

March 2, 1954

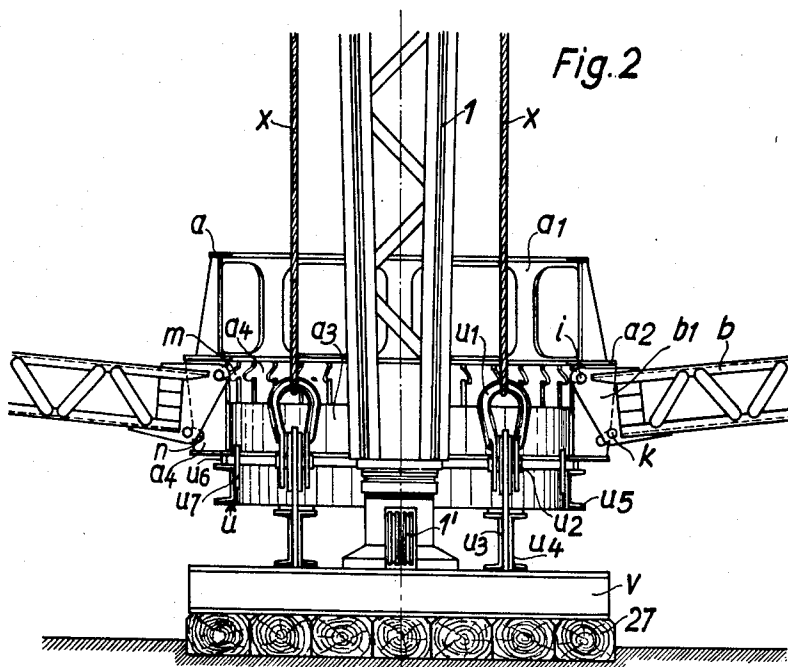
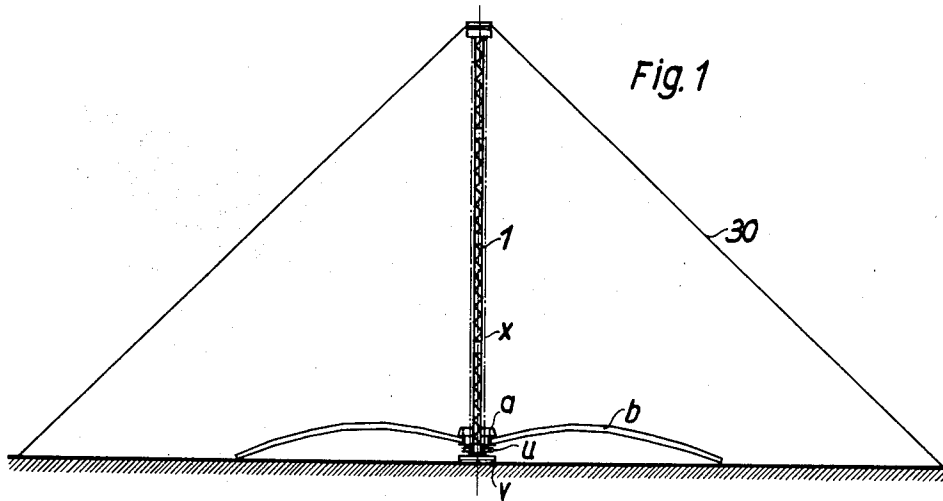
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2,670,818

