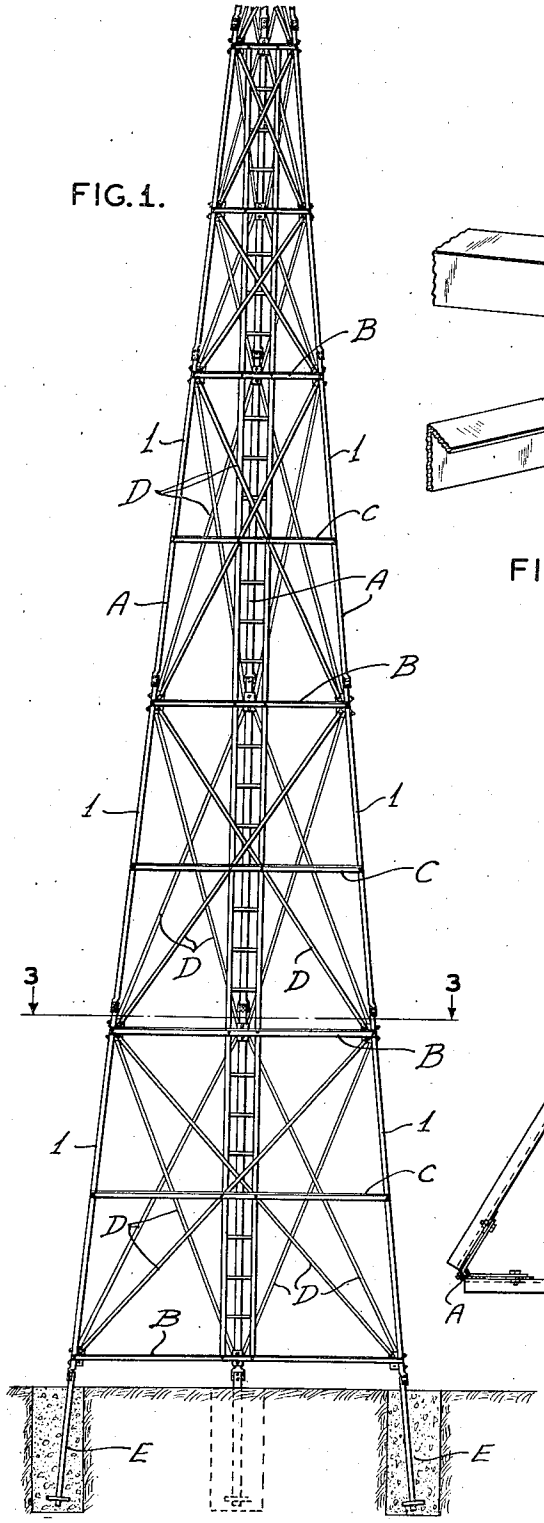
Jan. 9, 1940. C. BAUER 2,186,190

STEEL TOWER

Filed July 2, 1938 2 Sheets-Sheet 1

FIG. 1.



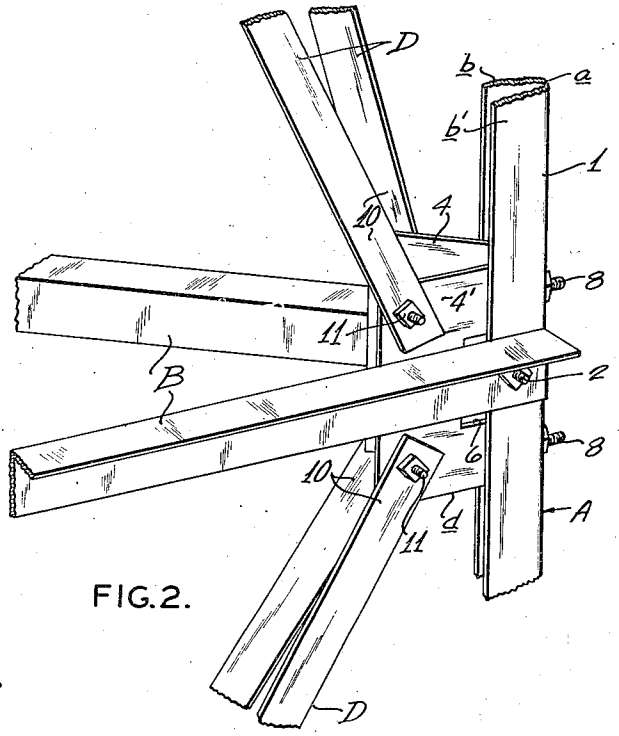




FIG. 2.

