June 13, 1961 E. A. CAMPBELL ET AL 2,988,180

SKELETON TOWER

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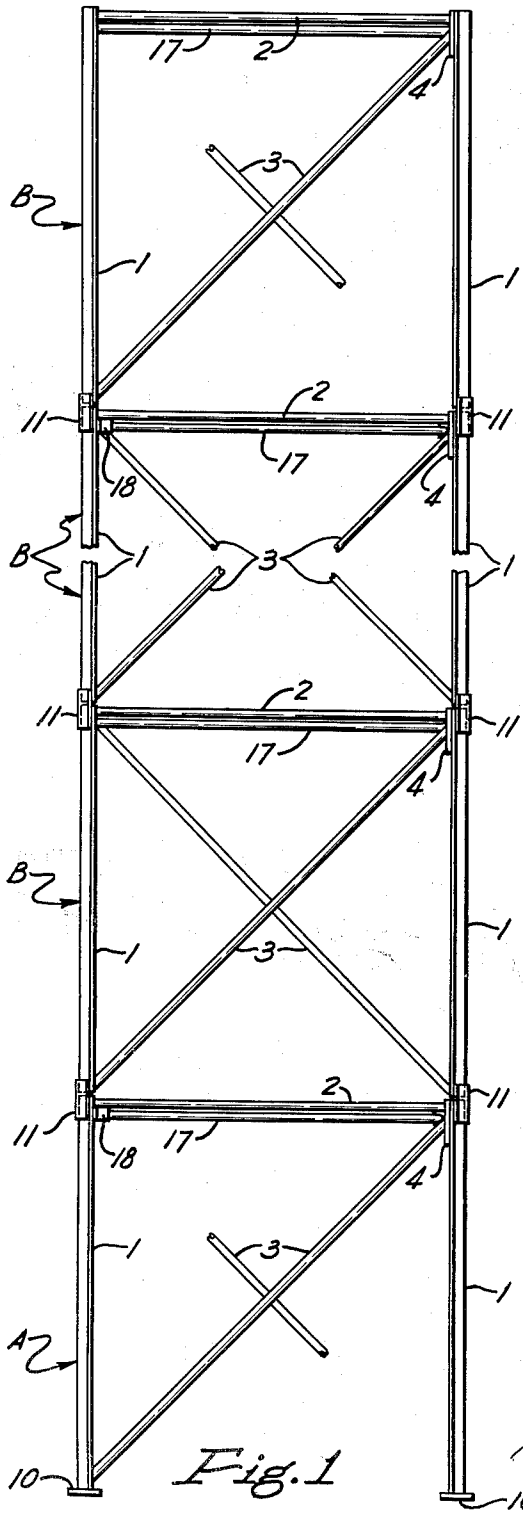


