Oct. 26, 1948. E. O'SULLIVAN 2,452,487

SCAFFOLDING AND LIKE STRUCTURES

Filed July 9, 1946 4 Sheets-Sheet 1

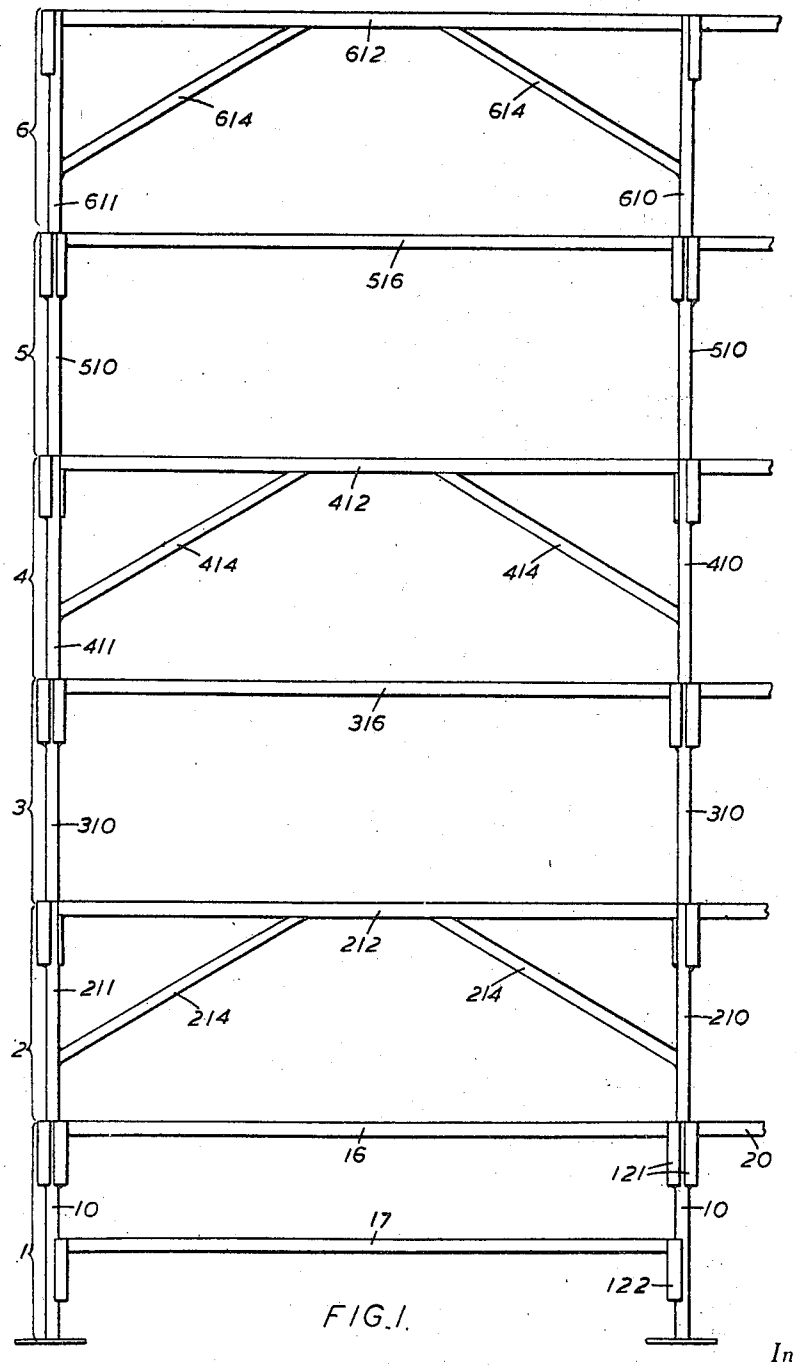


FIG. 1.

