Aug. 6, 1940. V. ORSENIGO 2,210,465

SCAFFOLD

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FIG. 1.

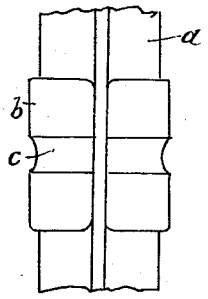


FIG. 3.

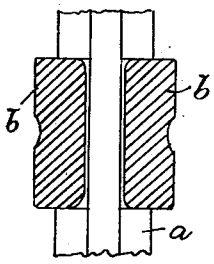
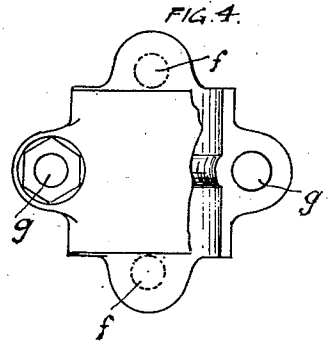


FIG. 4.



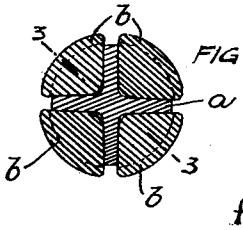


FIG. 2.

FIG. 5.

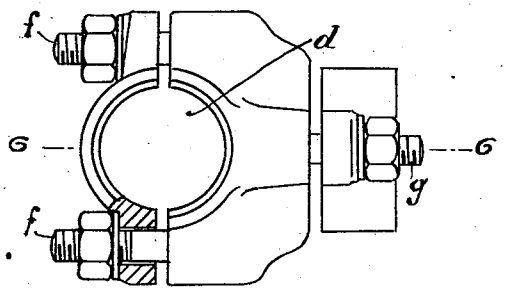
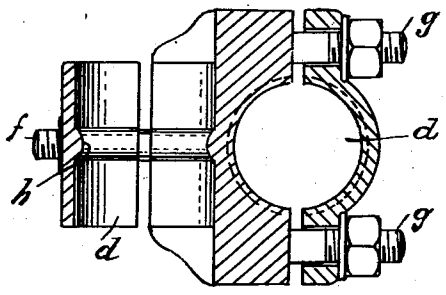


FIG. 6.



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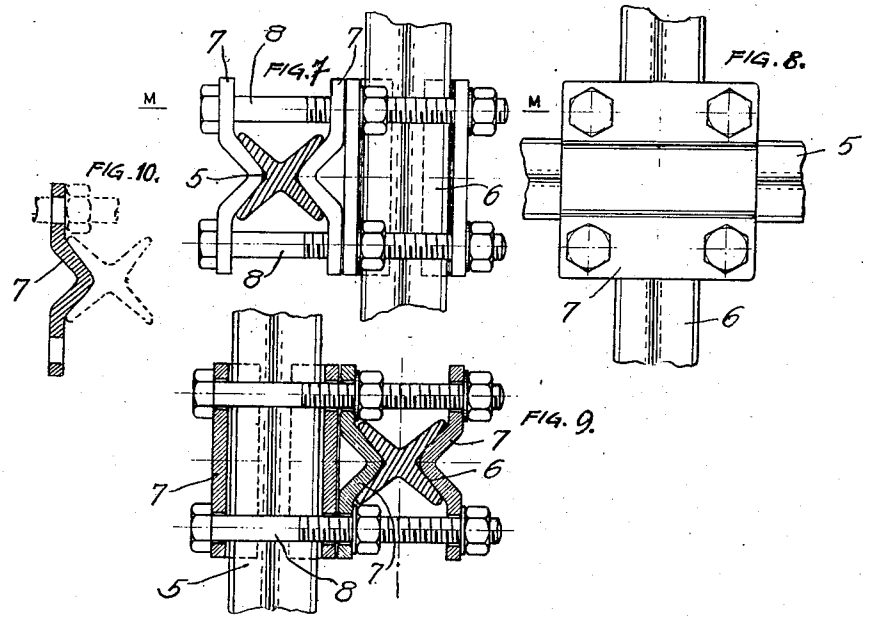

