Dec. 12, 1967 E. A. WAGNER 3,357,517

MOBILE SCAFFOLD

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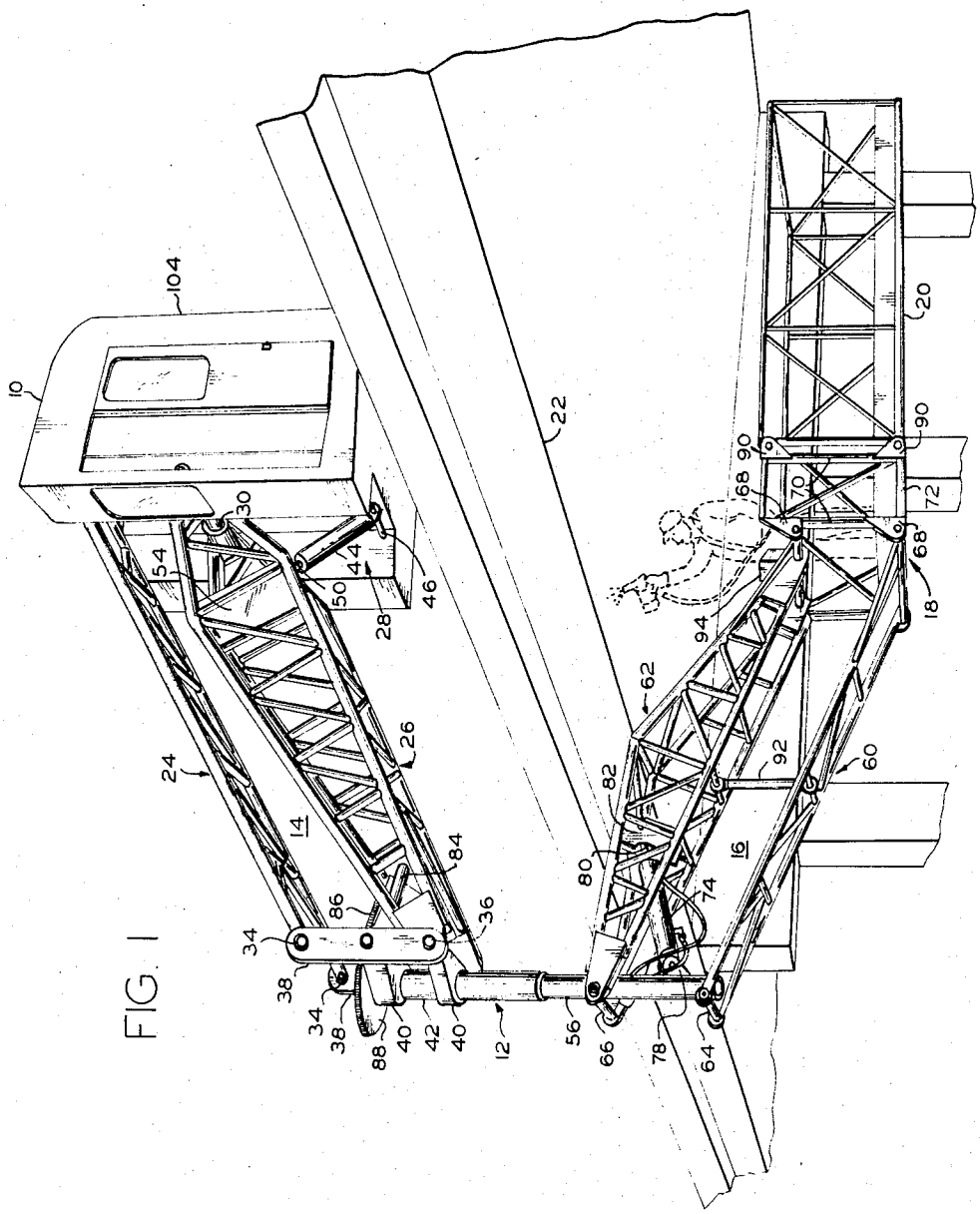

