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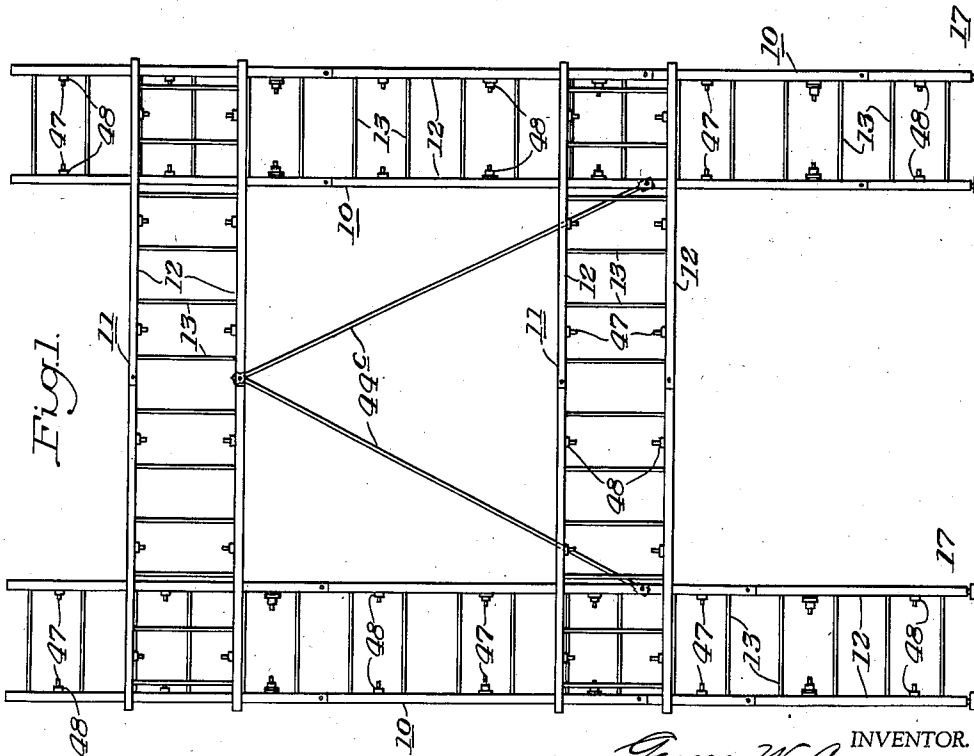
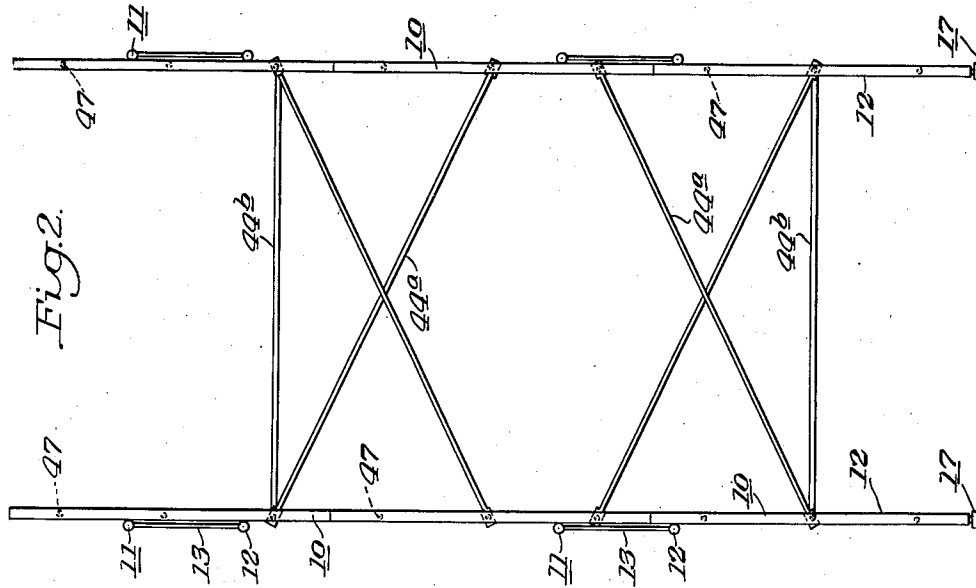
G. W. CAUSEY