Fig. 1

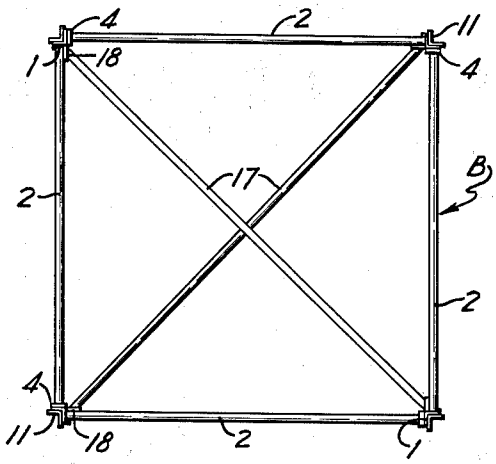


Fig. 2

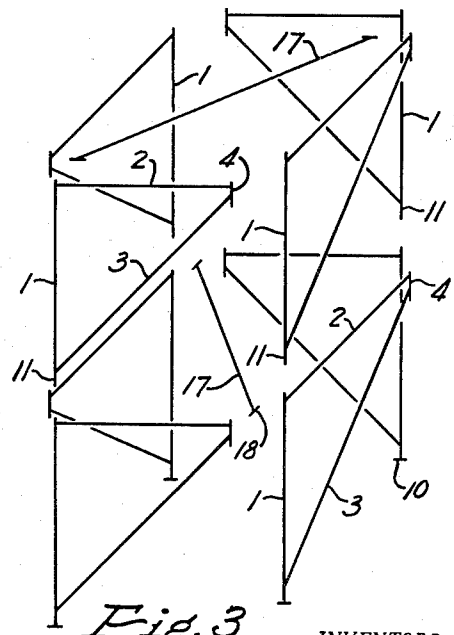


Fig. 3

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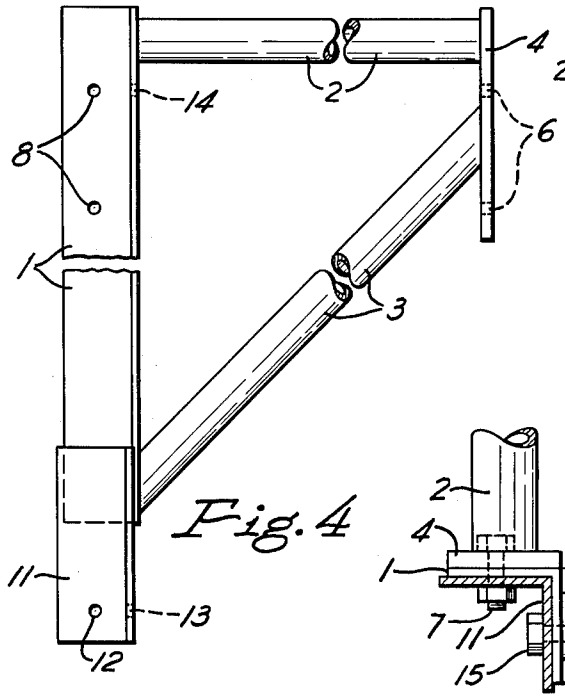