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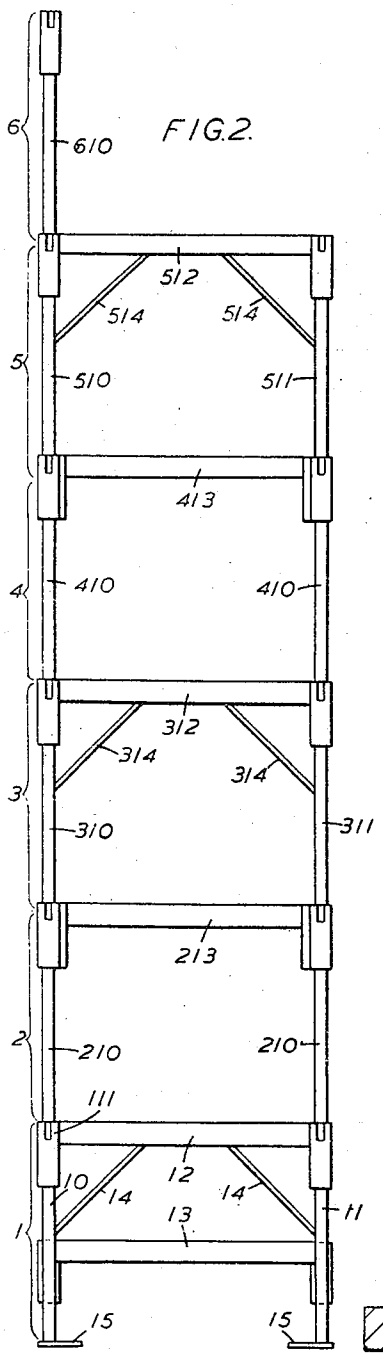


FIG. 2.

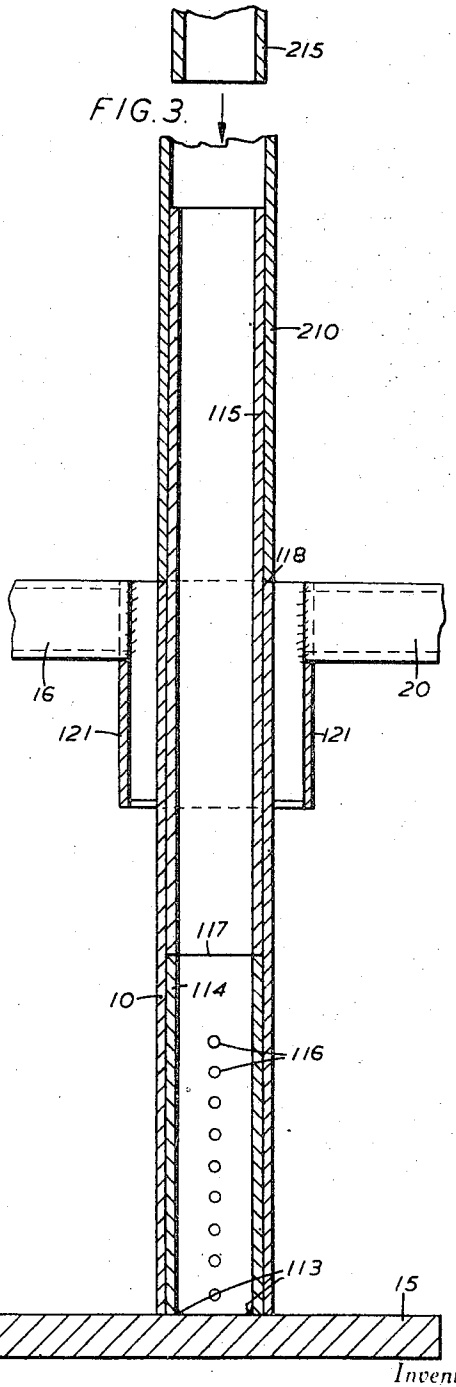


FIG. 3.