2,201,608

SCAFFOLDING

Filed Feb. 9, 1938

5 Sheets-Sheet 1



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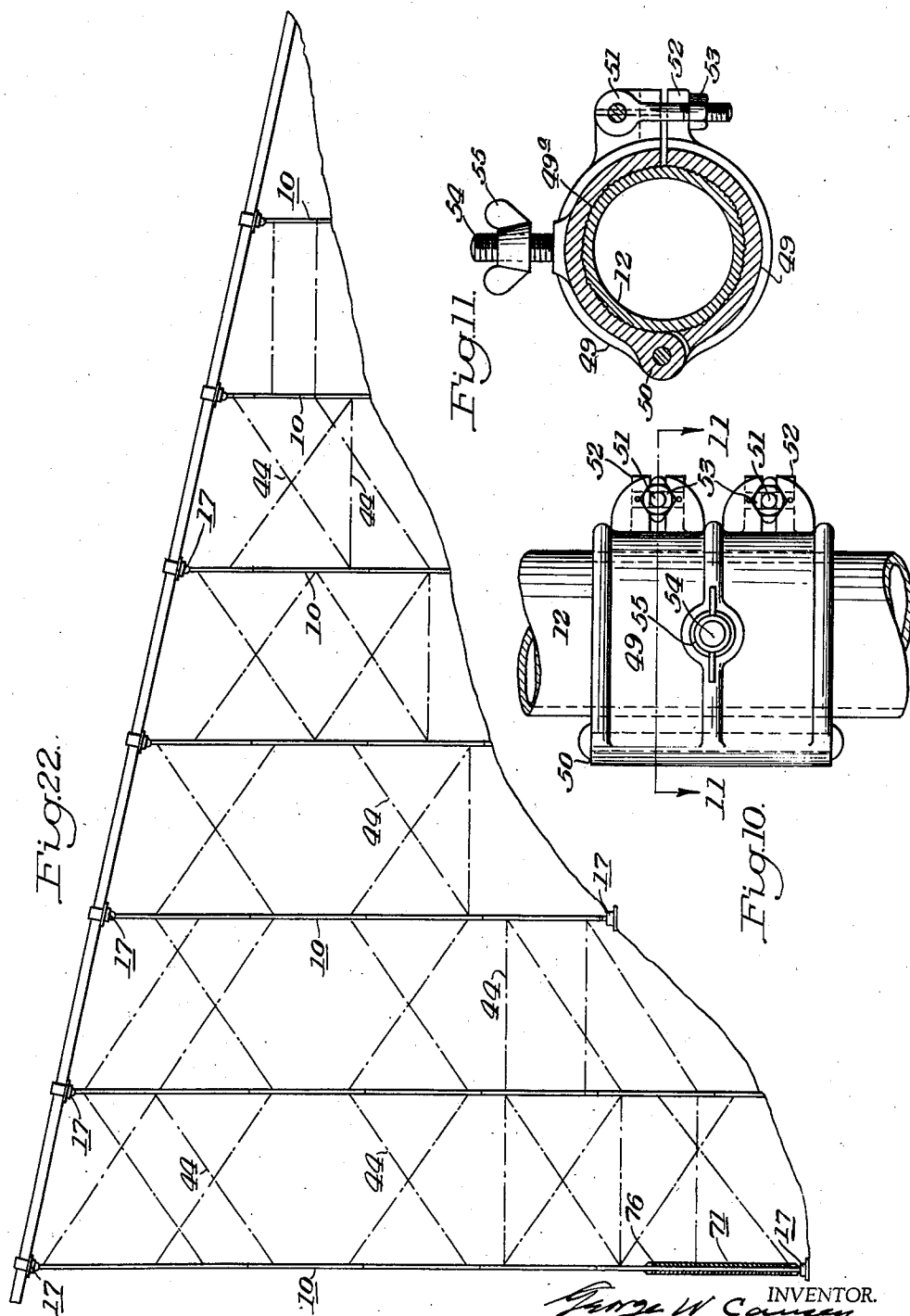
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5 Sheets-Sheet 3