METHOD OF ERECTING CUPOLA STRUCTURES

Filed Dec. 3, 1949

5 Sheets-Sheet 1



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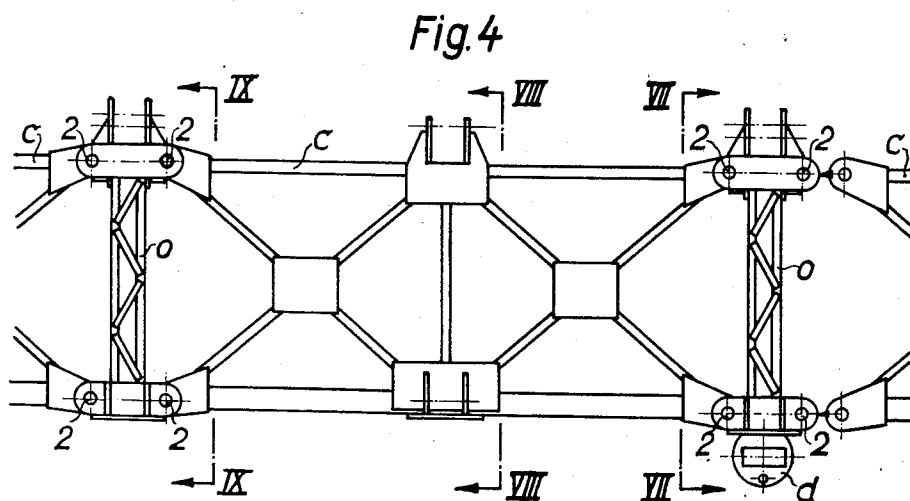
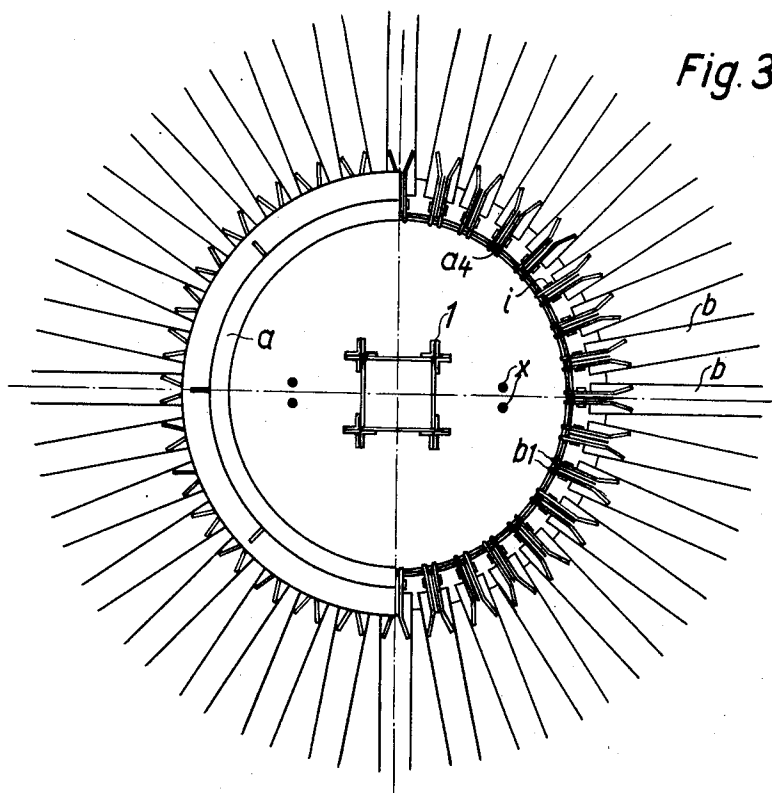
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METHOD OF ERECTING CUPOLA STRUCTURES