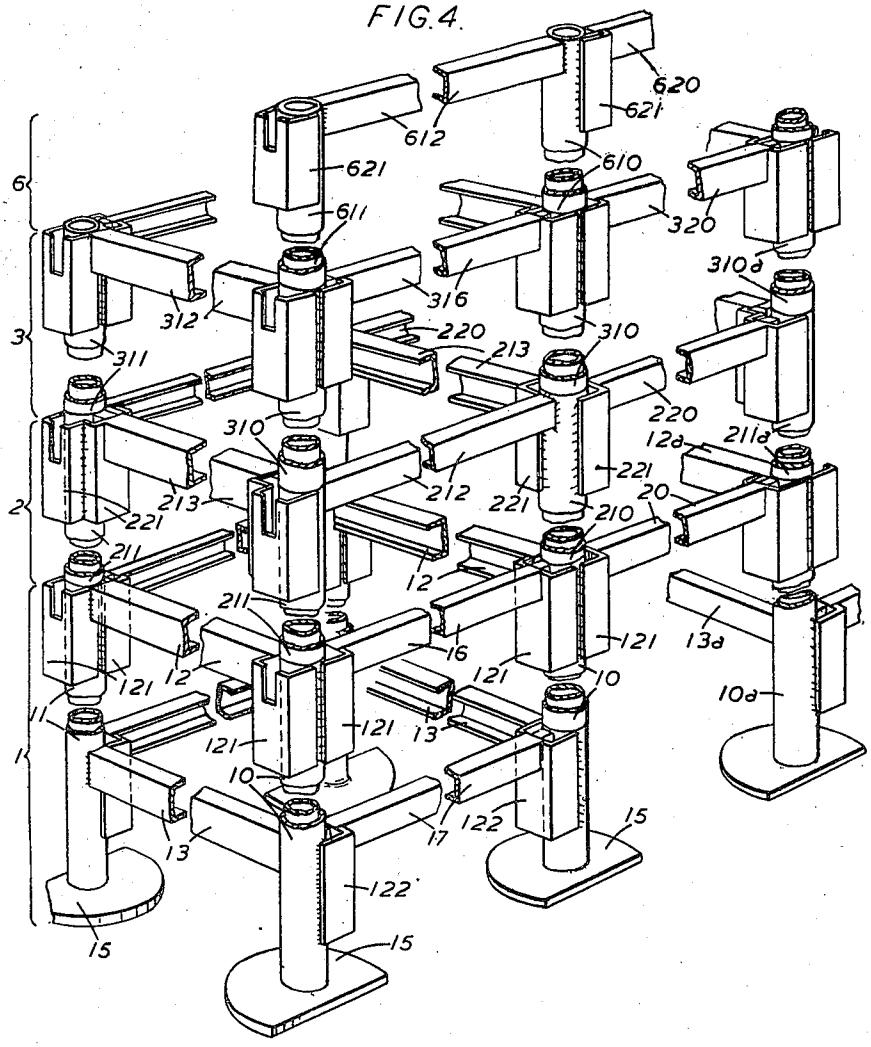
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SCAFFOLDING AND LIKE STRUCTURES

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FIG. 4.



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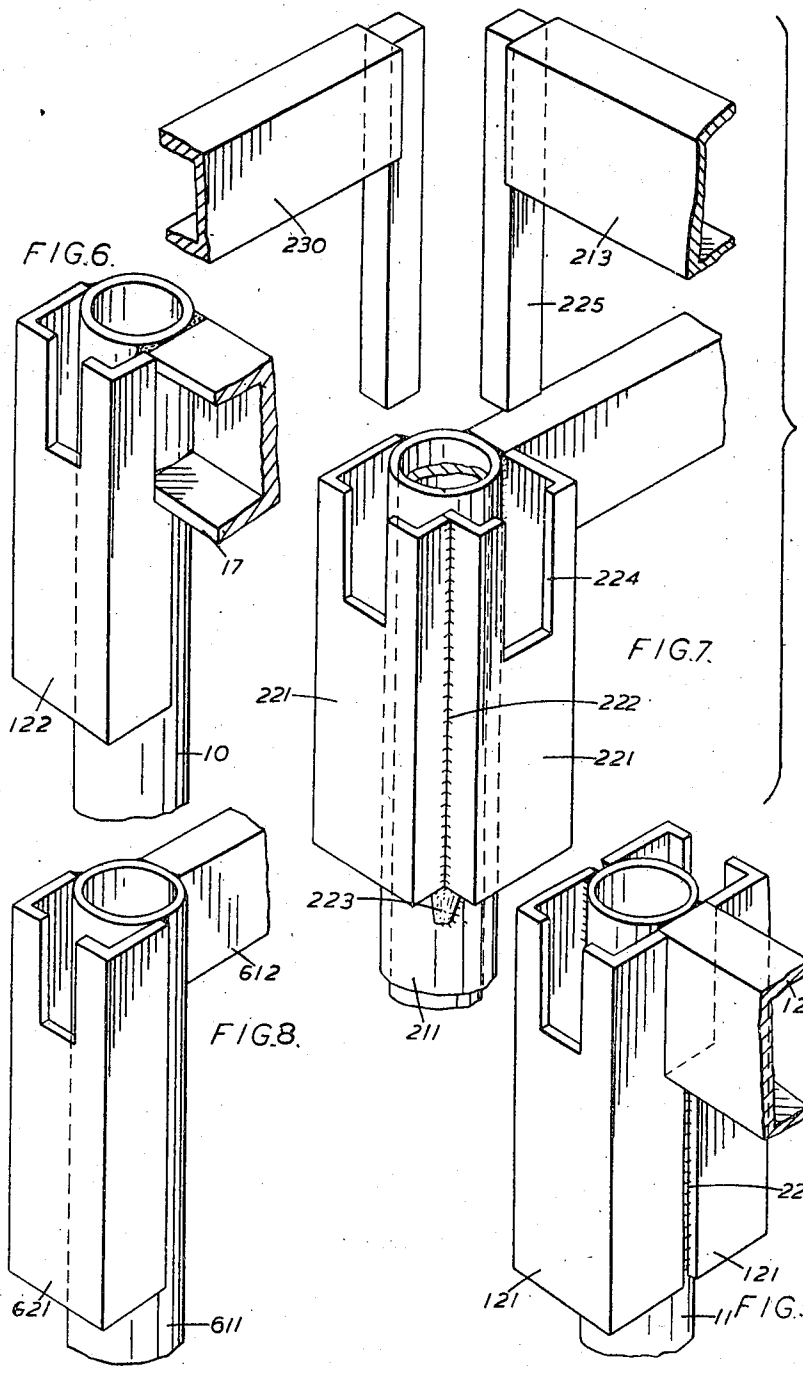


