and 27.

Each of the bin forming frames (Figs. 1 and 2) includes a series of bin posts 30, 31, 32 and 33 and a stub post 34 which are mounted in concrete 35 in the earth of the yard 16. The bin posts are connected by bed beams 36 butt welded to said posts, while bin post 33 is connected to stub post 34 by a bed beam 37 which is welded to these posts so as to lie on top of stub post 34. Welded to bed beam 37 and stub post 34 are lugs 38 and 39 having vertically aligned apertures for loosely receiving a stanchion pipe 40.

Each of the bed frames 25, 26 and 27 comprises a series of stub posts 45 set in concrete 46 in the ground and butt welded to a single overlying bed beam 47.

Bed beams 36, 37 and 47 all lie on the same level and form the bed 48 of the pole rack 17.

Bed frames 25 and 26 lie between bin forming frames 21 and 22, and are equally spaced from the latter frames and from each other. Bed frame 26 lies between and is equally spaced from bin forming frames 23 and 24.

The posts 30 and 31 of all the bin forming frames 21, 22, 23 and 24 unite with the rack 48 to form a pole bin 49 adapted for the storing of poles 85' in length. These are the longest poles the specific storage yard 16 is designed to handle and space is provided for storing up to fifty of these poles in the bin 49. The rack 17 is also adapted for storing a like number of each of the other pole lengths ranging from 50' to 25' in length.

Thus the posts 31 and 32 of frames 21 and 22 form a bin 50 for storing poles 50' in length; posts 32 and 33 of these frames form a bin 51 for storing poles 45' in length; and posts 33 and stanchion pipes 40 of these frames form a bin 52 for storing poles 40' in length.

In bin forming frames 23 and 24, stanchion pipes 40 and posts 33 form a bin 53 for storing poles 35' in length; posts 32 and 33 form a bin 54 for storing poles 30' in length while posts 31 and 32 of these frames form a bin 55 for storing poles 25' in length.

It is thus seen that the pole rack 17 of the present invention provides an extremely compact means for storing any number of poles up to fifty of each of the seven different lengths mentioned. Although the largest pole thus stored is 85' in length, the entire rack 17 is confined to a rectangular area about 85' x 40' in size containing 3400 sq. ft.

The pillar jib crane 18 is mounted on a base 60 comprising a section of heavy cylindrical casing 61 set in a concrete block 62 poured into an earth excavation. The casing 61 is reinforced by a steel band 63 welded thereto to span the upper face of block 62.

The lower end of casing 61 is closed by a bottom plate 64 welded therein, a bearing cradle 65 being concentrically welded on said plate.

The upper end of casing 61 is reinforced by a narrow outside band 66 welded thereto and having eight apertured master gear mounting ears 67 extending radially therefrom. Mounted on eight insulators 68 secured to casing 61 just below band 66 are three electric collector rings 69. An angle 70 tacked to the inside of the casing 61 conducts three phase insulated electric conductors from an outside conduit box 71 to the rings 69. Electricity is supplied to the conductors in conduit box 71 through a conduit pipe 72 which travels underground from an external system.

Resting on the upper end of casing 61 and bolted to ears 67 by bolts 75 is a master stationary crane rotating spur gear 76. The hub of this gear provides an internal bearing roller race 78.

The pillar jib crane 18 includes a pillar 79 made of a structural steel H-section 80 with opposite channels covered by plates 81 welded thereto to form a box construction. The lower end of pillar 79 has a double-roller heavy-duty thrust-radial bearing 82 rotatably mounted thereon, said bearing slidably fitting into bearing cradle 65 when the pillar 79 is concentrically lowered into the casing 61.

Fitting the pillar 79 and welded thereto at a level just above gear hub 77 is a roller mounting collar 83 carrying eight cam follower roller bearings 84 which are secured to the collar by bolts 85 so as to extend downward in rolling radial contact with race 78.

The bearings 82 and 84 are thus seen to support pillar 79 and maintain this in vertical position while permitting said pillar to be readily rotated.

Assembled on collar 83 by bolts 85 in two halves having meeting flanges 86 which are bolted together, is a gear and collector ring housing 90. This housing has a bottom 91 for accommodating the casing 61 and a felt ring 92 bearing against said casing and preventing admission of dust through said opening into said housing.

A bracket 93 within said housing supports brushes 94 which engage collector rings 69 and are connected by suitable conductor wires (not shown) to a control box 95 fixed on pillar 79. This box is in a position to be reached by an operator sitting in a seat 96, also mounted on said pillar, for controlling three separate actuating motors carried by said pillar and which will be described hereinafter.