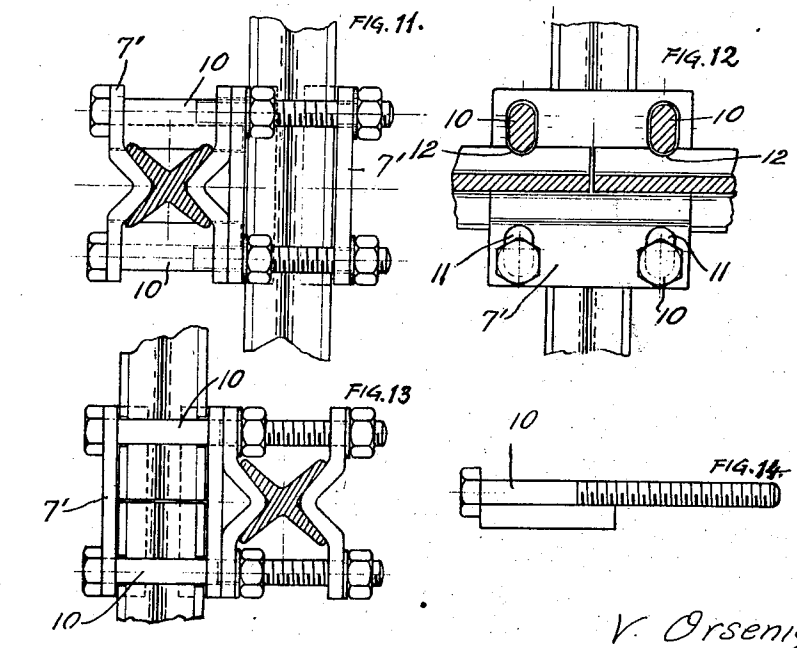

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FIG. 15

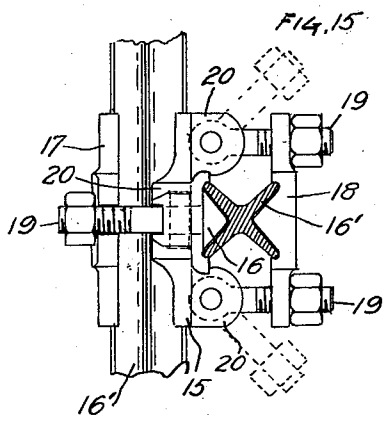


FIG. 16

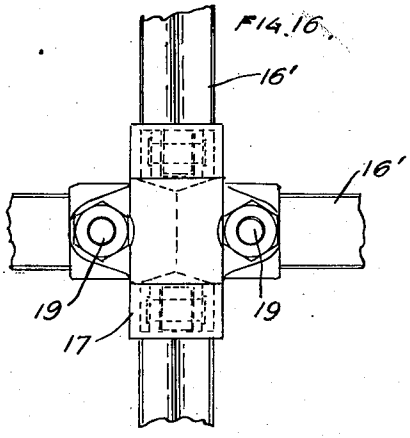
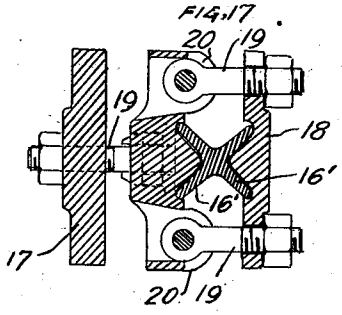


FIG. 17



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Patented Aug. 6, 1940 2,210,465

UNITED STATES PATENT OFFICE

2,210,465

SCAFFOLD

Vittorio Orsenigo, Milan, Italy

Application December 31, 1937, Serial No. 182,880
In Italy January 20, 1937

4 Claims. (Cl. 304—40)

Recent improvements obtained in the building industries and modern requirements for building of great size and great height, have brought about the need, for strong scaffolding, easy to assemble and easy to take down, capable of convenient transportation and storage but perfectly meeting all requirements of the building's erection, and offering the least possible obstruction to the public thoroughfares.

