My invention relates to antenna support towers and the method of erecting and operating same and is particularly concerned with but not limited to towers for television antennae.

In the present state of television broadcasting it is necessary to provide an elevated antenna for a receiving set located more than a few miles from the broadcasting station or stations to which it will be tuned if satisfactory reception is to be attained. The only towers now available for this purpose require a skilled crew to erect them and have no provision for lowering the antenna for inspection and repair. An electric motor is commonly mounted on top of the tower adjacent the base of the antenna mast for rotating this mast to bring its antenna into different angular positions to receive more effectively the broadcasts from different broadcasting stations.

Whenever it becomes necessary or desirable to inspect or repair the antenna, the antenna rotating mechanism, or the leads connected with either the antenna or its rotating mechanism, a man must climb the tower and effect any necessary changes or repairs while perched on the top thereof. This is a hazardous procedure requiring skill and experience beyond that of the ordinary householder and this service is customarily performed by a trained repairman who charges steep jack rates for climbing the tower.

The cost of installing and maintaining television receiving equipment is thus greatly increased for the householder who lives more than a few miles from the broadcasting station. Furthermore, it is frequently impossible to secure immediately the services of a trained repairman without considerable delay, whereas in many instances the desired inspection or repair could be made by the householder if the antenna and its lead-in wires were accessible without climbing the tower.

Because of the cost of erecting the towers presently available it is common practice to mount an antenna on the roof of a house. This imposes an additional load which the roof was not designed to support and vibration of the antenna in a high wind is apt to damage the roof and create leaks therein. Furthermore, inspection and repair of such an antenna is dangerous undertaking and the act of walking or climbing over a roof to effect such inspection and repair often results in damage to the roof.

An object of my invention is to provide a new and improved antenna support tower which is simple and inexpensive and may be easily erected by one man without special training.

Another object of my invention is to provide...
I have illustrated in erected position an antenna support tower incorporating my invention, it will be seen that in this particular embodiment of my invention, the tower has four telescopic sections A, B, C, and D. The section D is provided with a stud E adapted to receive the mast F of a television antenna which may be of any conventional or suitable type. The tower in erected position rests upon a base plate G and is held in upright position by guy wires indicated generally by the letter H and attached at their lower ends to a suitable anchoring means I. A sleeve J normally surrounds the lower end of the base section A but is movable to the dotted line position shown in Fig. 1 for a purpose which I shall presently describe.

The base G is shown in Fig. 3 and comprises a triangular plate of sheet metal or other suitable material having a cup-like depression 22 centrally located therein and downwardly turned corners 24. For a tower which is approximately 41 feet to the base of the aerial, I have found that the depression 22 can be quite shallow; that is, on the order of three-fourths of an inch, so that the plate G can be readily pressed into the ground by merely stepping thereon.

While any suitable anchoring means may be used for the lower ends of the guy wires H, I have found that the particular anchoring means shown in Fig. 4 is inexpensive, easy to drive into the ground, and especially effective in supporting the tower in upright position. This anchoring means is indicated generally by the reference character I and comprises a pair of pins or stakes 26 each terminating in a pointed end 28 and having an eye 30. These pins or stakes may be cheaply made of heavy wire or other suitable material and can be readily driven into the ground in the angular relationship shown so that the two eyes or heads 30 are adjacent each other with the shanks of the stakes forming an inverted V. The lower ends of the guy wires H are passed through both eyes so that the upward pull is exerted equally on the two stakes which, because of their angular relationship, pull against each other and afford an extremely secure anchor even in relatively loose soil.

Referring particularly to Figs. 5 and 6, which are parts of a continuous cut-away view of the tower in collapsed position, it will be seen that the base G of the tower is made up of four sections B, C, and D and the antenna support thereof. The section B is supported by ties 35 and can be held in erected position by section B, no lifting of sections C and D occurs until enough links 90 have been inserted.

The split sleeve J surrounds the lower end of the largest tube when the tower is erected and is secured to anchors firmly to keep the collapsed tower in upright position. Sleeve J is moved to upper position and part 42 of base tube 32 is removed.

A rod 62 is next inserted in the cross-bore 56 of tube 52 and raised to the position shown in Fig. 10 thereby raising the sections B, C and D and the antenna support thereof. While holding rod 62 with one hand, the operator inserts a hoist tube link 84 with the other hand. This link is of the same diameter and thickness as tube 52. The rod 62 is loosened to permit the tube 52 to rest in the link 84 when the rod 62 is withdrawn and inserted in cross-bore 66 in link 84. Again rod 62 is raised and another link 84 inserted beneath the link 84 in which the rod 62 is engaged.