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5 Sheets-Sheet 2



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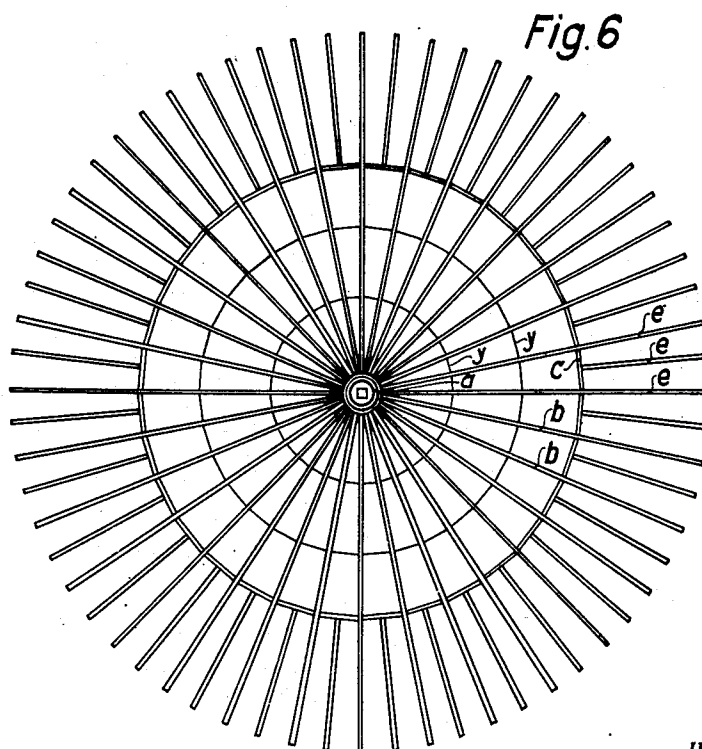
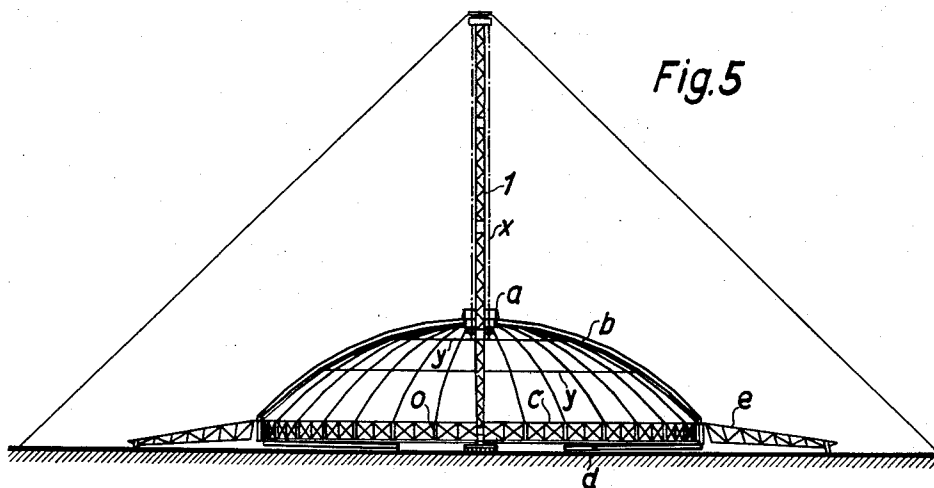
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METHOD OF ERECTING CUPOLA STRUCTURES

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5 Sheets-Sheet 3



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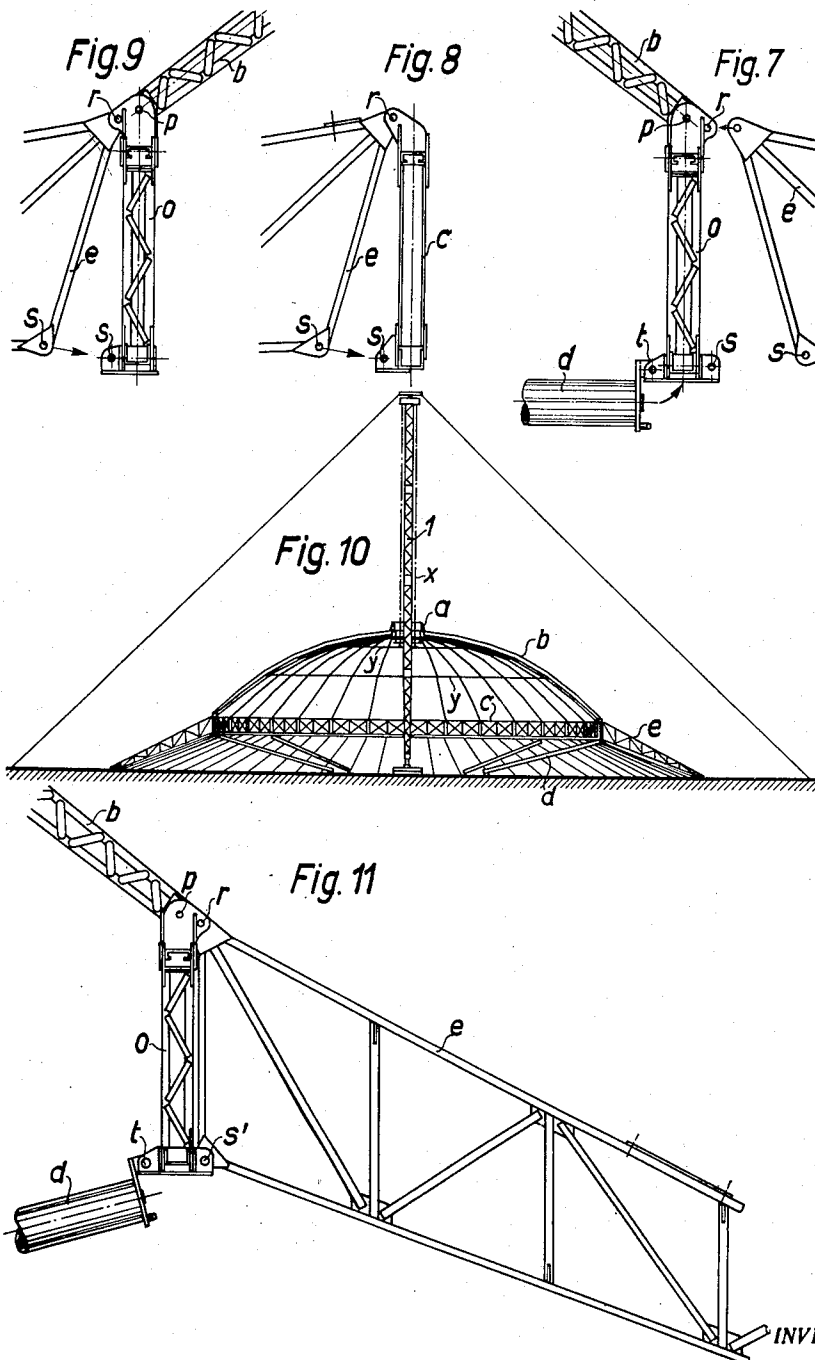
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METHOD OF ERECTING CUPOLA STRUCTURES