Fig. 4

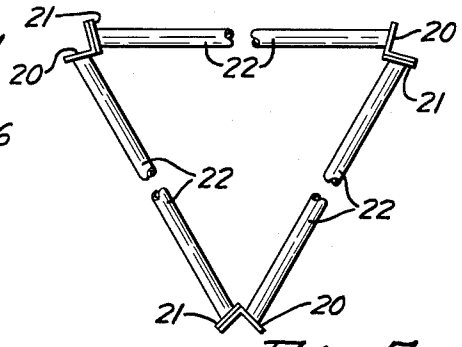


Fig. 7

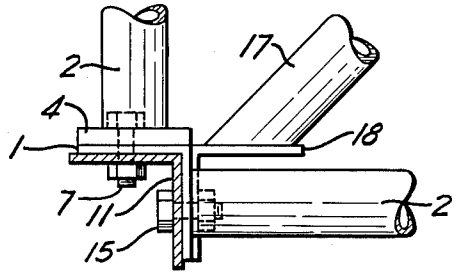


Fig. 6

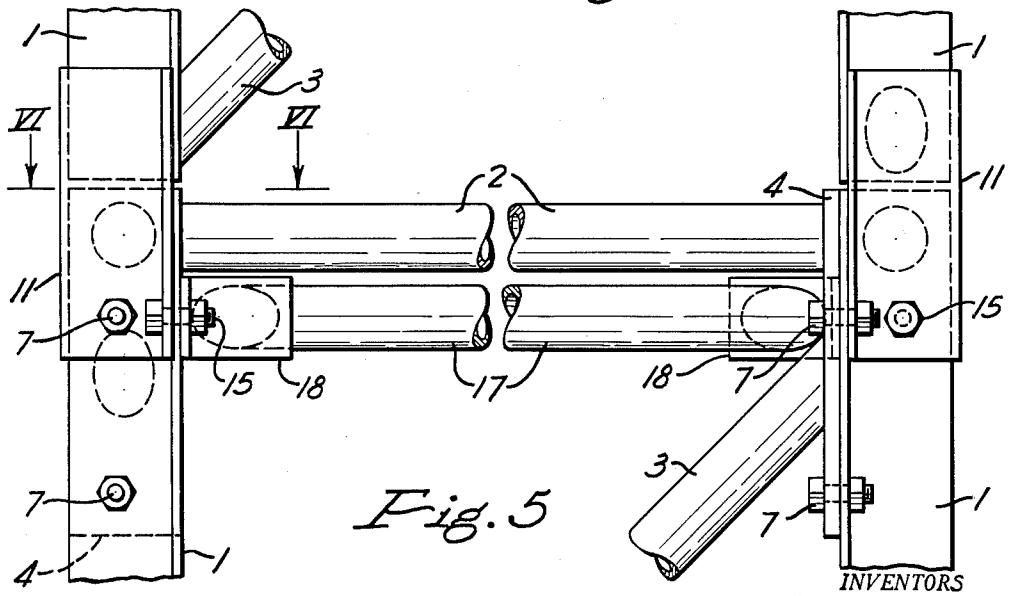


Fig. 5

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United States Patent Office 2,988,180 Patented June 13, 1961

2,988,180

SKELETON TOWER

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Filed Feb. 4, 1960, Ser. No. 6,773
7 Claims. (Cl. 189—12)

This invention relates to skeleton towers, and more particularly to those assembled from prefabricated units.

The customary way of building a tower is to set up leg sections on the ground and then connect them by girts and braces, adding more leg sections, girts, and braces as the height of the tower is increased. That is a slow process, because a great many pieces and connections are required. As work progresses upward, the dangers to the workmen increase. Sometimes some of the elements forming the tower are preassembled so that fewer connections have to be made as the tower is erected, but still there are a large number of different parts to handle unless the prefabricated parts are large and difficult to handle.

It is among the objects of this invention to provide a skeleton tower, which is composed of units of only two or three different simple forms, which can be quickly erected with a minimum of joints, and which utilizes prefabricated panels, each of which consists principally of a girt and a brace and a section of a leg.

In accordance with this invention the tower is formed from a plurality of superposed sections that are rigidly connected together by fastening members. Each section is formed from three or four prefabricated side panels, depending on whether the tower is triangular or square. All of the panels are of the same construction, except that those in the lowest section may be provided with feet. Each panel is triangular and it includes a substantially vertical leg, a girt extending horizontally away from the leg, an inclined brace extending away from the opposite end of the leg toward the outer end of the girt, and means joined to the adjoining ends of the girt and brace for connecting the panel to the leg of an adjoining panel in the same section. Also, one end of the first-mentioned leg is formed for connection by a fastening member to the adjoining end of a leg in an adjoining section.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a side view of a square tower with several sections omitted;

FIG. 2 is a plan view;

FIG. 3 is an exploded diagrammatic perspective view;

FIG. 4 is an enlarged side view of a single panel with portions of it broken away;

FIG. 5 is an enlarged fragmentary side view showing the connections between two adjoining sections;

FIG. 6 is a fragmentary horizontal section taken on the line VI—VI of Fig. 5; and

FIG. 7 is a plan view of a section for a triangular tower.

Referring to FIG. 1 of the drawings, the tower is composed of any desired number of tower sections A and B resting on top of one another. Each of these sections, which is generally put together in the field, is composed of prefabricated side panels of substantially identical construction. Where a square tower is to be constructed, each section is composed of four panels. Each side panel is flat for ease in shipping and handling and is triangular as shown in FIG. 4. The sides of the triangle are formed by a substantially vertical leg **1**, a girt **2** extending horizontally away from the leg at one end, preferably the upper end, and an inclined brace **3** extending from the opposite end of the leg toward the outer end of the girt. The adjoining ends of the girt and brace are rigidly connected by suitable means, such as a substantially vertical splice plate **4** disposed transversely thereto. All of these

elements are welded together. For best results, the panel leg is formed from an angle bar, and the girt and brace are formed from tubes. When the legs of the sections are strictly vertical, as distinguished from slightly inclined, the inner flange of each legs, to which the girt and brace are welded, is parallel to the splice plate **4**, and the other or outer flange of the leg extends outward in a direction away from that plate. The splice plate is provided with one or more vertically spaced holes **6**, through which fastening members, such as bolts **7** (FIGS. 5 and 6), extend. The outer flange of the leg is provided with holes **8** at the same level as the splice plate holes, so that the bolts extending through the splice plate of a panel at right angles to that flange can also extend through the flange to connect those two panels together. By connecting the splice plate of each of the four panels to the leg of an adjoining panel in this way, a square tower section is formed. The panels are easy to handle and can be quickly connected to one another by the bolts to form the different sections, in which the panel legs become the section legs.