Besides, it is often required to build suspended scaffolding on the building facades above the ground by anchoring the scaffolding to said facade.

Therefore, wooden scaffolding having been discarded as obsolete owing to its many disadvantages, particularly for its bulky overall dimensions, the difficulty of transportation of long poles and standards, the great space required for storage, early deterioration and destruction, the fire hazards and other disadvantages, iron scaffoldings have been more and more in use these last years. The most used are those consisting of sections of iron tubes, connected together with special couplings utilizing friction contact and secured to the pipes by bolts.

The object of the present invention is to provide scaffoldings formed of drawn or rolled steel bars, having the same tensile strength and length as the tubular sections usually employed in metal scaffolding. The bars are cross-shaped in section and the thickness of the material is such as to show a resisting moment to axial pressure combined with flexibility and stresses and weight appreciably equal to that of the tubular sections usually adopted for scaffolding.

The rolled cross shaped elements, in cross-section, have an outside surface which is easily reached in any part for protective painting. Besides they are not so thin as to be easily eaten up by rust. Their cross-section is uniform and regular in all points and therefore the mechanical resistance to the scaffold's stresses is absolutely uniform and safe. Besides the free surface exposed to the action of the air or to noxious atmospheric agents, is much smaller (about one-half that of tubular sections), equal resistance being admitted.

The rolling of such bars is apparently much cheaper than the rolling of tubes, therefore the scaffold of this kind will cost less than with tubular units.

The adoption of such rods for erecting scaffolds and other metal frames, which are easy to disassemble, is rendered possible and convenient by means of special couplings for connecting the iron elements.

The coupling can be of the universal pattern, or, according to an alternative embodiment of the invention, it can be made with metal plates, and differs from the usual and known sleeve couplings, which are expensive and cumbersome, as the former are essentially formed by a number of metal plates, all alike, of a simple shape and easily connected to each other by means of screws and bolts. This obtains cheaper manufacture and quicker erection.

The coupling has a device preventing any sliding of parts, not only through friction but in a rigid positive way, obtaining a perfect fit of the bars in the coupling, particularly, where coaxial bars are to be jointed; this means consisting of special bolts forming a key seat.

Besides, when drop forged or cast iron plates are used, these can have any convenient shape.

The invention is shown in one of its preferred forms and in some alternative forms in the attached drawings, where:

Fig. 1 shows in side view a part of the standards with the spacing blocks.

Fig. 2 is a horizontal section of the same.

Fig. 3 is a vertical section of same along line 3—3 of Fig. 2.

Fig. 4 shows a coupling in front view partly broken away.

Fig. 5 shows the same in top view, partially sectioned.

Fig. 6 is a section of Fig. 5 along line 6—6.

Fig. 7 is a side view of a first alternative construction of the coupling, one of the bars being shown in section.

Fig. 8 is a front view of Fig. 7.

Fig. 9 is a horizontal section through Fig. 7.

Fig. 10 is a section of a plate.

Fig. 11 shows a side view of a second alternative form of coupling, one of the bars being shown in section.

Fig. 12 is a front view of Fig. 11 partly in section.

Fig. 13 is a plan view sectioned of Fig. 11.

Fig. 14 shows a coupling bolt for the form shown in Fig. 11.

Fig. 15 shows a side view of a third alternative form of coupling, one of the bars being shown in section.

Fig. 16 is a front view of Fig. 15, and

Fig. 17 is a view similar to Fig. 15 showing the coupling in section.

With reference to Figs. 1 to 6: *a* is the standard made of an iron-bar with a cross-like sec-

tion; *b* are the fillers or spacing-blocks in the shape of circular segments, with an outer groove *c*, which are applied to the standards at the crossing points of the vertical and horizontal bars.