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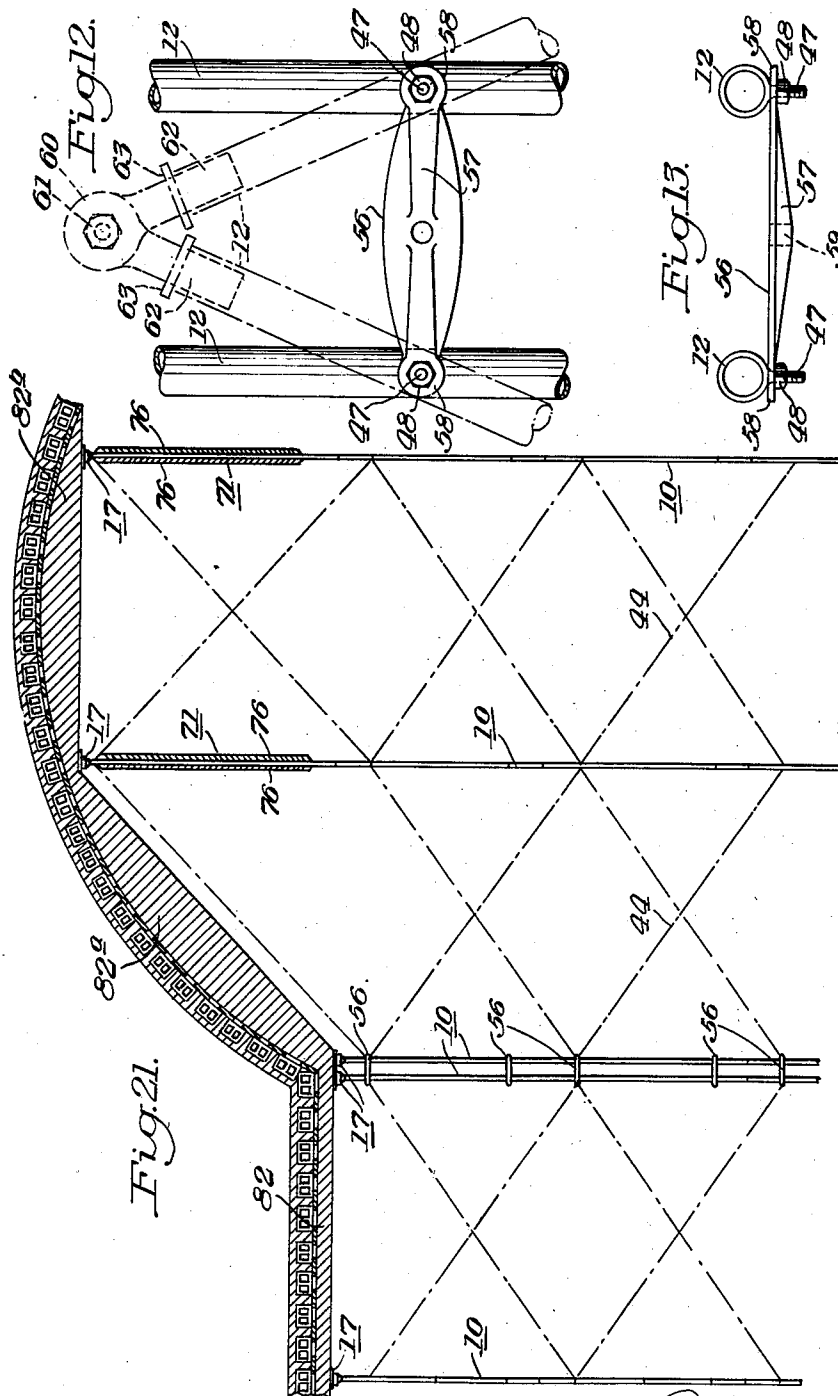
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5 Sheets-Sheet 4



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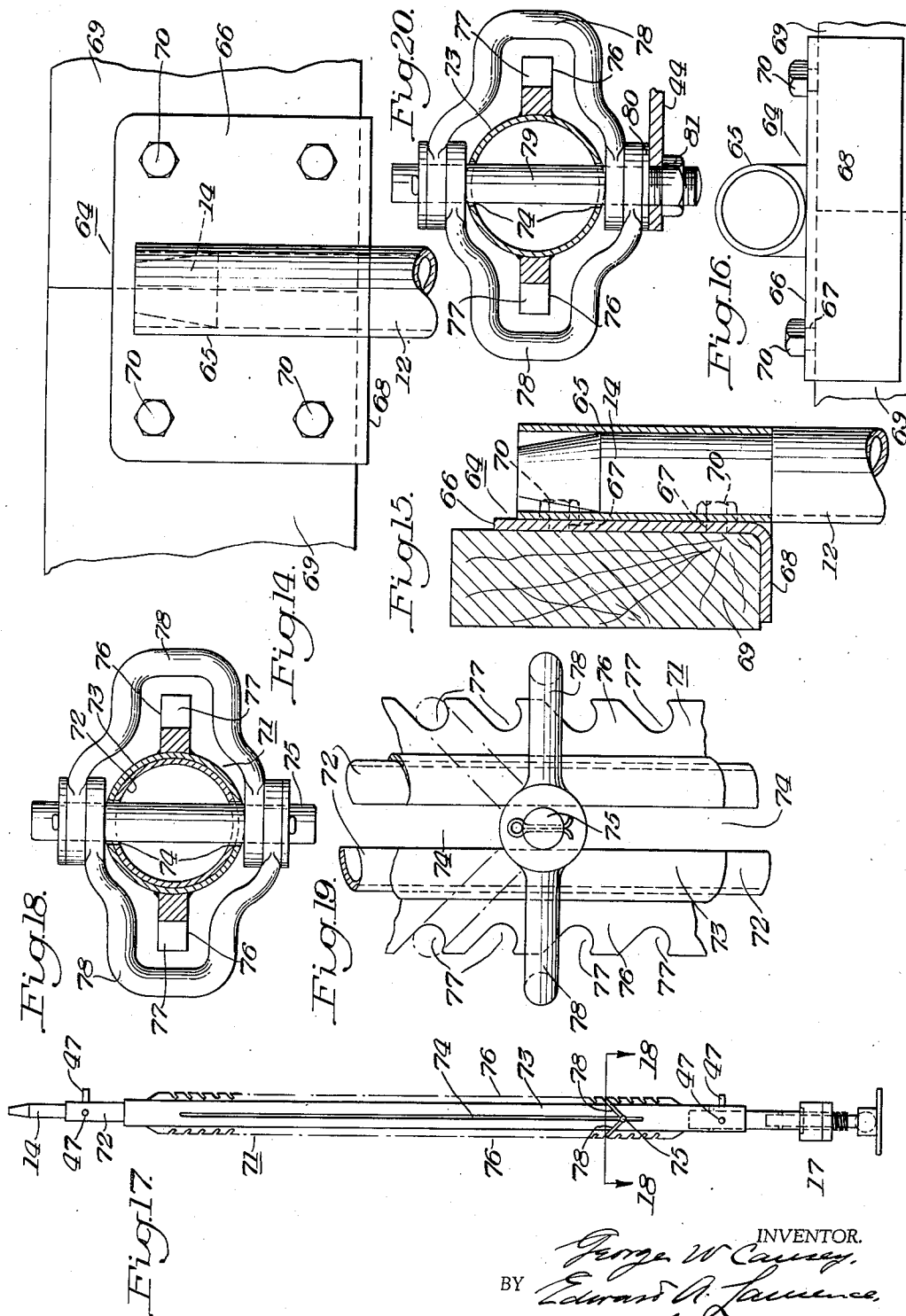
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5 Sheets-Sheet 5