A door 100 is provided in housing 90 for servicing brushes 94.

An eccentric hole 101 is formed in the top of housing 90 to accommodate a jack shaft 102 carrying a pinion 103 fixed thereto which meshes with gear 76, said shaft journalling in bearings 104 and 105 provided on an I-beam bracket 106 welded to pillar 79. Fixed to the upper end of shaft 102 is a jack gear 107 which is driven by a pinion gear 108 of a fluid-drive reduction geared reversible motor 109 fixed on pillar 79. Gears 107 and 108 are enclosed in a dust shield 110 fixed on bracket 106.

The upper end of pillar 79 has a boom platform 115, supported by welded gussets 116, on which platform is bolted a horizontal member 117 which extends in one direction from the pillar 79 to form a cantilever crane boom 118 and in the opposite direction to form a counterbalance boom 119. The latter boom carries a concrete counterbalance weight 120 which in a 1½ ton jib crane, as illustrated, preferably weighs 3000 pounds.

The crane boom 118 terminates in an outer horizontal trolley crane section 125 which is formed of an I-beam 126 trimmed at its four corner edges with angle iron members 127. Welded in place lengthwise centrally on beam 126 is a section of railroad rail 128 having wheel stops 129 extending upwardly therefrom at its opposite ends.

Mounted to travel on rail 128 is a power driven carriage 130. This includes a frame 131 having side plates 132 and 133 connected by a top plate 134, and a hoist mount 135 to which lower edge portions of the side plates are bolted. Journalled in bearings 136, mounted on the side plates, are shafts 137 carrying double flanged wheels 138, which rest on rail 128. Sprockets 139 are fixed on ends of said shafts extending outward through plate 132.

An adjustable idle sprocket 140 is mounted on side wall 132. The top plate 134 supports a reduction geared reversible motor 145 having a sprocket 146. This motor drives wheels 138 through a chain 147 trained about sprockets 139, 140 and 146, to cause travel of carriage 130 on rail 128 in either direction.

Guide rollers 148, mounted on brackets 149 welded to side plates 132 and 133, roll on the lower pair of angle members 127 to keep the carriage 130 upright, and out of rubbing contact with said members.

Bolted to the hoist mount 135 is an electric cable hoist 150, the cable 151 of which is provided with a pole grapple 152.

Extending laterally from opposite ends of crane boom section 125 are arms 153 between which a taut tag line wire 154 is strung. A power supply cable 155, leading from control box 95 to motor 145 and the motor of electric hoist 150, is provided at intervals with rings 156

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which slide on tag line 154. When carriage 130 is at the outer end of rail 128, the cable 155 is extended between its points of support by rings 156. As the carriage 130 travels inwardly on rail 128, rings 156 are telescoped by an arm 160 on carriage 130 so that cable 155 hangs in loops from said rings. These loops are short enough to keep this cable out of the way yet maintain electric connection with the travelling carriage in any of its positions on rail 128.

In view of the storage yard 16 being designed especially for handling electric power line poles, it is preferable that this facility have means combined therewith for storing the transformers and drums of wire which are used in conjunction with the poles in erecting an electric power line.

Such means is provided in the transformer platform 20 and comprises a concrete slab cast on graded earth. This platform is spaced from the pole rack 17 to provide room for the roadway 19 to come therebetween. This roadway is preferably a paved road extending entirely through the storage yard 16 and is equipped with railroad spur tracks 165 to permit deliveries to and out of yard 16 to be made directly by railroad cars.

Operation

The bearings 82 and 84 supporting the pillar jib crane 18, and the use of collector rings 69 and brushes 94 for supplying electricity to the motors 109, 145 and 150, give unlimited freedom of rotation to the crane 18, under the control, of course, of the operator, who sits in seat 96.

Each of these motors being reversible, it can be energized to rotate in either direction by the operator's manipulation of one of the control levers of control box 95. Each motor is also equipped with a brake which is automatically applied to halt rotation of said motor and the mechanism connected therewith when said motor is deenergized. Electric power line poles approximate the shapes of the tree trunks from which they are made. The butt end of the pole is thus of considerably greater diameter than the opposite end. To prevent distortion of poles in storage and make the best use of bin space, adjacent poles in each bin are deposited therein in end to end reversed relation.

For each pole to be easily handled while suspended it must have grapple 152 applied at its center gravity. Because of the taper in the pole, the center of gravity is not at the midpoint of the pole but sometimes several feet therefrom. The pole ends at each end of each bin, being placed in the same plane, the middle area of that bin in which the pole centers of gravity lie is twice as long as the distance of the centers of gravity from the midpoints of the poles.