FIG. 1

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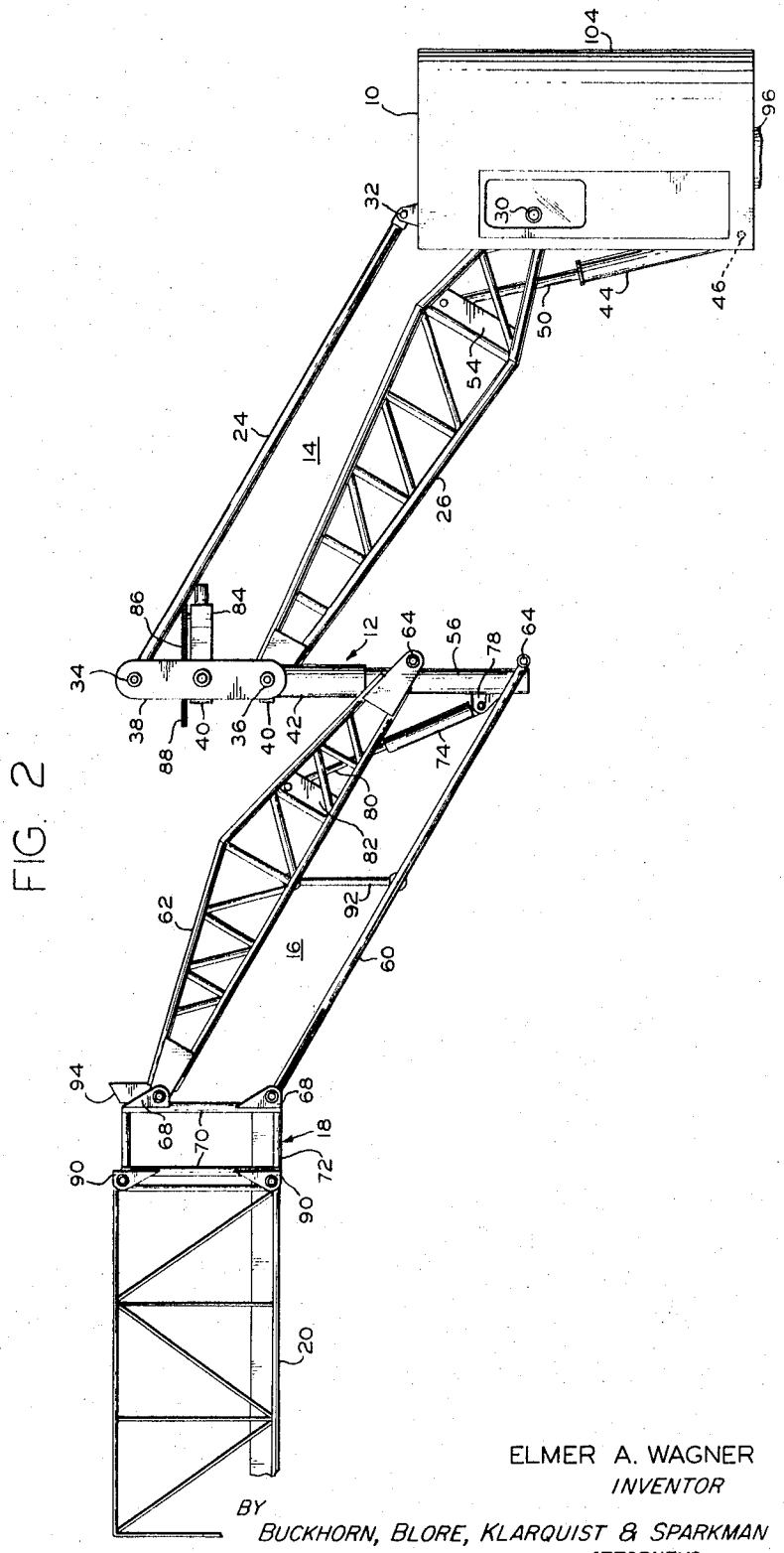