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SCAFFOLDING

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12 Claims. (Cl. 304—3)

My invention relates to sectional scaffolding of the take-down type.

Such scaffolding is used as a substitute for wooden or timber scaffolding and has the recognized advantages of repeated use, economy of time in erection and removal, and greater strength.

Among the objects which I have in view are the following:

10 Greater economy of materials and ease of erection and removal arising from my use of simple standardized structural elements or units.

15 Greater strength and rigidity, and consequently greater load capacities, due to the novel means for connecting together and bracing of the units when erected.

20 Greater range of variation in forms and shapes of the erected scaffolding, thus adapting it to a greater variety of uses than hitherto known in the art.

Other objects and novel features of construction and also of arrangement of parts will appear from the following description.

25 In the accompanying drawings, wherein I have illustrated practical embodiments of the principles of my invention,

Fig. 1 is a side elevation of a simple vertical scaffold to which my invention is applied;

Fig. 2 is an end view of the same.

30 Fig. 3 is a broken elevation on enlarged scale showing the means for attaching together axially aligned ladders or posts;

35 Fig. 4 is an elevation showing my novel longitudinally and angularly adjustable footing used in connection with my improved scaffolding;

40 Fig. 5 is an enlarged broken elevation, and Fig. 6 also is an elevation looking from the right in Fig. 5, of one form of my improved clamp employed to connect the vertical and horizontal ladder elements together.

Fig. 7 is an elevation, and Fig. 8 also is an elevation looking from the left in Fig. 7, of a modified form of clamp;

45 Fig. 9 is a broken elevation of one end of a cross brace used for connecting and bracing parallel ladder elements;

Fig. 10 is an enlarged elevation of a removable screw stud structure for the attachment of the end of a brace such as illustrated in Fig. 9.

50 Fig. 11 is a sectional view taken along the line 11—11 in Fig. 10;

55 Fig. 12 is an elevation showing my improved coupling for connecting together adjacent posts or ladder elements which are either parallel or disposed at an angle to each other;

Fig. 13 is a plan view of the same;

Figs. 14, 15 and 16 are, respectively, an elevation, an end view and an inverted plan view of the top bracket by means of which a platform sill or rail may be mounted on the scaffolding;

Fig. 17 is an elevation of an extensible shoring post, the same being shown retracted;

Fig. 18 is an enlarged sectional view taken along the line 18—18 in Fig. 17;

Fig. 19 is a broken elevation of the shoring post on enlarged scale.

Fig. 20 is an enlarged cross sectional view of the shoring post showing the means for the attachment of a cross brace thereto.

Fig. 21 is a diagrammatic view in side elevation showing scaffolding, comprising my invention, used in the construction of a flat and domed ceiling or roof;

Fig. 22 is a like view showing the same employed as a ramp structure or for the support for a temporary platform or bleacher seats.

Referring first to Figs. 1 to 9, inclusive, I employ for the main structural elements of my system of scaffolding ladders in vertical and horizontal relationship and detachably connected together. The vertically disposed ladders are indicated generally by the numeral 10 while the numeral 11 indicates the horizontal ladders.

