METHOD OF ERECTING AN ELECTRICAL POWER TRANSMISSION TOWER
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1 Claim. (Cl. 52—745)

This invention concerns apparatus and the process of erecting steel towers used to carry high tension voltage in large conductors.

Heretofore these towers (sometimes called transmission towers) have been erected from along side of each tower working from the outside of the tower with gin poles, hoists, and other machinery necessary to lift sections of the towers. The towers are always built from the bottom up. Thereafter the hardware, consisting of insulators, cables and the like, was added. This necessitated use of additional cranes and/or gin poles and the like to secure such items as insulators, in the first place, and the conductor wire attached to said insulators, in the second place.

This invention has for its objects the provision of a process and machine and other mechanism for erecting towers of the type concerned from the inside. Additionally, the tower is erected by building the top section first and then lifting it and building the next lower section, then resting the top section on the next lower section, and building the third section from the top beneath the second section and so on. When the tower is completed it is then ready for use. Additionally the hardware, including the insulators and line wires are added as the section to which these items are attached is completed. The line wires therefore are elevated from the ground to their position on the top most section and are carried with it as the tower is built.

One of the objects of the invention is to provide a multiple hydraulic or pneumatic jack which can be rested on the ground on especially prepared plates and will serve to elevate the sections as they are assembled to a height so that the next section can be assembled and built beneath them. The multiple jack may then be collapsed and moved out from the bottom most section and away from the assembled and erected tower.

A second object provides the construction and use of a workman's platform which is attached to the multiple jack and can be raised from a lowered position in one section to a raised position in the next above section so that the workmen can reach all necessary parts of the joints between the towers from the platform.

Another object is to provide a means for supporting the multiple jack on the ground and means for collapsing it and transporting it after its work has been done.

Still another object of the invention is to provide a structure and method for the erection of a transmission line tower from a position which will minimize contact of the erecting machinery with adjacent objects and hazards such as other transmission lines, trees, buildings and other similar objects.

A further similar object is to provide means and apparatus for erecting towers of the type described wherein the use of a crane is made unnecessary and tag lines and guy lines are made unnecessary.

I attain the foregoing means of the devices, parts and combinations of parts shown in the accompanying drawings, in which—

FIGURE 1 is a plan view of a multiple hoist used in erecting sections of a transmission line tower from a position within the tower;

FIGURE 2 is a fragmentary portion of one of the radial supporting base arms with portions shown in sec-

tion taken substantially on line 2—2 of FIGURE 1.

FIGURE 3 is a fragmentary section of the central portion of the multiple jack frame taken substantially on line 3—3 of FIGURE 1;

FIGURE 4 is a side elevational view of the multiple jack with portions of the tower being erected, shown in phantom and with movement of the jack parts shown in dotted lines.

Similar numerals refer to similar parts in the several views.

In the drawings 2 indicates a base for the multiple jack generally indicated by numeral 3. The multiple jack consists of a central plate 4 from which four arms 6 extend radially. In the form shown the base plate 4 is substantially square and each of the base arms 6 extends outward from each of its four corners. Attachment is made between the base arms 6 and the central plate 2 by bolts 8, 8a, 8b, and 8c. The arms can be pivotally moved on these bolts when they are loosened but are held rigid when the nuts of the bolts are tightened.

At the outer ends of each of the base arms 6 there are loops 10, 10a, 10b, and 10c. These loops are sized and disposed so they will each include a cement pier or pile 12. These piers form foundations for the tower and are poured in proper position when the work is laid out in the first place. In the center of each pier there is a stub angle fitting 14. These fittings are included in the cement of each pier when it is cast and are provided with holes 15 for receiving attachment bolts.

Near the outer end of each of the base arms 6 there are multiple stage hydraulic jacks 16. These, in the form hereinafter shown, consist of three sections, the bottom cylinder 20, resting on the upper face of each arm, the top section 22 and the mid-section 21 connecting the bottom section to the top section 22.

At the top of the top section there is a fitting 23 which connects the top to a horizontal brace member 24 so that the tops of all of the jacks are braced in correct position to fit against the lower member of the tower section being lifted, such as 25 in FIGURE 4. These horizontal connection bars are removable attached by said fittings so that they may be easily removed when the jacks are to be hinged in a horizontal position for transport. Flexible hydraulic tubing 30 is used to connect the lower section of each of the jacks to a hydraulic pressure pump 31 positioned on plate 4. A valve system is used to apply the hydraulic fluid to each of the cylinders as desired and is located in a box 33, also positioned on plate 4. This box also contains electrically driven hydraulic pump (not shown).