FIG. 2

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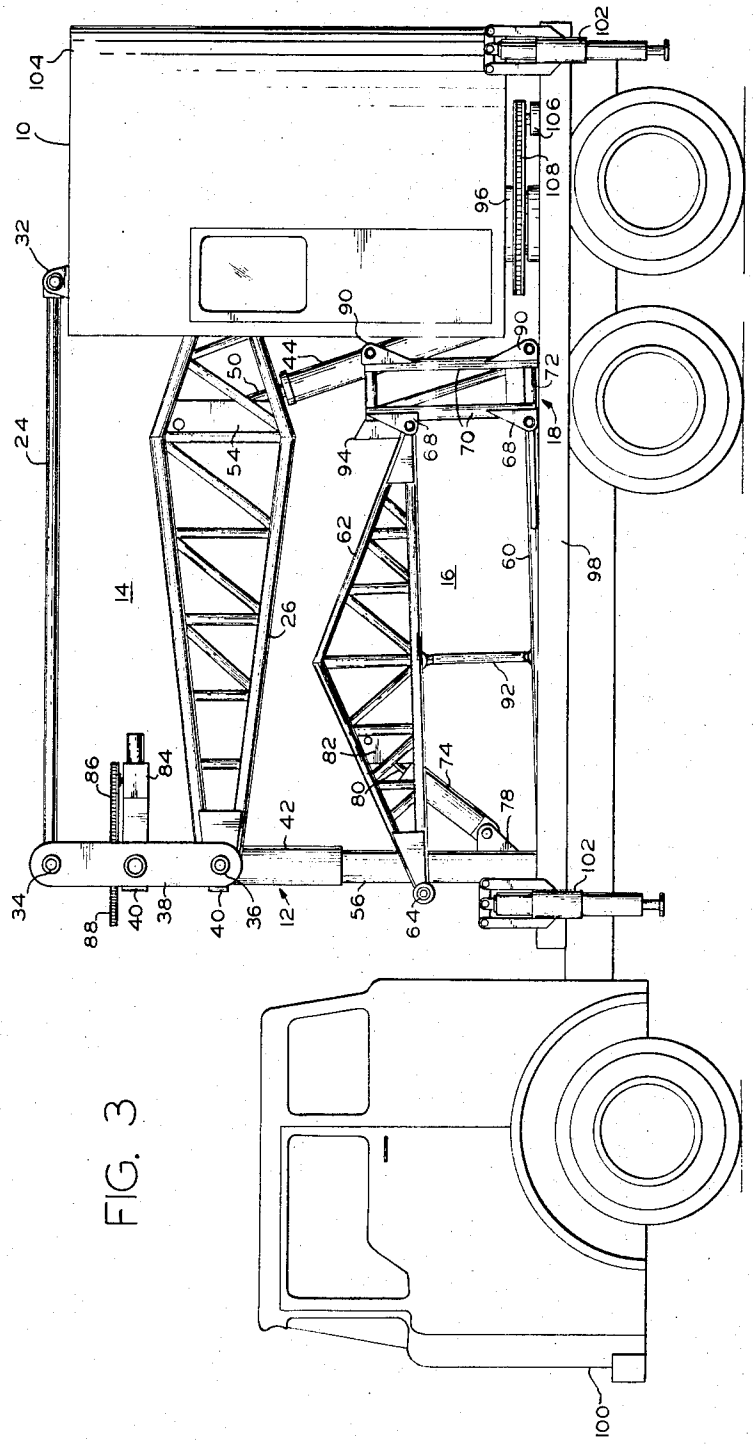

FIG. 3

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3,357,517

MOBILE SCAFFOLD

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10 Claims. (Cl. 182—2)

This invention relates to a mobile scaffold and particularly to a transportable mobile scaffold for providing access to the underside of elevated surfaces.

Access to the underside of elevated surfaces such as bridges, elevated roadways and the like may be provided with conventional scaffolding suspended from the elevated structure. Access to a large area of such surface for construction, painting, inspection and repairing thereof, then involves the considerable expense of construction and reconstruction of the scaffolding and moving of such scaffolding from one location to another. Alternatively such an under surface may sometimes be reached with a conventional crane or other boom device. However, there may be no place where such a crane may be positioned, as in the case of uneven terrain or when an obstruction is present. Moreover, the elevated surface may be at too great a height for convenient access with a conventional crane device.

It is therefore an object of the present invention to provide a mobile scaffold apparatus for positioning and supporting an individual in difficult to reach locations.

It is another object of the present invention to provide an improved mobile scaffold apparatus for providing convenient, ready access to the underside of elevated surfaces.

Briefly, in accordance with an embodiment of the present invention, a mobile scaffold comprises a rotatable base member and a first boom for positioning an intermediate support means at the distance from the base member. The first boom includes a pair of parallel arms pivoted to the base member upon parallel axes, and the arms are similarly pivoted to the intermediate support means so the intermediate support means is maintained at a constant attitude with respect to the base member, e.g., with the intermediate support means maintained in a vertical position even though the boom is raised and lowered. The intermediate support means preferably includes a vertical shaft depending from the head end of the first boom and rotatable with respect to the first boom.