These ladders are similarly constructed of longitudinal members or posts 12 and rungs 13, both of which may be conveniently formed of steel tubing welded or otherwise permanently connected together; thus providing structural elements of great strength and rigidity but of comparatively light weight.

The horizontal ladder or ladders 11 are set on edge, thus acting as connecting trusses and effectually presenting lateral movement and sway of the vertical ladders 10. A single rail may be used in place of a ladder, if desired.

It will be understood other horizontally disposed ladders, at right angles to those illustrated in Figs. 1 and 2, are employed to brace other portions of the scaffolding from that shown in Figs. 1 and 2. These are omitted for the sake of clearness.

The desired length or height of the scaffold structure is obtained by joining together end to end a plurality of ladders of different lengths, which lengths are standard and proportioned. Thus by the use of various combinations many lengths may be easily obtained to provide various top levels or to compensate for irregularities or slopes of the ground or other supporting surfaces.

I provide improved means for connecting the

ends of vertically superimposed ladders together so that they may safely sustain the required loads while being readily attachable and detachable.

Thus I employ coupling pins 14 (Fig. 3) which are partially inserted into and snugly fit the ends of the tubular posts 12 at one end of a ladder section and are rigidly attached therein as by spot welding through holes in the walls of the posts as indicated at 15. The pins protrude for substantially half of their length from the ends of the posts and have their free extremities slightly tapered as at 16 so as to be easily inserted into the lower ends of the posts of the ladder to be superimposed upon the first named ladder with the lower extremities of the upper posts supported on the upper ends of the lower posts as indicated in dotted lines in Fig. 3. Thus the ladders are adequately supported in aligned relationship and safely assume the load and the snug telescoping of the pin 14 within the tubular posts takes care of lateral strains and thrusts.

My improved form of connecting aligned ladders or posts, as above described, is inexpensive but thoroughly efficient and reliable.

However it is obvious that the lengths of the combined vertical structural elements frequently must be more nicely adjusted than is convenient or possible in practice by the use of ladder elements of different predetermined lengths. Thus a slight variation may and usually does occur in ground level. Again in shoring or supporting a roof, ceiling or floor from below relative close adjustments of top elevations are required. In all of such cases the under supporting surface or the surface to be supported from below frequently is not normal of the axis of the supporting element, so that the extremity of the element upon which it is supported or by means of which it supports the load must assume an angular relation to the axis of the element.

To accomplish these purposes I have provided a novel footing 17 which may be connected to either the bottom or top extremity of the supporting ladder assembly or shoring posts.

This footing is illustrated in detail in Fig. 4 as applied to the lower end of a ladder post. Thus 18 is a bearing plate preferably having a flat contact surface and having on its other surface a ball-socket 19 in which is journaled the ball 20 secured to or integral with the end of a pin 21. For convenience in assemblage the socket may be split and the parts welded or otherwise secured together after the ball is inserted therein. The diameter of the pin 21 adjacent to the ball 20 is preferably lessened to provide a reduced neck 22 so as to provide clearance for obtaining, when desired, a substantial angularity of the pin relative to bearing plate 18.

A portion of the pin 21 adjacent the neck 22 is provided with a square helical thread 23 upon which is threaded an abutment nut 24 whose upper bore is countersunk to form an annular seat 25 surrounding the pin 21 and of the proper diameter to receive and support the lower end of a tubular post as indicated at 12 in dotted lines in Fig. 4. 26 represents a lock nut on the threaded pin below the abutment nut to hold the latter against accidental rotation on the pin.

The upper portion of the pin is preferably unthreaded and of proper diameter to telescope snugly within the bore of the post 12.

Thus the post or other structural element is properly supported by the footing and may be extended or retracted to raise or lower the post relative to the ground by screwing the abutment

nut, upon which the lower end of the post rests, in the proper direction on the pin. Again, where the post or other element is to be disposed at an angle to the vertical or to the surface upon or against which the bearing plate 17 rests, the ball and socket connection between the pin and the bearing plate permits such misalignment without impairing the efficiency of the structure.

It is evident that the above described footing may be used for the other or upper end of a ladder or post to brace the same against a horizontal, curved or inclined surface or to support such a surface as in the construction of walls, ceilings, roofs, floors and the like. Such uses are hereinafter referred to.

I provide means for securely clamping the vertical and horizontal ladders together, and such means are arranged for quick application and removal.

Two embodiments of my improved form of clamp are illustrated, one type for use adjacent the end of a ladder where no rung interferes with the installation and removal of the clamp; the other where a rung intervenes between the end of a ladder post and the desired location of the clamp.

The first type is illustrated in Figs. 5 and 6, and is of the following construction.