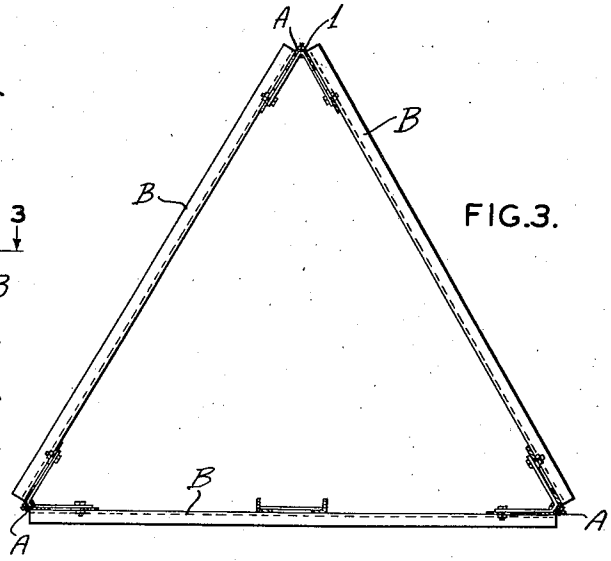



FIG. 3.

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Jan. 9, 1940. C. BAUER 2,186,190

STEEL TOWER

Filed July 2, 1938 2 Sheets-Sheet 2

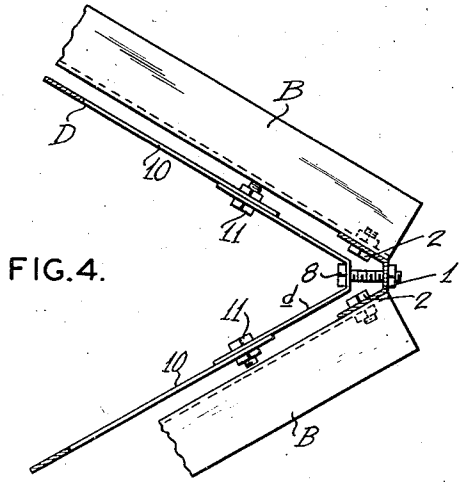



FIG. 4.

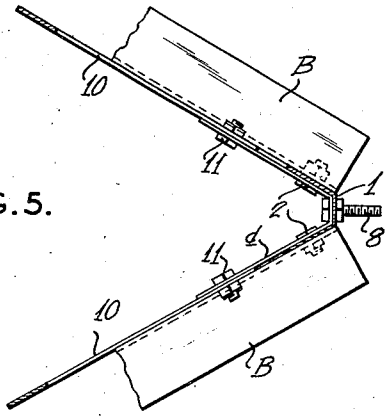



FIG. 5.

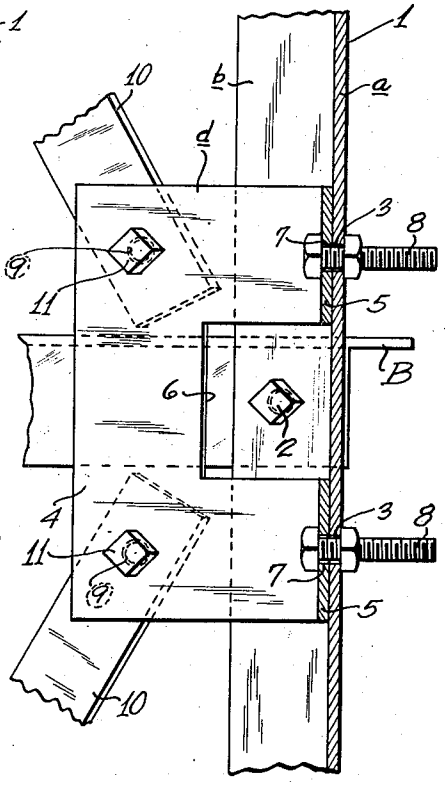



FIG. 7.

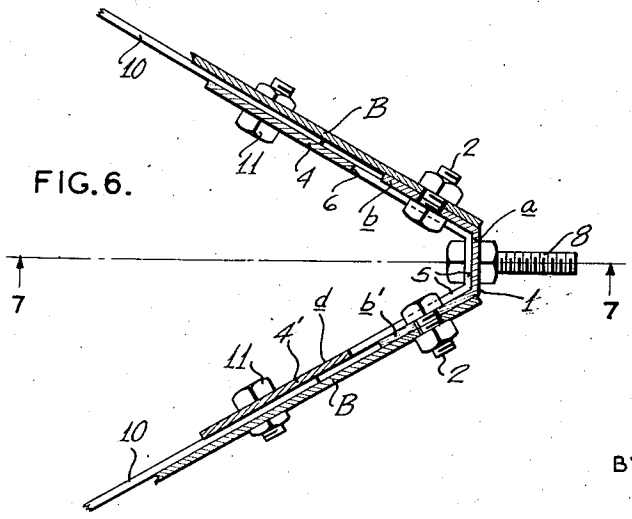



FIG. 6.