This step by step raising of sections B, C, and D continues until section B nears the upper limit of its movement. At this point the half section 88a of a special bottom link 88 is inserted as shown in Figs. 7 and 16. A complete bottom link 88 is shown in Fig. 15 and consists of two half sections 88a and 88b. This bottom link is preferably longer than the links 84, and the half section 88a thereof is so placed in base tube 32 that the open side of section 88a faces the opening in the tube 32. The section B is now fully extended and the guy wires attached to collar 32 are held in place by means of the anchors I to assist in holding the tower upright.

Next a series of links 90 (Figs. 7 and 8) are inserted. These links are identical with links 84 except that links 90 are of the same diameter as tube 88. Since this tube is held in elevated position by means of links 90, the levers of sections C and D occur until enough links 90 have been inserted.
to bring the first one into engagement with the lower end of tube 58. As tube 58 approaches its upper limits another half 92 of a bottom section 92 is inserted. The bottom section 92 is like the bottom section 88 except of smaller diameter and shorter so that the joints between links 90 are slightly offset with respect to the joints between links 94. The guy wires of collar 60 are now attached firmly to the anchors I and add additional support to the tower.

A third set of links 94 is next inserted. These links are preferably made in the form of spools by drawing out the ends of a tube to form flanges 56 of the same diameter as the outside of the small tube 62. These flanges 56 are rounded in an axial direction to facilitate sliding of the spools in tube 58 and links 94. Each link 94 has a rod-receiving cross-hone 98. Enough links 94 must be inserted to bring the topmost link into contact with tube 62 before section D and the antenna carried thereby are raised. As section D approaches its limit, a solid cylinder 100 is inserted into tube 32 and half-sections 88a and 92a. This cylinder is shorter than half-sections 92a whereby the joints between links 94 are offset with respect to the joints between the other links since links 54, 50, and 94 are of the same length. The guy wires attached to the topmost collar are now made fast to the anchors I.

To complete the erection of the tower the half-sections 92b and 88b are inserted in tube 32 in the order named and then part 42 of tube 32 is put in place. Sleeve J may now be lowered and tightened to clump part 42, the complementary portion of tube 32, and the halves of links 88 and 92 firmly about the cylinder 100 and add rigidity and strength to the lower part of the tower.

Another important feature of my invention lies in the provision of method and means for rotating the antenna to any desired position. It will be noted (Figs. 7 and 12) that slot 50 provided by the cut-away portion of part 42 coincides with slots 102 and 104 formed by the similar cut-away portions of half-sections 88 and 92b respectively and that these slots are in horizontal alignment with the four bores 66 of cylinder 100. By raising sleeve J just enough to uncover these slots, and guided sleeve 23 may be inserted in a bore 105 and moved to turn cylinder 100. This turning movement is transmitted through the frictional engagement of the driving flanges 96 of spools 94 to tubes 62 and the antenna supported on its stud E. Antiflare bearing 66 between tube 62 and its collar 64 and antiflare bearing 105 beneath thrust swivel pad 110 on which cylinder 100 rests, facilitates this angular adjustment of the antenna. When the antenna has been turned to the desired position, sleeve J is lowered into a normal position and secured firmly about the base of the tower.

It will be seen from the foregoing description taken in connection with the accompanying drawings that I have provided a simple and inexpensive tower which can be easily erected and easily manipulated by a novel method to lower the antenna for inspection and repair and subsequently return it to erected position. A further advantage of my invention lies in the provision of simple and inexpensive means and method for rotating the tower to bring the antenna into the most effective alignment with any broadcasting station for which the receiving equipment may be tuned. This rotative adjustment of the antenna requires no motors or other expensive equipment and can be readily accomplished by a person on the ground. Experience has shown that where the principal parts of my novel tower are made of aluminum, a man working alone can easily erect a tower which, in extended position, is 41 feet to the base of the antenna mast.

While I have illustrated and described a particular embodiment of my invention in which the tower is composed of four telescopic sections, it is to be understood that my invention is not so limited but encompasses towers having different numbers of sections and made of any suitable material and of any desired length, since my novel construction and novel method are readily applicable to various sizes of towers composed of various suitable materials. However, my novel construction and method are particularly adapted for use in the form of a television antenna supporting tower which can be erected and operated by a single individual.

Another advantage of my novel construction and method of operation lies in the fact that it is not essential to raise a larger inner section to its maximum height before the next smaller inner section can be raised. In other words, where it is not necessary to extend a tower to the fullest extent, the degree of extension of each inner section may be varied within wide limits to give any desired arrangement.

While I have illustrated in the drawings only a single form of my invention, it is to be understood that my invention incorporates all modifications, variations, and equivalents coming within the scope of the appended claims.