The clamp 27 is formed of a steel rod bent to provide a central loop 28 and the two parallel legs 29 are bent to provide the twin loops 30. The parallel extremities 31 of the rod are threaded, extending through the bridge plate 32 to receive the nuts 33. The numeral 12a represents the post of the vertical ladder or element and the numeral 12b the post of the horizontal ladder or element. To assemble the elements the horizontal post 12b is first engaged in the loop 28 and the clamp and horizontal ladder moved vertically to bring the twin loops 30 down over the end of the post 12a to the proper level. The bridge plate 32 is then placed on the free ends 31 of the rod 27 and the nuts 33 applied and tightly screwed home. Thus the vertical and horizontal posts are tightly clamped together and the horizontal ladder or element securely maintained at the desired elevation.

In the case of the clamp 34 illustrated in Figs. 7 and 8, the steel rod is bent to form a central loop 35, and the parallel legs 36 are bent to form twin half loops 37 and their extremities are flattened as at 38 and pierced with parallel bolt holes 39 through which extend the twin bolts 40 whose threaded ends extend through twin holes in the bridge plate 41 against which plate the nuts 42 are screwed on the threaded ends 43 of the rod. 12a represents the vertical post and 12b the horizontal post, respectively, and 13 represents the horizontal rung of the vertical ladder of which 12a is one of the posts. In installing clamp 34 the clamp is moved horizontally first to clasp the vertical post 12a beneath the rung 13 and the horizontal post 12b is then nested in the half loops 37. The bolts 40 are then inserted through the holes 39, the bridge plate 41 is put in position with the bolts extended through the holes thereof and the nuts 42 are screwed up on the threaded ends 43 of the bolts against the bridge plate. Thus the horizontal ladder or element is securely clamped at the desired elevation on the vertical ladder or element.

Thus I have provided suitable clamps by means of which the horizontal ladders or elements may be securely mounted in place at any desired elevation or position relative to the vertical ladders

or elements. The clamp are adapted for quick application and removal.

For the purpose of the vertical ladders I provide cross brace members generally indicated by the numeral 44, the use of which is illustrated in Fig. 1 and the preferred structure of which is shown in Fig. 9, being formed of a round rod with ends flattened as at 45 and pierced with a circular hole 46. The posts 12 of the vertical ladders 10 are provided with inwardly extending threaded studs 47 which may be welded to the posts and which are threaded to receive nuts 48. The pierced ends of the braces are placed over these studs and the nuts screwed tightly home against the braces.

In Fig. 2, I show pairs of such braces 44a applied in crossed arrangement to connect the vertical ladders and other of such braces 44b arranged horizontally.

In Fig. 1, I show a pair of such braces 44c connecting a stud on the upper horizontal ladder 11 with studs on the vertical ladders 10. In this manner I effectually stiffen the assembled scaffold and prevent any lateral movement or sway from the vertical.

I provide the permanent or fixed studs 47 at regular intervals along the posts of the ladders but occasion frequently arises for the employment of a stud for the attachment of a brace to a ladder at some point intermediate of the fixed studs or to a shoring post or other element, and for this purpose I provide the novel detachable stud structure illustrated in Figs. 10 and 11, wherein 49 represents a two part collar having parts hinged together at 50, the free ends of the parts provided with fastening means by which they may be clamped together. Thus one free end is provided with swing bolts 51 and the other end with bifurcated lugs 52 which when the collar encircles the post element, as 12 in Figs. 10 and 11, straddle the bolts, so that the nuts 53 may be screwed up on the bolts against the lugs to clamp the collar fixedly to the post. The collar is provided with a radially extending and threaded stud 54 which may be inserted through the pierced end of the brace and the nut 55 screwed up on the stud against the brace. To improve the grip of the collar 49 on the post and thus prevent the former slipping, I prefer to serrate the inner wall surface of the collar as at 49a.

It is evident that these collars may be mounted at any desired positions on the posts and thus braces may be provided wherever needed.

In some instances the loads to be sustained may be regarded as too great to be safely assumed by a single ladder or assembly of aligned and connected ladders, and it may be desired to use a pair of ladders or sets of ladders in relatively close parallelism. For use in such instances I provide novel strut members to hold the parallel elements in rigid relationship.

Thus in Figs. 12 and 13 I illustrate the preferred embodiment of such a strut, the same being in the form of a metal bar 56, preferably strengthened by a longitudinal rib 57 and having enlarged curved end portions 58 which are pierced with holes. These bars are placed in position with the studs 47 of the parallel posts 12 extending through the holes in the ends of the struts 56 at desired intervals, the nuts 48 screwed up on the studs against the bar. Thus by providing such struts at proper intervals along the length of the posts, the two ladder elements are united

to form a unitary post structure of great strength and rigidity.

In dotted lines in Fig. 12 I show two posts or ladders disposed in angular relation to each other, united together by the strut. By providing a plurality of such struts of the proper relative lengths, any angular relation may be obtained between two posts or ladders.

The centers of the bars 58 may be provided with holes 59 so that bars connecting different pairs of posts or ladders may be connected by bracing rods or bars.