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Patented Jan. 9, 1940 2,186,190

# UNITED STATES PATENT OFFICE

2,186,190

## STEEL TOWER

Carl Bauer, St. Louis, Mo., assignor to Missouri Rolling Mill Corporation, St. Louis, Mo., a corporation of Missouri

Application July 2, 1938, Serial No. 217,180

5 Claims. (Cl. 189—20)

This invention relates generally to structural steel towers, such as oil well derricks, wind-mill, wind-power, and transmission towers, vertical radiators, and the like. More particularly, my present invention relates to a certain new and useful improvement in towers of the type disclosed in my Patent No. 2,145,232, issued Jan. 31, 1939, and has for its primary object the equipment of the tower with means preferably in the form of so-called brackets readily shiftable for not only facilitating the attachment of the diagonals to the tower legs, but also adjustably tensioning the diagonals on adjacent sides of the tower for increasing the rigidity and efficiency of the tower.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings (2 sheets)—metallic tower constructed in accordance with and embodying my present invention;

Figure 1 is a front elevational view of a metallic tower constructed in accordance with and embodying my present invention;

Figure 2 is an enlarged fragmentary perspective view of the tower, showing one of the diagonal securing and tension adjusting members or brackets and its associated parts;

Figure 3 is an enlarged horizontal sectional view of the tower, taken approximately along the line 3—3, Figure 1;

Figures 4 and 5 are enlarged fragmentary horizontal sectional views of the tower, showing one of the diagonal securing and adjusting brackets in loosened and tightened positions, respectively;

Figure 6 is an enlarged horizontal sectional view of the tower, showing the diagonal bracket in tightened position; and

Figure 7 is an enlarged fragmentary vertical sectional view of the tower, taken approximately along the line 7—7, Figure 6.

Referring now in more detail by reference characters to the drawings, which illustrate a preferred embodiment of my invention, the present tower is preferably in the form of a three-sided structure and, accordingly, in the present instance, comprises three upstanding legs A preferably in converging relation, as shown, each formed of a series of endwise connected or joined structural steel or other metallic members 1 transversely interconnected in tower-formation by a plurality of vertically spaced, horizontally disposed girts B and intermediate struts C and also by diagonal bracing D, each of the legs A being embedded at its lower extremity, as at E, in the ground or in a conventionally formed concrete foundation or footing, as will be understood and as best seen in Figure 1, and each respective leg A being, as shown, common, as it may be said, to two sides of the tower.

Each of the leg-members 1, which are preferably fabricated in any convenient lengths and of any desirable size, thickness, and strength, integrally includes a central longitudinally extending web *a* and opposed longitudinally extending flanges *b*, *b'*, disposed at angles of approximately 120° to the web *a* and, correspondingly, at an angle of approximately 60° to each other, the respective members 1 being suitably constructed at their respective opposite ends for interfitting attachment endwise one to the other in tower-formation, all as more fully described and disclosed in my said co-pending application, Serial No. 150,136.

The girts B, which are preferably in the form of flat or angle strips apertured at their respective opposite ends for bolt-accommodation, are preferably arranged in horizontally disposed, triangular sets, vertically spaced at suitable intervals lengthwise or longitudinally of the legs A, each girt B being at its opposite extremities disposed flatwise upon, and by means of bolts or other suitable attachment means 2 secured to the flanges *b*, *b'*, of opposite leg-members 1, as best seen in Figure 2. Since the flanges *b*, *b'*, of each member 1 are disposed, as stated, at an angle of approximately 60° to each other, the girts B are hence similarly angularly disposed in a horizontal plane at an angle of approximately 60° one with respect to the other.

Likewise, the intermediate struts C, which are also preferably in the form of flat or angle strips, are arranged in horizontally disposed triangular sets, positioned preferably midway between successive sets of girts B, each intermediate strut C being at its extremities fitted upon and secured to the leg-members 1 in the same manner as the girts B.

Each of the leg-members 1 at its web *a* is provided with a pair of apertures 3, 3, equally spaced on opposite sides of, and adjacent to, the point of attachment of each respective girt B. Disposed within the angle of each respective leg-member 1 adjacent the point of attachment of the particular girt B, and forming, as it may be said, substantially a part of the bracing D, is a securing and tightening-bracket *d* integrally including a pair of opposed flanges 4, 4', disposed

at an angle of approximately 60° to each other and integrally connected by a central web-portion 5, the bracket *d* being centrally cut away and thereby apertured, as at 6, as best seen in Figures 2 and 7, for accommodating the girt and leg securing bolts 2.