A second boom, pivoted from the lower end of the vertical shaft, similarly comprises a pair of parallel arms. The second boom supports a working bridge at its head end, and, since the second boom includes a parallel arm mechanism, the bridge is maintained at a constant attitude with respect to the base member, e.g., with its floor parallel to the floor of the base member.

The base member may be located on the top of an elevated surface such as an elevated highway or the like with the first boom extending downwardly and over the side of the elevated structure. The second boom, rotatably attached to the end of the first, is conveniently swung into a position so it extends back under the elevated structure upon which the base member is located. The booms may be moved horizontally and vertically to position the bridge into a desired position under the elevated structure whereby an individual located on the bridge may obtain easy access to the structure's under surface.

According to another feature of the present invention, the base member is desirably rotatably supported upon a vehicle. For example, the base member may comprise a cab mounted on the bed of a truck. For transporting the mobile scaffold according to the present invention,

the booms are swung over the bed of the truck with the second boom extending back under the first. Of course, the vehicle mounting also provides convenient movement of the scaffold while the same is in use, e.g., in inspecting extended lengths of an under surface.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. The invention, however, both as to organization and method of operation, together with further advantages and objects thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings wherein like reference characters refer to like elements and in which:

FIG. 1 is a perspective view of a mobile scaffold according to the present invention in operating position,

FIG. 2 is a side view of the mobile scaffold according to the present invention in an extended position, and

FIG. 3 is a side view of the mobile scaffold according to the present invention mounted on the bed of a vehicle and shown in retracted position for transporting.

Referring to the drawings, a rotatable base member comprising a cab **10** supports an intermediate support member **12** by means of a first boom **14**. A second boom **16** extends from the lower end of an intermediate support means **12** and in turn supports a bridge **18** to which may be connected bridge extension **20**. The bridge **18** and bridge extension **20** are maintained in a substantially horizontal position and may be suitably positioned under an elevated roadway **22** for construction, inspection, painting, or the like, as illustrated in FIG. 1. In this illustration, the cab **10** is positioned atop roadway **22** and is rotatable about a vertical axis as will hereinafter become more evident.

Boom **14** comprises an upper arm **24**, and a lower arm **26** substantially equal in length to arm **24**, where the arms are disposed in parallel relation. Both arms **24** and **26** are pivoted at the upper front of cab **10** on parallel axes and swing vertically within an indented area **28** on the front side of the cab. Arm **26** is mounted for vertical rotation about a horizontal shaft **30** extending across the indented area **28** approximately midway up the front of cab **10**. Arm **24** pivots in a vertical plane from brackets **32** located atop the cab as seen more clearly in FIGS. 2 and 3.

The opposite ends of arms **24** and **26** pivot in upper and lower bearings **34** and **36** establishing parallel axes and located within vertical side members **38** of intermediate support means **12**. These vertical side members are joined with horizontal cross pieces **40** extending on either side of a vertical sleeve **42** to which the cross pieces are secured. Upper bearings **34** and lower bearings **36** in vertical side members **38** are spaced the same vertical distance apart as shaft **30** and the pivotal axis of arm **24** with respect to brackets **32**. Thus arms **24** and **26** together with vertical side members **38** and cab **10** between the arms form a parallelogram or parallel motion system whereby side members **38** and sleeve **42** are maintained in substantially the same parallel attitude with respect to cab **10**. That is, as the head end of boom **14** is raised and lowered with respect to cab **10**, side members **38** and sleeve **42** are maintained in a vertical position.

Movement of boom **14** comprising arms **24** and **26** in a vertical direction is accomplished by means of a main hydraulic cylinder **44** pivoted at its lower end to engage a shaft **46** extending across the lower part of indented area **28** of cab **10**. Actuating rod **50** of main cylinder **44** is pivotally secured to the top of bracing member **54** extending across arm **26**.

Sleeve **42** of intermediate support means **12** is provided near the top thereof with a thrust bearing for

journaling a main shaft **56** maintained in a substantially vertical orientation within sleeve **42**. Main shaft **56** depends from sleeve **42** and supports a second boom **16** comprising a lower arm **60** and an upper arm **62** of equal length.