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5 Sheets-Sheet 4



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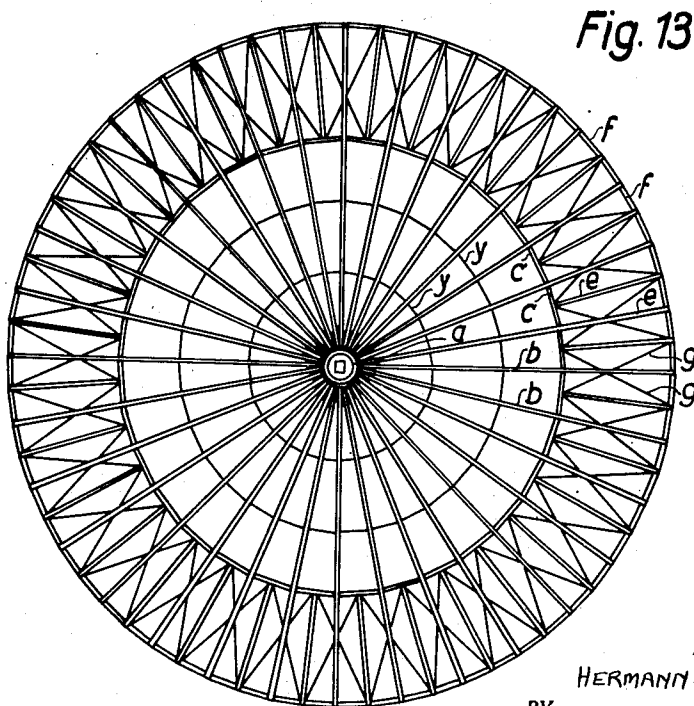
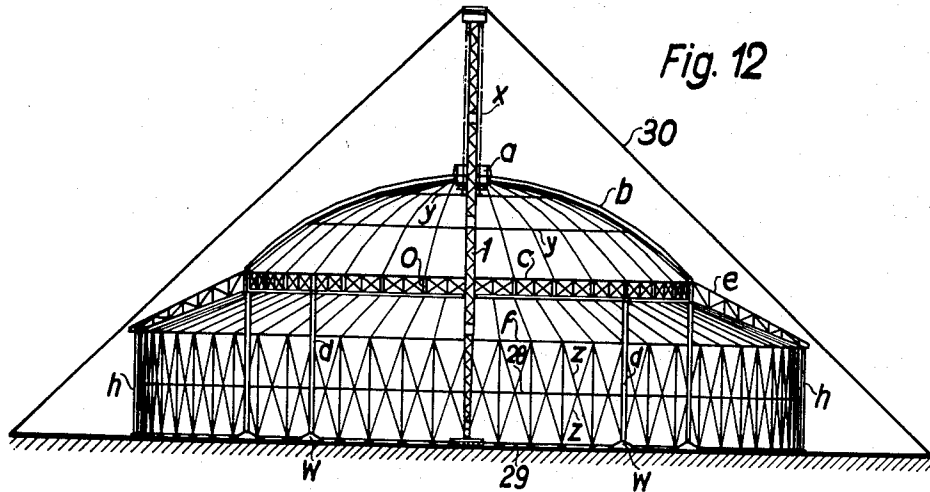
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METHOD OF ERECTING CUPOLA STRUCTURES

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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METHOD OF ERECTING CUPOLA STRUCTURES

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3 Claims. (Cl. 189—2)

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The present invention relates to cupola structures, and more particularly to a method for the erection of a cupola structure consisting of prefabricated elements.