In Fig. 12 I show the two angularly related posts 12 provided at their upper ends with flattened eyes 60 which may be pivotally united by the bolt 61, thus forming a jack for supporting other elements or loads. The eye members may be separate members having lower ends 62 insertible into and snugly fitting the bores of the members 12 and having circumferential shoulders 63 arranged to bear against the ends of the posts and thus limit the degree of insertion.

A reach or connecting rod may be substituted for the bolt 61 to connect spaced apart pairs of angularly connected posts or ladders together.

It is frequently desirable to provide the top of a scaffolding with sills for laying a platform of plank or other material thereon, or to provide the scaffolding with a safety rail above the working platform to prevent workmen or material from falling. For this purpose I provide the bracket member 64, illustrated in Figs. 14, 15 and 16, consisting of a tubular sleeve 65 to the front of which is welded a plate 66 provided with bolt holes 67 and an outwardly extending bottom lip 68.

In practice the topmost vertical posts 12 of the scaffolding are provided with the upwardly projecting connecting pins 14 and brackets 64 are mounted thereon by slipping the sleeves 65 down over the pins until they bear against the upper ends of the posts. A beam or rail 69 is then laid along the plates 66 with its bottom edge resting on the flanges 68 and secured to the brackets by bolts 70 extending through the holes 67. It is evident that these brackets may be employed to support any structure desired, such as forms to support tile or cement ceilings, domes, roofs, upper floors, etc.

My invention also comprises shoring means in the form of an extensible telescopic element or post which is highly useful for supporting loads, for underpinning scaffolding, for shoring scaffolding against walls, roofs and the like, and for many other purposes incident to the erection and use of scaffolding.

Such a shoring element is illustrated at 71 in Fig. 17 and its preferred structure is shown in detail in Figs. 18 and 19.

Thus 72 represents a central shaft, preferably tubular which is telescoped within a second tubular shaft 73 provided with diametrically opposed slots 74 disposed longitudinally thereof, through which slots extend the ends of the cross pin 75 fixed in the shaft 72 near the lower or inner end of the latter.

The outer shaft 73 is exteriorly provided with two diametrically opposed longitudinally disposed ribs 76 disposed in a plane at right angles to that of the slots 74, and said ribs are cut downwardly and inwardly to form a pair of racks with their teeth 77 opening upwardly.

78 represents a pair of oppositely disposed clevises whose ends are pivoted on the extremities of the pin 75 and which function as pawls to en-

gage the teeth 77 of the two racks. When the clevises are extended horizontally, as indicated in full lines in Fig. 19 they clear the racks but when in the upwardly inclined positions shown in dotted lines they engage the racks and lock the shaft 72 against downward movement relative to the shaft 73.

Thus the inner shaft 72 may be extended to any degree, within the limits of its movement relative to the shaft 73, thus obtaining any desired length of the shoring post 71, or the post may be retracted for removal and for convenience in its storage or transportation.

The extremities of the shoring post are preferably provided with suitable contact or connecting means as may be desired.

Thus in Fig. 17 I have shown the lower or outer end of the shaft 73 provided with the adjustable footing 17 shown in detail in Fig. 4 and the upper or outer end of the shaft 72 provided with a connecting pin 14 for the connection of a tubular post thereto. It is evident that both shafts may be provided with a footing at their extremities or with connecting pins, as may be found necessary.

For the purpose of connecting the shoring post by cross braces to each other or to other portions of the scaffolding, I provide the upper or protruding end of the inner shaft 72 and the lower or outer end of the outer shaft 73 with radially disposed threaded studs 47 to which the perforated ends of the braces may be secured by bolts.

To enable these braces to be disposed in two planes in angular relation to each other I position two or more of such studs at ninety degree intervals in annular series about the shafts.

In some instances it is desirable to connect a brace or braces to the extensible shoring member intermediate of its extremities and at various points thereon. For this purpose I provide the device illustrated in Fig. 20 wherein 19 represents a through-bolt which spans the interior of the shaft 73 and extends through the slots 74. The clevises 78 are mounted on the protruding portions of the bolt and are arranged to engage the teeth 77 of the racks 76 to support the bolt at any desired elevation on the shoring post. One end of the bolt is provided with a fixed or integral collar 80 outside of the clevises and the brace 44 is mounted on the extremity of the bolt and held in place by the nut 81 screwed onto the threaded extremity of the bolt.

In Fig. 21 I illustrate diagrammatically the application of the principles of my invention to scaffolding used in the erection of a tile roof or ceiling, partially flat and partially domed, the scaffolding being employed to support the wooden or other forms 82, 82a and 82b.

In Fig. 22 I illustrate diagrammatically the use of my scaffolding applied to the erection and support of an inclined surface, such as a ramp or the undersupport of temporary seats.