Fig. 1 illustrates how the method of the invention comprises the bringing together of the many different standard lengths of poles required to be stored so that these can be stored in substantial quantities in a relatively small yard area by bringing the center of gravity area of each bin into the pattern of the annular deposit or pick up zone 170 of the pillar jib crane 18.

Poles are handled by the crane 18 one at a time. This crane is controlled entirely by one operator from seat 96. The rest of the work including applying and removing the grapple 152 and the swinging of the pole about its point of support to properly position the pole for deposit is taken care of by one helper.

Poles delivered to the yard 16 on trucks or railway cars are removed therefrom one by one and deposited in the respective bins of the yard in accordance with their length and in proper reversed end to end relation with adjacent poles.

Power line transformers and drums of powerline wire are as readily removed by the crane 18 from a truck or railway car spotted on the roadway 19 and deposited for storage on the concrete platform 20. As required, these are loaded back on similar vehicles occupying the road-

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way 19 for out-shipment. Dollies (not shown) may be employed to shift such equipment out of and back into the annular crane zone 170, where required, so as to make full use of the storage capacity of platform 20.

The apparatus 16 of the invention is susceptible of further variations in use. For instance, the time of a truck or railway car delivering poles into storage may be saved by gravity dumping their load directly into bins 52 and 53 to facilitate which stanchions 40 have been temporarily removed. Then, after the delivery vehicle has departed, these poles can be picked up individually by the crane 18 and its two-man crew and placed in storage in the bins in which they respectively belong. The stanchions 40 are of course replaced before the distribution of the poles begins. This procedure would not, of course, be adapted for handling the longest poles. These are preferably transferred by crane 18 directly between the bin 49 and the vehicle delivering or receiving such poles.

The claims are:

1. A storage yard for storing poles of a plurality of standard lengths comprising: A first group of elongated, generally rectangular, open-topped, horizontal bins of substantially the same length, said bins being arranged in generally parallel, side-by-side relation; a second group of elongated, generally rectangular, open-topped, horizontal bins of substantially the same length, said bins of said second group being arranged in generally parallel, side-by-side relation and oriented in the same direction as the bins of the first group of bins, said two groups of bins being relatively displaced in the direction of the long dimension of said bins in generally opposed relation; an elongated, generally rectangular, open-topped, horizontal bin longer than the bins of either of said groups of bins, said longer bin being oriented in the same direction as said other bins and positioned outwardly thereof, said longer bin spanning the space between said two groups of bins and extending at least partially along the length of the outermost bins of both of said groups of bins; and a crane rotatable about a vertical axis lying in a region generally between said groups of bins, said crane having a hoisting mechanism operable within a relatively narrow annular zone concentric with said axis including the approximate geometrical centers of all of said bins, whereby said poles may be stored in said bins longitudinally thereof with poles of each standard length in a selected one of said bins and with the balance point of each pole positioned so that it can be grasped by the hoisting mechanism of said crane.

2. The storage yard of claim 1 in which the bins of said first group are in substantial alignment with the bins of said second group and said longer bin is positioned in side-by-side relation with the outermost bins of said two groups of bins.

3. The method of storing poles of a plurality of standard lengths relative to the vertical axis of a rotary crane, comprising sequentially grasping each of said poles at their balance point by the hoisting mechanism of said crane; swinging said pole on a selected arc about said axis; and depositing said pole horizontally in a storage area adapted to receive poles of that particular length and thus grouping said poles according to length, said poles being deposited so as to be oriented in the same direction with the storage areas for the shorter ones of said standard lengths of poles forming two groups with the individual storage areas of each group being in side-by-side relation, said groups being relatively displaced in the direction of the length of the poles in generally opposed relation with said axis lying generally between said groups and with the storage area for the poles of the longest of said standard lengths lying outwardly of said two groups spanning the space therebetween and extending at least partially along the length of the outermost

storage areas of both of said groups, the balance point of each pole lying within a relatively narrow annular zone within which the hoisting mechanism of said crane is operable, said zone being concentric to said axis and including all said selected arcs.

4. The method of claim 3 in which said poles are deposited so that the storage areas of one of said groups are in substantial alignment with the storage areas of the other of said groups and in which the storage area for poles of the longest of said standard lengths is positioned in side-by-side relation and coextensive with the outermost of said storage areas of said two groups.

5. The method of claim 3 in which said poles are deposited so that the length of the poles in said storage areas varies progressively between the lengths of the shortest and the longest of said standard lengths.

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