FIG.6. FIG.7. FIG.8. FIG.5.

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SCAFFOLDING AND LIKE STRUCTURES

Eugene O'Sullivan, Chislehurst, England

Application July 9, 1946, Serial No. 682,386
In Great Britain July 4, 1945

Section 1, Public Law 690, August 8, 1946.
Patent expires July 4, 1965

12 Claims. (Cl. 304—2)

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This invention relates to scaffolding and like structures which, while being particularly adapted for use in the construction of houses and other buildings, are also adapted to be used for supporting staging and the like in the construction of ships and aircraft. The scaffolding structure of the invention may also be arranged or adapted to form a framework suitable for many other purposes, such as, for example, as a support for tents or marquees.

The invention has for its chief object the provision of an improved scaffolding or like structure which is made up of a number of detachable parts to permit of the structure being easily and quickly assembled and taken apart. A further object of the invention is the provision of a scaffolding or other structure which can be built up to any desired size and height and which can be added to as occasion demands.

According to the invention in a scaffolding or like structure which includes at least two units, each of these units comprises four uprights, means rigidly connecting the said uprights together in pairs to form two fixed frames and at least two horizontal members detachably connected at their ends to the frames to form the units, one of said units being adapted to be erected on top of another unit with the uprights of the upper unit superimposed on the uprights of the lower unit and means being provided for connecting the upper and lower uprights together to retain them against lateral displacement.

Preferably one of the said units comprises a pair of fixed end frames and at least two longitudinal members detachably connecting the end frames together to form the unit and another of the said units comprises a pair of fixed side frames and at least two transverse members detachably connecting the side frames together to form the unit.

Such a scaffolding or like structure is preferably erected with units having fixed end frames alternating with units having fixed side frames. This results in a structure which, while being easy to assemble and dismantle, possesses great rigidity and strength.

The uprights are preferably tubular, of any suitable section, and the means for connecting the upper and lower uprights together may include an inner member for each upright of each unit above the base unit, means being provided for positioning the inner member to overlap the joint between the upper and lower uprights. If more than two superposed units are used the successive inner members are each supported on the member below them, the lengths of the members being made equal to the lengths of the corresponding uprights.

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The means for detachably connecting the horizontal members to the fixed frames preferably consist of sockets mounted on the frames and adapted to receive pins provided on the ends of the members.

When a scaffolding structure such as has been described is being used in, for example, the construction of the wall of a building, as soon as the height of wall is sufficient to require the use of a scaffolding, a base unit having, preferably, fixed end frames is assembled alongside the wall. If greater length is required than is provided by the unit or by two such units arranged close together end to end, two or more units may be used spaced apart by a distance which may conveniently be equal to the length of a unit. Each unit is connected to the next by longitudinal tie members which may be similar to the longitudinal members connecting the end frames together, the result being a continuous scaffolding of any desired length. Planks or boards are supported on the transverse members for the men to work on.

As soon as the height of a single unit becomes insufficient owing to the increasing height of the wall, a second unit is erected on top of the first, the planks being moved up on to this second unit. Preferably the second unit is constructed with fixed side frames connected together by removable transverse members.

Thus it will be seen that the invention provides a structure which, while being easily assembled and possessing great adaptability, is both strong and rigid.