The web 5 is also provided with apertures, as at 7, suitably spaced for registration with the leg-apertures 3 for receiving securing and tightening-bolts 8, and the flanges 4, 4', are each provided with a pair of vertically aligned apertures 9, for purposes presently more fully appearing, each bracket *d* being similarly common to adjacent sides of the tower.

The bracing D includes on each side of the tower a plurality of sets of diagonally extending wind-brace members 10, which are secured to respective flanges of the particular brackets *d* by means of suitable bolts 11 inserted through apertures suitably formed for the purpose in the opposite ends of the brace-members 10 and through the apertures 9 of the bracket-flanges, all as best seen in Figure 7.

As will be understood by reference to Figures 4 and 5, the several bracket securing and tightening bolts 8 are each loosened to substantially their greatest extent prior to the attachment of the diagonals or wind-brace members 10. Now, after the legs, girts, and struts of the tower have been securely bolted together, the several bolts 8 are each drawn up to put the diagonals or wind-brace members 10 under tension and thereby draw the entire tower into a tightly joined and integrated structure. It will be noted in this connection that each brace tightener *d* simultaneously tensions the diagonals 10 in two planes or sides of the tower, thus uniformly distributing the diagonal-tension over all faces of the tower.

It will, of course, be understood by those skilled in the art that bracing of my present invention may be applied to the construction of steel towers of other horizontal cross-sectional shape than the triangular section herein disclosed as a preferred embodiment, in each such instance, the particular brace tightener brackets being shaped to conform to the particular cross-sectional shape or form of the leg-members utilized in the tower structure.

In any event, the bracing of my present invention enables for the first time, so far as I am aware, the construction of steel or other metallic towers substantially irrespective of the cross-sectional shape thereof in which the diagonals are initially placed under tension and normally maintained under tension throughout the life of the tower.

Such bracing, further, enables the construction of metallic towers of unusual rigidity and strength having relatively lightweight steel members. Thus, towers embodying bracing in accordance with my invention are exceedingly economical both in original cost, as well as in cost of construction and maintenance, since such towers may be readily dismantled and transported from location to location, the cost of transportation being materially lower by reason of the lightness of weight of the members employed. Finally, in the erection and dismantling of the tower, time and labor are materially conserved by reason of the fact that the bolt-holes of the various interconnected members are previously drilled and fitted and may be enlarged sufficiently to allow for ready assembly, the structure being readily and conveniently tightened and secured by means of the unique diagonal securing and tensioning brackets described.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several members of the tower may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a structural steel tower, a diagonal securing and tightening bracket integrally including spaced apart web members adapted for adjustable securement to a leg of the tower, and a pair of angularly opposed flanges marginally joining said web members and being adapted for connection with respective tower braces in two different planes of the tower.

2. A tower brace-tightening bracket including a pair of U-shaped plate-members integrally connected across the end margins of their respective leg portions by spaced webs, each web being apertured for receiving a respective tightening bolt and each plate-member being apertured for retentive engagement with respective brace-members.

3. Tower-bracing including an angle-bracket comprising a central web and diverging flanges for fitting a correspondingly contoured tower-leg with the web of the bracket disposed within the angle, and presented toward the web, of the leg, diagonal brace-members secured at an end to the flanges only of the bracket, and means engaging the webs of the bracket and leg for adjustably securing the bracket to the leg for tensioning the several brace-members.

4. Tower-bracing including an angle-bracket comprising a central web and diverging flanges for fitting a correspondingly contoured tower-leg with the web of the bracket disposed within the angle, and presented toward the web, of the leg, diagonal brace-members secured at an end to the flanges only of the bracket, and means engaging the webs of the bracket and leg for adjustably securing the bracket to the leg for tensioning the several brace-members, the bracket being cut away for accommodating connection with said leg of a tower-girt.

5. Tower-bracing including an angle-bracket comprising a central web and diverging flanges for fitting a correspondingly contoured tower-leg with the web of the bracket disposed within the angle, and presented toward the web, of the leg, diagonal brace-members secured at an end to the flanges only of the bracket, the bracket being cut away at its web and flanges for accommodating connection with said leg of a tower-girt, and means engaging the web of the bracket, above and below said cut-away portion, and the web of the leg for adjustably securing the bracket to the leg for tensioning the several brace-members.

CARL BAUER.