It is the object of the present invention to provide a method for the erection of a cupola structure consisting of prefabricated elements without use of a scaffold or another temporarily erected framework.

With this object in view the present invention mainly consists in a method for erecting a cupola structure by means of a temporarily erected mast by which the elements of the cupola structure are supported during the construction. The mast supports by means of ropes a central annular member to which radially extending cupola members are pivotally attached. The annular member is gradually raised so that the cupola members pivot into a predetermined position in which they are fixedly secured to the central annular member. The lower ends of the cupola members are then connected by cupola supporting members which form a ring. To this ring, supporting members and other structural elements are pivotally attached, whereupon the structure is again raised until the supporting members, and the other structural elements, pivot into a predetermined position in which they are secured.

The invention will be best understood from the following description with reference to the accompanying drawings in which:

Fig. 1 is a side view of the structure according to the present invention during the first stage of erection;

Fig. 2 is a side view of a detail;

Fig. 3 is a plan view of Fig. 2;

Fig. 4 is a side view of a detail;

Fig. 5 is a side view of the structure before the second stage of erection;

Fig. 6 is a plan view of Fig. 5;

Figs. 7, 8 and 9 are sectional views showing details to Fig. 5 on lines 7—7, 8—8, and 9—9, respectively, in Fig. 4;

Fig. 10 is a side view of the structure during the second stage of erection;

Fig. 11 is a side view of a detail of Fig. 10;

Fig. 12 is a side view of the erected structure; and

Fig. 13 is a plan view of Fig. 12.

Referring now to the drawings and more particularly to Figs. 1, 2 and 3, a mast 1 is placed on a support consisting of boards 27 and a grate 28. The top end of the mast is secured by cables 30 holding the mast in upright position. Ropes x

pass over pulleys, not shown, on the top of the mast 1, and are secured at the ends thereof to a supporting structure *u* by means of forked members *u1* in which pins *u2* are mounted. Suspending members *u3* are turnable about the axis of the pins *u2*, and are secured to two beams *u4*. The beams *u4* extend across a supporting ring *u5* and are secured to the same so that the ring *u5* can slightly rock about the pins *u2*. On top of the ring *u5* another intermediate ring *u6* is arranged. Centering projecting members *u7* are provided for centering the annular member *a* on the supporting ring *u5*. The other ends, now shown, of the ropes *x* pass inside the mast structure 1 and are guided about pulleys 1'.

In the first stage of erection of the cupola structure, the annular member *a* is placed on the supporting rings *u5*, *u6*. The annular member *a* consists of an upper ring *a1* which has a horizontal flange *a2*, and of a lower ring *a3*. A plurality of radial webs *a4* which have cut outs *m* and *n*, are welded to the ring *a3* and to the flange *a2* of the upper ring *a1*.

A plurality of radially extending cupola members *b* are attached to the webs *a4* by bolts *i* and are arranged on the ground as shown in Figs. 1 and 3.

The central annular member *a* is raised by means of the ropes *x* so that the radially extending cupola members *b*, pivoting about the bolts *i*, slide with their lower ends on the ground until they arrive in a position in which the transverse bolts *k* engage the slots *n* in the webs *a4* whereby the position of the cupola members *b* is defined. The structure is further raised for a short distance whereupon vertical elements *o* are secured by bolts *p* to the lower ends of the cupola members *b*, as best seen in Fig. 9.

A plurality of cupola supporting members *c* are now arranged in a ring as shown in Figs. 5 and 6, and secured to the vertical elements *o* by means of bolts *q*, as shown in Fig. 4. The rigidity of the structure may be increased by connecting rods *y* forming a ring.

Thereupon, a plurality of tie members *e*, and supporting members *d* are secured by bolts *r* and *t*, respectively, to the vertical elements *o*, see Fig. 7. The structure is now in the position shown in Figs. 5 and 6 with the tie members *e* extending outwardly and the supporting members *d* extending inwardly in radial direction. Preferably there are twice as many tie members *e* provided than cupola members *b*, the attachment of the tie members *e* to the cupola supporting members *c* by bolts *r* being shown in Fig. 8.