The coupling shown in said figures is formed of a double sleeve of wrought iron, providing two circular holes *d* arranged at right angles; in each hole are placed the four wedge-shaped spacing-blocks *b* of cast-iron which can freely rotate in the hole without being able to slide out of it, being retained by a projection *h* corresponding with the groove *c*.

The wedge or sector shape of the spacing pieces *b* leaves a centre space in the shape of a cross into which are placed the iron bars of the scaffold; bolts *f—g* on the coupling serving to tighten the spacing-blocks on the bars.

It is clear that in this way the connection between bars can have any direction, the cross-shaped bars being rotatable within the coupling while the connection is securely established on tightening the bolts, by the complete frictional contact between the right sides of the cross-section of the bar and the corresponding faces of the coupling spacing pieces, thus obtaining a surface of contact of much greater extension than with the usual tube couplings.

With reference to the first alternative shape of coupling shown in Figs. 7 to 10: **5** and **6** are the profile or rolled bars of the scaffold, **7** are the plates forming the coupling, which are V shaped in their centre-line, according to the angle between two wings of the cross-shaped bars, while the ends of the plate extend as flanges and are provided with holes for the bolts **8** which tighten the plates **7** against the profile bars **5** and **6** and connect the two series of plates, thereby clamping the bars together.

In the second alternative construction of coupling, as shown in Figs. 11 to 14, instead of standard bolts, key shaped bolts **10** are used. Here the plates **7'** are provided with elongated holes **11** for receiving the key and preventing the bars from sliding off the coupling, the flanges of the bars having recesses **12** receiving the key shaped bolt portions.

With reference to the construction of the coupling shown in Figs. 15 to 17, the central plate **15** of the coupling may have the shape shown, whereby the inside of the plate is so shaped as to fit at **16** the profile of the bar **16'** against which it has to be tightened, so as to adapt itself perfectly against the same, obtaining an extended surface of friction, giving the coupling a firmness and a strength not yet obtained heretofore.

Besides, the counter-plates **17** and **18** clasp the bar very tight by means of two bolts **19**, instead of four, which may be hinged at one end, to ears **20** projecting from the central plate, the opposite ends being inserted in cavities at the extremity of the counter-plates.

The scaffolding formed in this manner is therefore a very practical one in the field of metal scaffolds and, it can be efficiently employed also in all such metal structures having a semi-permanent character as for instance: foot bridges, bridges, roofs, tribunes, staircases, barracks, platforms, trestles, scaffolds, open work towers, and girders, shelves, etc.

In fact, while for such construction the use of sections of metal scaffolding had been heretofore avoided due to the fact that tubular sections were of difficult maintenance and lacked durability, it is now possible to adopt with full confidence demountable sections in profile bars cross-shaped in section, which, having all the sides of the material exposed to sight can be conveniently protected with anti-rust varnishes and can be inspected periodically for maintenance.

The forms here illustrated are only given as examples, the coupling plates can be of any other shape, square, polygonal, crossed or round, without departing from the spirit of the invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A scaffolding comprising bars substantially cross-shaped in cross section, and couplings for said bars whereby the latter may be connected to each other at any angle, said couplings including parts fitting into at least two of the opposed angles formed by the cross shape of the bars, and means for drawing and maintaining said parts in engagement with said bars.

2. A scaffolding as claimed in claim 1 characterized in that said couplings include separable members forming an opening for the passage of one of said bars, a wedge-like spacing block confined in said openings, and received within the angles defined by the cross shape of said bars, said wedge blocks being rotatable in said openings, and means preventing axial movement of said blocks in said openings.

3. A scaffolding as claimed in claim 1 characterized in that said couplings each include pairs of separable members adapted to be applied to adjacent bars, portions of the members of each pair being shaped to interfit with said bars, and adjustable connecting means for the pairs of members including a key coacting with said bars.

4. A scaffolding as claimed in claim 1 characterized in that said couplings each include pairs of members, and adjustable connecting means between said pairs of members, the members of each pair being shaped to interfit with the angles of the cross shaped bars.

VITTORIO ORSENIGO.