It is evident that it may be adapted to many other forms of temporary structures.

I claim:

1. A sectional scaffolding comprising a plurality of vertically disposed ladders in parallel spaced relation, a plurality of horizontally disposed ladders set vertically on edge and spaced apart vertically spanning the space between the vertical ladders, and clamps detachably securing the longitudinal members of the horizontal ladders to the longitudinal members of the vertical ladders to brace the vertical ladders against swaying.

2. A sectional scaffolding comprising a plurality

of vertically disposed ladders in parallel spaced relation, a plurality of horizontally disposed ladders set vertically on edge and spaced apart vertically spanning the space between the vertical ladders, clamps detachably securing the longitudinal members of the horizontal ladders to the longitudinal members of the vertical ladders to brace the vertical ladders against swaying, and brace members spanning the spaces between the vertical ladders and attached at their ends to the latter.

3. A sectional scaffolding comprising a plurality of parallel uprights each consisting of a plurality of vertically disposed ladders having their adjacent ends jointed by pin and socket connection, cross braces connecting individual ladders of one upright with individual ladders of another upright located at different levels, a horizontally disposed ladder set on edge spanning the space between the uprights, and clamps detachably connecting the longitudinal members of the horizontal ladder to the longitudinal members of the vertical ladders.

4. A sectional scaffolding comprising a plurality of parallel uprights each consisting of a plurality of aligned and vertically disposed ladders having their adjacent ends joined by pin and socket connection, cross braces connecting individual ladders of one upright with individual ladders of another upright located at different levels, a plurality of spaced apart horizontally disposed ladders set vertically on edge, and clamps detachably connecting the longitudinal members of the horizontal ladders to the longitudinal members of the vertical ladders to brace the vertical ladders against swaying.

5. The combination with a tubular scaffolding support having a reduced end forming an annular shoulder, of a top bracket having a sleeve arranged to be telescoped over said reduced end and to be supported on said shoulder, and a plate fixed tangentially to said sleeve and arranged for the attachment thereto of a horizontally disposed member.

6. The combination with a tubular scaffolding support having a reduced end forming an annular shoulder, of a top bracket having a sleeve arranged to be telescoped over said reduced end and to be supported on said shoulder, and a plate fixed tangentially to said sleeve and arranged for the attachment thereto of a horizontally disposed member, the lower edge of said plate being provided with an outwardly extending flange to under support said member.

7. In a footing for scaffolding and the like, the combination of a socket member having a contact surface, a ball in said socket, a threaded pin mounted on said ball, and an abutment nut adjustable on said pin and engaged by a tubular element with the pin extending in the bore of the latter, said nut being provided with a seat concentric with the pin to permit the pin to be inserted into a tubular element and the end of said tubular member to be stepped in said seat.

8. An extensible shoring member comprising a tubular shaft having a longitudinally disposed slot in its wall, a second shaft nested in the tubular shaft and arranged for extension and retraction relative thereto, a bolt carried by the second shaft and extending through said slot, a pawl and rack mechanism for holding said bolt stationary relative to said slot, and means for attaching a brace to the protruding end of the bolt.

9. In scaffolding, a hinge connection for a plurality of pairs of tubular posts and the like, comprising pairs of pin members pivotally connected together at one end and arranged to be inserted into the bores of the tubular members, circumferential ribs on said pins to limit the degree of their insertion into said bores, and a connecting member which forms the common pivot and holds the pairs of pivotally connected pins in spaced relation.

10. A sectional scaffolding comprising a pair of ladders vertically disposed in spaced and parallel relation in the same plane, a second pair of ladders vertically disposed in spaced and parallel relation in a second plane which is parallel to the first plane, horizontally disposed ladders set vertically on edge connecting the ladders of each pair, and cross connections between the corresponding ladders of the two pairs.

11. A sectional scaffolding comprising a pair of ladders vertically disposed in spaced and parallel relation in the same plane, a second pair of ladders vertically disposed in spaced and parallel relation in a second plane which is parallel to the first plane, and horizontally disposed ladders set vertically on edge connecting the ladders of each pair, and cross connections between the corresponding ladders of the two pairs.

allel relation in a second plane which is parallel to the first plane, and horizontally disposed ladders set on edge connecting the corresponding ladders of the two pairs.

12. A sectional scaffolding structure consisting of an assemblage of interchangeable ladder-like units each comprising a pair of longitudinal rails and a plurality of cross members holding the rails in permanent parallel and spaced relation, a pair of said units being vertically disposed in spaced and parallel relation in the same plane, a second pair of said units being vertically disposed in spaced and parallel relation in a second plane which is parallel to the first mentioned plane, a plurality of said units horizontally disposed and set on edge spanning the spaces between the members of each pair of vertical units and between the members of the opposed pairs of vertical units, and detachable means for securing the rails of the horizontal units to the rails of the vertical units.

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