For a better understanding of the invention the same will now be more fully described, by way of example with reference to the accompanying drawings, in which—

Figure 1 is a general view from the front of a scaffolding constructed in accordance with the invention;

Figure 2 is an end view of the scaffolding shown in Figure 1;

Figure 3 is an enlarged sectional view, not to scale, illustrating the manner in which successive units of the scaffolding are positioned one upon the other;

Figure 4 is partly cut-away perspective view of a scaffolding similar to that shown in Figures 1 and 2, but including fewer superposed units, the parts being shown to a larger scale; and

Figures 5 to 8 are detail views showing a number of arrangements of the sockets by means of which

the removable longitudinal and transverse members or bars are connected to the uprights.

Referring more particularly to Figures 1 and 2, the section of scaffolding shown comprises a base unit 1, four superimposed units 2, 3, 4 and 5 and a hand-rail 6.

The base unit 1 comprises two fixed end frames, each consisting of front and rear uprights 10 and 11 permanently connected together by transverse bars 12 and 13. These bars are connected to the uprights by welding or other suitable means. Diagonal struts 14 serve to brace the frames and give additional rigidity. Feet 15 of suitable area to take the weight involved without sinking an excessive amount into the ground are provided on all the uprights. The two end frames are detachably connected together to form a unit by means of removable longitudinal members 16 and 17 which are fixed to the uprights by means of socket connections which will be more fully described later.

While the uprights are shown as being of circular section they may be of square or any other suitable section if desired.

The second unit 2 consists of two fixed longitudinal or side frames, each consisting of right and left hand uprights 210 and 211 connected together at their upper ends only by means of a fixed longitudinal bar 212 welded in position. Diagonal struts 214 may be provided to give strength and rigidity. The two side frames so constructed are secured together on top of the base unit by means of removable transverse members 213.

The third unit is similar to the base unit in that it consists of fixed end frames secured together by removable longitudinal members, but in this case there are no lower fixed tranverse bars corresponding to the bars 13 nor are there lower longitudinal members to correspond to the members 17. Each end frame consists of front and rear uprights 310 and 311 connected together by a transverse bar 312 and braced by struts 314. The two end frames are connected together by means of removable longitudinal members 316.

The fourth unit is similar in every respect to the second unit. It comprises uprights 410 and 411, which are permanently connected in pairs by longitudinal bars 412 and struts 414 to form fixed side frames. These frames are detachably connected together by transverse members 413.

Similarly, the fifth unit corresponds to the third unit, comprising as it does uprights 510 and 511, fixed transverse bars 512 and struts 514 and removable longitudinal members 516.

The fifth unit is surmounted by a hand-rail 6. This hand-rail is constituted by a frame which may be similar, except for the omission of sockets or other attachments for transverse members, to one of the fixed side frames of units 2 or 4. Each hand-rail consists of a pair of uprights 610 and 611 rigidly connected together by means of a rail 612 and braced by means of struts 614.

The construction of the uprights and the method of fitting and securing the uprights of an upper unit on the uprights of a lower unit are most clearly shown in Figure 3, which shows, not to scale, one upright of a base unit on which the corresponding upright of the second unit is being fitted.

The base or lower upright 10 consists of a hollow tube to the upper end of which are welded the end of the fixed transverse bar 12 (Figure 2) and sockets 121 for the reception of removable longitudinal members 16 and 20. The construction of these sockets and the purpose of the member 20 mill be more fully described in due course. For the sake of clearness a lower socket 122 and the associated member 17 have been omitted from Figure 3.

The foot 15 is attached by welding at 113 to an inner tubular leg member 114. This leg is of a diameter to fit loosely but without excessive play within the tubular upright 10. The length of the leg 114 is half that of the upright, the top of the leg being indicated at 117.

When the base unit has been assembled and a second unit is to be erected on it an inner tubular member 115 is inserted into the upper end of the upright 10 until it rests on the end 117 of the leg 114. The upper half of the member 115 will project above the top 118 of the upright 10 and on it is fitted the tubular upright 210 of the second unit. If a third unit is to be fitted another inner member 215, similar to the member 115, is inserted in the upper end of the upright 210 and serves in to turn to receive the upright 310 (Figures 1 and 2).