The lower end of each panel leg **1** in the bottom section A may have a flat plate **10** welded to it to serve as a foot on which the tower rests. Each of the panels in the rest of the sections B has means at one end of its leg for splicing it to the end of a leg in an adjoining section. The splicing means may be separate members that are permanently secured to the lower ends of the legs for connection by bolts to the upper ends of the underlying legs. Thus, the splicing may be accomplished by a short angle bar **11** overlapping the lower end of a panel leg, to which it is welded, and extending downward therefrom a few inches in overlapping engagement with the underlying leg. The flanges of the splice bar are provided with holes **12** and **13**, the first of which registers with the upper hole **8** in the outer flange of the overlapped leg, and the other of which registers with a hole **14** in the inner flange of that leg. The same upper bolt **7** that connects a splice plate **4** to the leg of another panel, also extends through hole **12** in the overlapping splice bar **11** to rigidly connect the three elements together. Another bolt **15** extends through the other hole **13** in the splice bar and the leg hole **14** to strengthen the connection.

This last bolt **15** may also be used to fasten one end of a horizontal diagonal brace to the same leg. The opposite end of the brace is connected in like manner to a diagonally opposite leg in the same section. In the next section above, the diagonal brace extends at right angles to the one just mentioned. Each diagonal brace may be formed from a straight tubular member **17** welded at its opposite ends to angle brackets **18**, one flange of each of which engages the inner surface of the inner flange of a panel leg. The brace and leg are rigidly connected together by means of bolt **15**. It will be seen that there are only three bolts at each upper corner of each section of the tower, and no bolt at the lower corners. Lower bolt **7** connects a splice plate and panel leg, upper bolt **7** does the same thing and also holds in place the splice bar **11** of the leg above it, and at two corners of the section the bolt **15** connects together the splice bar and the leg and the diagonal brace.

In erecting this tower, the four panels with feet **10** are bolted together in the manner just described to form bottom section A resting on the ground. Then each section B can be formed on the ground by bolting four panels together, after which it is hoisted into place and bolted to the section below it. The diagonal brace, bolts **15** and upper bolts **7** are not put in place in any given section until the next section has been set on top of it, because those bolts are used for connecting the two sections together. Another erection procedure is to build each tower section in place, by first bolting one panel to the leg below it, then bolting the next panel to the leg be-

low it and to the splice plate 4 of the first panel, and following the same procedure in succession for the remaining two panels to complete the new section. A diagonal brace can then be installed at the top of the underlying section.

This tower is formed entirely, except for the bolts, from flat triangular panels and straight diagonal braces that are easy to handle. All of the panels are the same, except the bottom four which have feet instead of splice bars at their bottom. It will be observed that this tower does not use separate legs, because the vertical members of the panels form the legs.

The same principle can be used for constructing a triangular tower. In such a case each section of the tower is formed from triangular panels as before, but of course only three panels are used per section as indicated in FIG. 7. The only difference in the panels themselves is that either the panel leg 20 or the splice plate 21, or both, is disposed at such an angle to the horizontal girt 22 that the leg and plate will fit flat against the adjoining plate and leg of the other two panels in the section so that they can be bolted thereto. Diagonal bracing is unncessary in a triangular tower.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. A skeleton tower comprising a plurality of superposed sections, and fastening members rigidly connecting said sections together, each section being formed from prefabricated side panels of the same construction, and each panel being triangular and including a substantially vertical leg, a girt extending horizontally away from one end of the leg, an inclined brace extending from the opposite end of the leg toward the outer end of said girt, and means joined to the adjoining ends of said girt and brace and formed for connection to the leg of an adjoining panel in the same section by a said fastening member, one end of the first-mentioned leg being formed for connection by another said fastening member to the adjoining end of a leg in an adjoining section.