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The second stage of erection is started from the position shown in Fig. 5, and is illustrated in Fig. 10 which shows how raising of the central annular member *a* causes raising of the outer ring consisting of the cupola supporting members *c* so that the members *e* and *d* slide on the ground into final positions. First the tie members *e* arrive in the inclined position shown in Figs. 10 and 11, and are secured to the vertical elements *o*, and to the cupola supporting members *c* as illustrated in Figs. 8, 9, and 11 by bolts *s'* which are placed in the holes *s*. Outer ring elements *f* are now attached to the lower ends of the tie members *e*, and form an outer ring, while connecting ties *g* are provided for increasing the rigidity of the roof structure formed by the members *e*.

The structure is now further raised until the supporting members *d* arrive in the vertical position shown in Fig. 12, in which position they are supported by foundations *w*.

Wall members *h*, connected by horizontal members forming rings 28, 29, are secured to the cupola supporting members *e*. Diagonal ties *z* may be provided for increasing the rigidity of the structure and for providing a support for wall panels.

The cupola structure is now completed, and the mast *l* is now removed. The ring *u* is lowered to the ground, the ropes *x* and the cable 30 are removed, and the mast is disassembled by successively removing the lowermost portions of the same and gradually lowering the upper portions to the ground.

Disassembly of the cupola structure is carried out in reverse order. First the central annular member *a* is supported on a mast, and then the structure is disassembled from the outside starting with the wall members *h*, whereupon the supporting members *d* are pivoted out of the vertical position, and the structure lowered. The members *e*, *d* and *c* are then disconnected, and the upper portion of the structure lowered and dismantled.

While the invention has been described and illustrated with reference to a preferred method of erecting a cupola structure, it will be understood that modifications of the method of the present invention may be made without departing from the spirit of the present invention.

What I claim is:

1. A method of erecting a cupola structure comprising, in combination, the steps of erecting a mast passing through a central annular member located on the ground; pivotally attaching a plurality of radially extending cupola members to said annular member; lifting said annular member by means of ropes connected thereto and to the top of said mast so that said cupola members pivot into a predetermined inclined position; securing said cupola members in said inclined position to said annular member; placing a plurality of cupola supporting members end to end in a circle around the lower ends of said cupola members; connecting each of said cupola supporting members to an adjacent cupola supporting member and to the lower end of a correspondent cupola member; arranging a plurality of tie members in an outwardly extending radial position, and a plurality of supporting members in an inwardly extending radial position on the ground; pivotally connecting each of said supporting members and of said tie members to the joining point of said cupola members and of

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said cupola supporting members; lifting the structure again until said supporting members pivot into a vertical position, and said tie members pivot into a predetermined inclined position; attaching a plurality of wall members to the outer ends of said tie members; supporting said wall members and said supporting members; and removing said mast.

2. A method of erecting a cupola structure comprising, in combination, the steps of erecting a mast passing through a central annular member located on the ground; pivotally attaching a plurality of radially extending cupola members to said annular member; lifting said annular member by means of ropes connected thereto and to the top of said mast so that said cupola members pivot into a predetermined inclined position; securing said cupola members in said inclined position to said annular member; placing a plurality of cupola supporting members end to end in a circle around the lower ends of said cupola members; connecting each of said cupola supporting members to an adjacent cupola supporting member and to the lower end of a correspondent cupola member; arranging a plurality of supporting members in a radially extending position on the ground; pivotally connecting each of said supporting members to the joining point of said cupola members and of said cupola supporting members; lifting the structure again until said supporting members pivot into a vertical position; supporting said supporting members; and removing said mast.

3. A method of erecting a cupola structure comprising, in combination, the steps of erecting a mast passing through a central annular member located on the ground; pivotally attaching a plurality of radially extending cupola members to said annular member; lifting said annular member by means of ropes connected thereto and to the top of said mast so that said cupola members pivot into a predetermined inclined position; securing said cupola members in said inclined position to said annular member; placing a plurality of cupola supporting members end to end in a circle around the lower ends of said cupola members; connecting vertical elements to the adjacent ends of adjacent cupola supporting member; connecting one of said vertical elements to the lower end of each of said cupola members; arranging a plurality of supporting members in a radially extending position on the ground; pivotally connecting each of said supporting members to one of said vertical elements; lifting the structure again until said supporting members pivot into a vertical position; supporting said supporting members; and removing said mast.

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