Thus the scaffolding can be built up for as many units as are necessary using inner members super-imposed one upon the other within the tubular uprights to provide the connection between successive units. By reason of the staggering of the joints between the inner members with respect to the joints between the outer uprights a firm and rigid structure is obtained. One upright can only be removed from the one below it by raising it axially clear of the inner member. This cannot happen accidentally when the scaffolding is in position but it can easily be done when the scaffolding is being dismantled.

In order that the scaffolding may be adapted to stand on uneven ground means are provided for adjusting the feet. These means may comprise, for each foot, a pin which is adapted to be passed through a pair of opposed holes (not shown) in the walls of the upright 10 (or 11) near the lower end thereof and through any selected pair of a series of opposed holes 116 in the inner leg member 114. When the scaffolding is being erected any foot which is to stand on lower ground is partly withdrawn, with its attached leg 114, from the upright by the necessary amount and is locked in position by inserting a pin through the holes in the upright and through the appropriate pair of holes 116. This will have the effect of lowering all the superimposed inner members 115, 215, etc., by corresponding amounts, but the joints between these members will still be staggered with respect to the joints between the uprights.

Figure 4 shows in greater detail a scaffolding structure which is similar to that shown in Figures 1 and 2 except for the fact that the fourth and fifth units have been omitted. Also Figure 4 illustrates how two sections of scaffolding can be connected together to provide an extended length of scaffolding. Furthermore it shows more clearly the manner in which the fixed transverse bars 13, 12, 312, etc., and the fixed longitudinal bars 212, 612, etc., are fixed to their respective uprights by welding, while the removable members 17, 16, 316, etc., are detachably connected to the uprights by means of sockets 121, etc., welded to the uprights in the appropriate positions.

As is shown in Figure 4 the uprights 10 and 11 are each formed with one lower socket 122 to receive a member 17 and with two upper sockets 121 for the members 16 and 20. The construc-

tion and arrangement of the sockets 121 and 122 are more clearly shown in Figures 5 and 6 respectively.

The uprights 210 and 211 of the second unit, in common with the uprights of other units having fixed side frames, are each provided with a pair of sockets such as 221 which are arranged at right angles to each other as shown in Figure 7, these sockets being adapted to receive a transverse member 213 and, when necessary, a longitudinal tie member such as 230 similar to the member 20.

In the case of the third and other units having fixed end frames, each upright is provided with a pair of sockets arranged in a similar manner to the sockets 121 on the base unit and adapted to receive members 316, 320, etc.

Finally in the rail section each upright 610 and 611 is provided with a single socket 621 adapted to receive a tie rail such as 620 when necessary. An example of such a socket is shown in Figure 8.

Every section of scaffolding consisting of any desired number of units, each comprising four uprights connected together, is complete in itself. While it would be possible merely to erect two sections close together end to end when a longer run of scaffolding is required, this is a wasteful system when a run of more than twice the length of a section is required. In such cases it is preferred to erect two sections spaced apart by a distance equal to the length of one section. The second of these sections is indicated in Figure 4 by the uprights 10*a*, 11*a*, 310*a* and by the transverse bars 13*a*, 12*a*, etc. The two adjacent sections are connected together by removable tie members 20, 220, 320, etc. to form a continuous run of scaffolding. Any number of sections may be added as required.

Once the scaffolding structure has been erected to the desired height, boards or planks are laid on the topmost series of transverse members, which may be of larger section than the longitudinal members in order to take the load. For additional strength one or more additional removable transverse support bars may be provided resting on the longitudinal members intermediate the ends of the latter. Also removably connected diagonal struts (not shown) may be provided, each connected at one end to a transverse member and at the other end to an adjacent longitudinal mmber.

As shown in Figures 4 to 8 each socket consists of a short length of channel iron open at its upper end. Its lower end may be open or closed. This socket is welded, as at 222 and 223, to the upright and to any adjacent socket. Each socket is formed in its upper lip with a cut-out or recess such as 224 (Figure 7) of a height and width corresponding to the cross-section of the transverse member which is to be connected to the socket.

Each detachable transverse or longitudinal member, such as 213 (Figure 7) consists of a length of channel iron to each end of which is welded a vertical pin 225 which is adapted to fit in the appropriate socket 221. The end of the member 213 enters the recess 224, the member thus being securely connected to the upright 211 from which, however, it may be readily and quickly disengaged when required.

In certain cases it may be desired to arrange two or more sections of scaffolding side by side and to connect them together by removable tie members similar to the members 20, 220, etc.