2. A tower in accordance with claim 1, in which each section is formed from four of said panels, the tower including a plurality of diagonal braces, each diagonal brace comprising a straight central portion and opposite end portions disposed at an angle thereto and secured to diagonally opposite legs of one of said sections.

3. A skeleton tower comprising a plurality of superposed sections, and fastening members rigidly connecting said sections together, each section being formed from prefabricated side panels of the same construction, and each panel being triangular and including a substantially vertical leg, a girt extending horizontally away from one end of the leg, an inclined brace extending from the opposite end of the leg toward the outer end of said girt, and a substantially vertical splice plate secured to the adjoining ends of said girt and brace and formed for connection to the leg of an adjoining panel in the same section by a said fastening member, one end of the first-mentioned leg being formed for connection by another said fastening member to the adjoining end of a leg in an adjoining section.

4. A skeleton tower comprising a plurality of superposed sections, and fastening members rigidly connecting said sections together, each section being formed from prefabricated side panels of the same construction, and each panel being in the general shape of a right triangle and including a vertical leg, a girt extending horizontally away from one end of the leg, an inclined brace extending from the opposite end of the leg toward the outer end of said girt, means joined to the adjoining ends of said girt and brace and formed for connection to the leg of an adjoining panel in the same section by a said fastening member, and means secured to one end of the first-mentioned leg and formed for connection by another said fastening member to the adjoining end of a leg in an adjoining section.

5. A square skeleton tower comprising a plurality of superposed sections, and fastening members rigidly connecting said sections together, each section being formed from four prefabricated side panels of the same construction, and each panel being triangular and including a substantially vertcial leg, a girt extending horizontally away from one end of the leg, an inclined brace extending from the opposite end of the leg toward the outer end of said girt, and a substantially vertical splice plate secured to the adjoining end of said girt and brace and formed for connection to the leg of an adjoining panel in the same section by a said fastening member, one end of the first-mentioned leg being formed for connection by another said fastening member to the adjoining end of a leg in an adjoining section, and a diagonal brace having opposite end portions secured to diagonally opposite legs of each section.

6. A skeleton tower comprising a plurality of superposed sections, and fastening members rigidly connecting said sections together, each section being formed from prefabricated side panels of the same construction, and each panel being in the general shape of a right triangle and including a vertical leg, a girt extending horizontally away from one end of the leg, an inclined brace extending from the opposite end of the leg toward the outer end of said girt, a vertical splice member secured to the adjoining ends of said girt and brace and provided with a fastener-receiving hole extending therethrough, said leg having a fastener-receiving hole therethrough at the same level as said plate hole in a position aligned with the hole in the splice plate of another panel in the same section, some of said fastening members extending through said holes in said first-mentioned panel and securing it to two adjoining panels in the same section, and a splice bar secured to one end of said leg and projecting vertically therefrom in overlapping relation with the adjoining end of a leg in an adjoining section, another of said fastening members extending through the projecting portion of said splice bar and adjoining leg.

7. A square skeleton tower comprising a plurality of superposed sections, a plurality of horizontal diagonal braces, and fastening members rigidly connecting said sections and braces together; each section being formed from four prefabricated side panels of the same construction, and each panel being in the general shape of a right triangle and including a vertical angle bar leg, a girt perpendicular to one flange of the leg and extending horizontally away from its upper end, an inclined brace extending from the lower end of the leg upward toward the outer end of said girt, a vertical splice plate parallel to said leg flange secured to the adjoining ends of said girt and inclined brace and provided with a fastener-receiving hole for securing it to the leg of an adjoining panel at right angle to said girt, and a splice angle bar secured to the lower end of said leg and projecting downward therefrom in overlapping engagement with the adjoing upper end of a panel leg below it, both flanges of the angle bar leg having fastener-receiving holes at the same level as said splice plate hole, each flange of the splice bar being provided with a fastener-receiving hole below the angle bar leg registering with a hole in said overlapped leg, the fastening members in the holes in the girt-engaging flanges of two diagonally opposite legs in each section connecting one of said diagonal braces thereto.

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