On the bottom side of each of the arms 6 there are casters 35 to be used in moving the multiple jack frame when desired. When the jack frame is in use in the erection of a tower, however, the weight of the jack and the load which it lifts is borne by jacks 37 near the outer ends of each arm. These jacks are coupled with comparatively large base plates 38. Similar jacks 39, on base plates 40, are positioned near the inner ends of each of the arms. These jacks are of any type desired and may be screw jacks, as shown, operated by hand or may be small hydraulic jacks connected by flexible tubes to the pump in box 33.

These jacks, being positioned under each radial arm 6, carry the load of the tower as and when it is being erected. They are lowered and removed after the weight of the tower has been transferred to the pier 12. In disconnecting the arms from the piers, it is to be noted that the attaching loops 10 are secured to the ends of the arms 6 by bolts 16. These bolts are removed and the loops 10 removed from the pier 12 after the tower has been assembled and erected.
It is to be understood that the top section A of the transmission line tower B is of standard construction or any suitable construction to suit the particular job being erected. For this reason the various parts of the tower are shown in phantom.

In the process of erection it is to be understood that certain portions of the tower may be prefabricated; that is, held together loosely by bolts when taken from the shop assembly to the place of erection in the field. For example, the side members C of the tower may be assembled with the several corner braces held by bolts. These sections may be erected and held in position by chain hoists D and drawn into position when desired by these hoists. The hoists are then disconnected and bolts are inserted where necessary in order to complete the joints between the several sections of the tower. As the tower is built from the bottom most section and raised to insert the next lower section, the said next lower section is assembled from the prefabricated sections supplied from the assembly shop. Additionally and due to the fact that the erecting frame is disposed centrally of the foundation piers, it is to be noted that when prefabricated sections are utilized, it will be necessary to disassemble one corner or the like of all sections other than the topmost, in order that the same may be “wrapped around” the jacks which are supporting other sections in an elevated position.

When, for example, tower section C is completed the jack 24 and their lifting pads, together with horizontal connecting members 25 are reapplied to the bottom of the completed section C. Thereafter a new section is erected by applying corner assemblies and bolting them in place, as desired, in the same manner as above indicated.

When this section is completed the jacks are applied to it and it is raised to make room for the next following section. The bottom most section, when assembled and installed, will have its corner members rest on piers 12, one at each corner. The stub angle pieces 14 will then carry the load of the tower and the conductor wires that are strung on it. As above stated, the conductor wires, first laid upon the ground along side the tower, will be attached to insulators on the tower at the various positions indicated for them and will be carried up with the tower as the sections are raised by the multiple jack and the new sections built under them.

Workmen connecting the various parts together are held on a platform F which is operated by a heister G. This heister is on a base H which is hinged to the plate 4. When not in use the heister can be folded over the central portion of the assembly and thus space economized. The men on the platform operate the heister vertically as well as position it laterally. This type of structure is independent of the hydraulic lifting structure and is constructed optionally as best suits the particular installation.

I claim:

3 The method of erecting steel towers for high tension electrical transmission lines comprising the steps of erecting substantially equally spaced concrete foundation piers in the earth at the corners of an imaginary geometrical configuration, inserting tower engaging support members in each of the foundation piers, positioning an erecting frame with the main body thereof disposed substantially centrally of the geometrical configuration and extending at least one removably secured support arm from the main body to each of the foundation piers, positioning an adjustable jack on each of the support arms adjacent the foundation piers, interconnecting the tops of each jack by removable members for supporting the lower portion of a tower section which is to be elevated, connecting each jack to a source of fluid pressure disposed on said main body, erecting the top section of a multiple section tower wherein each section is of the same general dimension as said geometrical configuration and includes interconnected vertical and horizontal structural components, positioning the ends of the horizontal structural components on said piers, engaging the horizontal structural components with said interconnecting members and raising the said top section of said transmission tower by introducing fluid into each jack, positioning and assembling the next lower section of said tower beneath said top section with the respective horizontal ends of the next lower portion resting temporarily on said piers, lowering said jacks and said interconnecting members by withdrawing the fluid from said jacks to thereby bring the adjacent surfaces of said top section and said next lower section in proximity to one another, fastening the adjacent surfaces of said top and said next lower sections together, engaging the horizontal structural components of said next lower section with said interconnecting members and elevating the same by reintroducing fluid into the jacks and placing and assembling a third section of said tower beneath said top and said next lower sections with the respective horizontal ends of the third section resting on said piers, withdrawing the reintroduced fluid from said jacks to lower the interconnecting members to thereby bring the adjacent surfaces of said next lower sections and said third section in proximity to one another, fastening the adjacent surfaces of said third section and said next lower section together and securing the pier engaging ends of the third section to its respective top tower engaging support member, and connecting transmission lines and insulators to the top section of said tower.

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