To enable this to be done each upright may be provided with an additional socket (not shown) on its front face in the case of a front upright such as 10 or on its back face in the case of a back upright such as 11. This will enable any number of sections to be assembled and connected together in any of a wide variety of ways to suit different purposes.

It may, in certain cases, be desired to extend the height of the scaffolding, or of one or more units thereof, without the inclusion of additional horizontal bars or members. For example, it may be required to provide a series of stages of a height greater than that of the individual units, each stage being unimpeded by such an obstruction as would be provided by an intermediate horizontal member. To enable this to be done additional individual tubular uprights may be provided which are adapted to be interposed between the tops of the uprights of one unit and the bottoms of the uprights of the next unit. Additional inner member may be provided to constitute the connections between the additional uprights and the uprights of the superposed units. Furthermore, for additional rigidity, external sleeves may be provided adapted to overlap these connections. Each sleeve may be located on the upright by means of a stud mounted on the upright and engaging in a longitudinal slot cut in the sleeve.

The dimensions of the units of the scaffolding may be selected to suit particular requirements. For scaffolding to be used in building, a length of nine feet and a width of four feet are convenient. A suitable height for the base unit is three or four feet while all succeeding units may have a standardised height of four feet. The invention is not limited to any particular dimensions, however, since these may be varied as required.

Furthermore, the invention is not limited to the particular construction described and shown. Various modifications may be made without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. A scaffold structure including at least two units, one of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members at their ends to said end frames to form the unit, and another of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two side frames, at least two transverse members and means for detachably connecting said transverse members at their ends to said side frames to form the unit, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit and means being provided for connecting the corresponding uprights of the upper and lower unit together to retain them against lateral displacement.

2. A scaffold structure including at least two units, one of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members at their ends to said end frames to form the unit, and another of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two side frames, the

length of said side frames being greater than the length of said end frames, at least two transverse members and means for detachably connecting said transverse members at their ends to said side frames to form the unit, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit and means being provided for connecting the corresponding uprights of the upper and lower units together to retain them against lateral displacement.

3. A scaffold structure including at least two units, one of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members to the said end frames to form the unit, and another of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two side frames, at least two transverse members and means for detachably connecting said transverse members to said side frames to form the unit, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit, for each upright of the lowermost unit an inner member freely fitting within the upright, means for positioning said member within the upright with its upper end below the upper end of the upright, and for each upright of each superimposed unit an inner member which is freely slidable within said upright and within the upper part of the next lower upright, which inner member is supported by its lower end resting directly on the upper end of the said inner member within the next lower upright.

4. A scaffold structure including at least two units, one of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members to the said end frames to form the unit, and another of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two side frames, at least two transverse members and means for detachably connecting said transverse members to said side frames to form the unit, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit, for each upright of the lowermost unit an inner member freely fitting within the upright, a foot mounted on the lower end of said inner member, means for adjustably positioning said member within the upright with its upper end below the upper end of the upright, and for each upright of each superimposed unit an inner member which is freely slidable within said upright and within the upper part of the next lower upright, which inner member is supported by its lower end resting directly on the upper end of the said inner member within the next lower upright.

5. A scaffold structure including at least two units, one of which units comprises four uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid end frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid end frame, a pair of longitudinal members and means for detachably connecting said longitudinal members at their ends to the tops of the said end frames to form the unit, and another of which units comprises four uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid side frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid side frame, the lengths of said side frames being greater than the lengths of said end frames, at least two transverse members and means for detachably connecting said transverse members at their ends to the tops of said side frames to form the units, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit and means being provided for connecting the corresponding uprights of the upper and lower units together to retain them against lateral displacement.

6. A scaffold structure including at least two units, one of which units comprises four tubular uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid end frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid end frame, a pair of longitudinal members and means for detachably connecting said longitudinal members at their ends to the tops of the said end frames to form the unit, and another of which units comprises four tubular uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid side frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid side frame, at least two transverse members and means for detachably connecting said transverse members at their ends to the tops of said side frames to form the unit, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit, for each upright of the lowermost unit an inner member freely fitting within the upright, means for positioning said member within the upright with its upper end below the upper end of the upright, and for each upright of each superimposed unit an inner member which is freely slidable within said upright and within the upper part of the next lower upright, which inner member is supported by its lower end resting directly on the upper end of the said inner member within the next lower upright.