I claim:
1. A tower of the class described comprising a plurality of telescopic sections including an outer section having a closed lower end and a removable wall part thereabove, an inner section projecting from the upper end of said outer section, a plurality of separate supporting links interposed between said inner section and said outer section, each supporting link being of such size that it can be inserted into said outer section through the opening formed by removing said part, a second inner section projecting upwardly from said first-mentioned inner section, and a plurality of independent links supporting said second inner section, said last-named links forming a column located in said first-named inner section and the supporting links therefore, said second-named links also being of a size for insertion through said opening in the outer section.

2. A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, and a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through the opening formed by removing said part.

3. A tower of the class described comprising an outer section having an opening adjacent
its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.

A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.

A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.

A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.

A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.

A tower of the class described comprising an outer section having a removable wall part adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in each series of links are offset from the joints in the other two series of links, and a sleeve slideable on said outer section to hold said removable part in an opening when said sleeve is in one position and to permit removal of said removable part when said sleeve is in a different position.
links holding said third inner section in extended position, all of said links being of a size for insertion through an opening formed by the removal of said wall section, the bottom links of the three series being of different heights and the other links all being of the same height whereby the joints in one series of links are offset in the other two series of links, an antifriction bearing for supporting said third series of links, and means for rotating said third series independently of the others.

11. A tower of the class described comprising an outer section having an opening adjacent its lower end, a first inner section telescoped in said outer section, a first series of independent supporting links holding said inner section in extended position, a second inner section telescoped in said first inner section, a second series of independent supporting links holding said second inner section in extended position, said second series of links extending through said first series of links and into said first inner section, a third inner section telescoped in said second inner section, and a third series of independent supporting links holding said third inner section in extended position, all of said links being of a size for insertion through said opening, the bottom link in the first and second series being longitudinally divided into halves and having a horizontal slot, and means extending through said slot to engage and rotate said third series of links and the section supported thereon.

12. A tower composed of an outer section and a plurality of inner sections in telescopic relationship, a supporting column for each inner section, each supporting column comprising a plurality of independent links, said outer section having an opening adjacent its base through which said links may be inserted and removed.

13. A tower composed of an outer section and a plurality of inner sections in telescopic relationship, a supporting column for each inner section, each supporting column comprising a plurality of independent links, said outer section having an opening adjacent its base through which said links may be inserted and removed, and means for rotating the innermost column and inner section supported thereon without rotating the remainder of the tower.

14. That method of extending a tower composed of telescopic sections which comprises the steps of raising an inner section, laterally inserting a supporting member thereon, lowering the raised section into engagement with the inserted member, raising the inserted member, laterally inserting a second member thereon, and lowering the raised member into engagement with the last inserted member.

15. That method of extending a tower consisting of several telescopic members which includes raising the second largest section, inserting laterally through the largest section a supporting member to a position below the raised section, lowering the raised section into engagement with the supporting member, raising the supporting member and inserting a second supporting member thereon, lowering the first inserted member into engagement with the last inserted member, repeating the last two steps until the second largest section has been raised to the desired elevation, and inserting through the largest section and the lowest supporting member of the second largest section a plurality of supporting members for a smaller section.

16. That method of extending a tower composed of telescopic sections which comprises raising the largest inner section, placing a supporting member thereon, lowering said largest section into contact with said member, raising said member, inserting a second member thereon, repeating the last two steps until said largest inner section has been raised to the desired height, inserting smaller members one at a time into the lowestmost of said first-named members, and raising each of said smaller members to permit insertion of another of said smaller members therebelow until the second innermost section has been raised to the desired height.

17. That method of operating a tower composed of an outer section and a plurality of inner sections in telescopic relationship which comprises inserting through said outer section one at a time a plurality of supporting members to extend the inner sections in the decreasing order of their size and to remove said supporting member one at a time through said outer section to lower said inner sections in the reverse order.

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References Cited in the file of this patent

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>989,069</td>
<td>Siewert</td>
<td>Apr. 11, 1911</td>
</tr>
<tr>
<td>1,299,261</td>
<td>Taylor</td>
<td>Apr. 1, 1919</td>
</tr>
<tr>
<td>1,413,582</td>
<td>Vail</td>
<td>Apr. 11, 1922</td>
</tr>
<tr>
<td>1,681,325</td>
<td>Sands</td>
<td>Apr. 20, 1928</td>
</tr>
<tr>
<td>1,672,246</td>
<td>Clark</td>
<td>June 3, 1922</td>
</tr>
<tr>
<td>1,808,633</td>
<td>Carver</td>
<td>June 2, 1931</td>
</tr>
<tr>
<td>1,972,427</td>
<td>Brock</td>
<td>Sept. 11, 1934</td>
</tr>
<tr>
<td>2,036,047</td>
<td>Hill</td>
<td>Mar. 31, 1936</td>
</tr>
</tbody>
</table>