7. A scaffold structure including a plurality of units, each of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two frames and a plurality of members for connecting said frames together to form the unit, means being provided for detachably connecting said members with said frames, the said units being adapted to be erected in superimposed relationship with the corresponding uprights superimposed directly one on the other, for each upright of each unit above the lowermost unit an inner member freely slidable in the upright, the length of said inner member being substantially equal to the length of said upright and means within each upright of the lowermost unit for supporting the corresponding inner member of the next superimposed unit, the inner members of any units above the said next unit being supported with their lower ends rest-

ing directly on the inner member of the next lower unit.

8. A scaffold structure including a base unit and at least one upper unit adapted to be erected above the base unit, said base unit comprising four tubular uprights, means rigidly connecting said uprights together in pairs to form frames, means for detachably connecting said frames together to form the unit, an inner leg within each upright, a foot on the lower end of each leg and means for adjustably positioning each leg within its upright with the upper end of the leg below the upper end of the upright, and each said upper unit comprising four tubular uprights, means rigidly connecting said uprights together in pairs to form frames, means for detachably connecting said frames together to form the unit, and an inner member freely slidable within each upright, the length of each said inner member being substantially equal to the length of the corresponding upright, and one upper unit being adapted to be erected on top of the base unit with the uprights of said upper unit supported directly on the upper ends of the uprights of the base unit and with the inner members of said upper unit supported directly on the inner legs of the base unit.

9. A scaffold structure including at least two units, each of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two frames, a plurality of connecting members and means for detachably connecting each of said connecting members at each end to one of said frames, thereby to connect the frames together to form the unit, said means comprising a tubular socket mounted on the frame and a downwardly extending pin mounted on the member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot.

10. A scaffold structure including at least two units, one of which units comprises four uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members at their ends to said end frames to form the unit, said means comprising a tubular socket mounted on the frame and a downwardly extending pin mounted on the member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, and another of which units comprises four upright, means rigidly connecting said uprights together in pairs to form two side frames, at least two transverse members and means for detachably connecting said transverse members at their ends to said side frames to form the unit, said means comprising a tubular socket mounted on the frame and a downwardly extending pin mounted on the member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, one of said units being adapted to be

erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit and means being provided for connecting the corresponding uprights of the upper and lower units together to retain them against lateral displacement.

11. A scaffold structure including at least two units, one of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two end frames, at least two longitudinal members and means for detachably connecting said longitudinal members to the said end frames to form the unit, said means comprising a tubular socket mounted on the frame and a downwardly extending pin mounted on the member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, and another of which units comprises four tubular uprights, means rigidly connecting said uprights together in pairs to form two side frames, at least two transverse members and means for detachably connecting said transverse members to said side frames to form the unit, said means comprising a tubular socket mounted on the frame and a downwardly extending pin mounted on the member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit, for each upright of the lowermost unit an inner member freely fitting within the upright, means for positioning said member within the upright with its upper end below the upper end of the upright, and for each upright of each superimposed unit an inner member which is freely slidable within said upright and within the upper part of the next lower upright, which inner member is supported by its lower end resting directly on the upper end of the said inner member within the next lower upright.

12. A scaffold structure including at least two units, one of which units comprises four tubular uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid end frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid end frame, a pair of longitudinal members and means for detachably connecting said longitudinal members at their ends to the tops of the said end frames to form the unit, said means comprising a tubular socket mounted on each said upright adjacent the upper end thereof and a downwardly extending pin mounted on each said member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, and another of which units comprises four tubular uprights, means including a horizontal bar secured at its ends to the tops of two of said uprights to form a rigid

side frame, means including a horizontal bar secured at its ends to the tops of the other two of said uprights to form a second rigid side frame, a pair of transverse members and means for detachably connecting said transverse members at their ends to the tops of said side frames to form the unit, said means comprising a tubular socket mounted on each said upright adjacent the upper end thereof and a downwardly extending pin mounted on each said member at the end thereof, said socket being open at its upper end to receive the pin and being formed with a slot which extends part way down from its upper end, said slot being adapted to receive the end part of said member, which end part rests on and is supported by the bottom of the slot, one of said units being adapted to be erected on top of the other said unit with the uprights of the upper unit superimposed on the uprights of the lower unit, for each upright of the lowermost unit an inner member freely fitting within the upright, means for positioning said member within the upright with its upper end below the upper end of the upright, and for each upright of each

superimposed unit an inner member which is freely slidable within said upright and within the upper part of the next lower upright, which inner member is supported by its lower end resting directly on the upper end of the said inner member within the next lower upright.

EUGENE O'SULLIVAN.

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