A pair of parallel horizontal rods **64** are joined to the lower end of main shaft **56** on one side thereof and are vertically spaced with respect to one another. Arms **60** and **62** turn upon rods **64** and are arranged to extend from rods **64** toward the opposite side of the main shaft **56**. The opposite ends of arms **60** and **62** are pivotally joined to a working bridge **18** having brackets **68** pivotally receiving parallel end shafts joined to arms **60** and **62**. Brackets **68** are positioned such that arms **60** and **62** are equi-spaced at both ends, in the same manner as the aforementioned arms **24** and **26**, and since the arms **60** and **62** are also of equal length, bridge **18** is maintained in a parallel attitude with respect to intermediate support means **12** and therefore with respect to cab **10**. That is, bridge **18** is maintained with side members **70** in a vertical position and its lower floor member **72** in a horizontal position.

A secondary cylinder **74** hinged to main shaft **56** at bracket **78** has its actuator rod **80** pivoted to the upper end of bracing member **82** extending across arm **62**. Operation of cylinder **74** controls upward and downward movement of the boom **16** comprising arms **60** and **62**. The boom **16** also rotates on main shaft **56**. A hydraulic motor **84** supported from upper cross piece **40** initiates and controls the rotation of the main shaft **56**. Hydraulic motor **84** drives shaft **56** through a chain **86** engaging sprocket **88** which is in turn keyed to the shaft **56**. Therefore, the boom **16** carried on the shaft **56** may be turned in any desired direction.

Although the bridge **18** is of sufficient size for many purposes, e.g., of sufficient size for supporting one man, it is frequently desirable to lengthen the working space thus available at the head end of the boom by means of an extension bridge **20**. For joining extension **20** to bridge **18**, the bridge **18** is provided with brackets **90** carrying outwardly extensible pins for conveniently engaging the adjacent end of the bridge extension **20**. Thus extension **20** considerably lengthens the working space available at the head end of the boom as illustrated in FIG. 1. Since bridge extension **20** is securely joined to the bridge **18**, bridge extension **20** is maintained in a substantially horizontal attitude despite changes in orientation and direction of the various boom members.

For the purpose of strengthening the booms, at least one arm of each boom is preferably formed as a steel pipe truss frame. For example, arm **26** of boom **14** and arm **62** of boom **16** are so formed. The truss frames include both vertical struts and horizontal cross braces as can be seen from the FIG. 1 perspective drawing. Arm **26** desirably increases in its vertical dimension from each end toward the bracing member **54** where upward force is applied by means of actuating rod **50** of main cylinder **44**, while arm **62** desirably employs A-frame truss side members. The remaining arms **24** and **60**, are also desirably steel pipe structures and are at least cross braced as shown in the FIG. 1 perspective drawing. To further reinforce boom **16**, a vertical bracing member **92** is pivotally connected between the center of arm **60** and the center of arm **62**. Since these points on arms **60** and **62** remain vertically separated by a constant distance, bracing members **92** remains in a vertical position and does not interfere with the operation of the apparatus.

The main cylinder **44** as well as a secondary cylinder **74** and hydraulic motor **84** are operated and controlled in a conventional manner. A first or primary operating station therefor is located in cab **10**. A desirable additional feature comprises a second operating station **94** located on bridge **18**. It is therefore possible for an individual on bridge **18**, and possibly out of view of cab **10**, to position himself at will.

The mobile scaffold according to the present invention is conveniently located upon a transporting vehicle as illustrated in FIG. 3. Cab **10** is supported on a main column **96** rotatably supported on bed **98** of a vehicle at the rear end of the bed, that is, at the end of the vehicle remote from cab **100**, in order to provide storage room for the mobile scaffold according to the present invention. Although placement of cab **10** at the end of bed **98** adjacent the vehicle cab **100** is possible, the described placement at the end of the vehicle remote from cab **100** gives the maximum freedom in manipulating the apparatus, that is, 360 degree freedom in moving the booms. In any case, the booms **14** and **16** are accommodated with boom **16** turned beneath boom **14** on the vehicle bed.

The cab **10** may be turned with respect to bed **98** upon main column **96** which, of course, has the effect of moving the entire scaffold apparatus in a horizontal arc. Turning of cab **10** is accomplished with motor **106** driving main column **96** by means of chain drive **108**. Since booms **14** and **16**, as well as the bridge members they carry, are reasonably heavy and are located on a long lever arm, it is desirable that cab **10** be reasonably heavy, particularly in the rear portion **104** thereof in order to provide proper counterweight. During operation of the mobile scaffold according to the present invention, additional support may be desired for the vehicle bed upon which the apparatus may be mounted. For this reason, a hydraulic jack **102** is mounted at each corner of the vehicle bed and may be operated to support the bed directly upon the ground.

The mobile scaffold according to the present invention is effective for providing ready working access to the underside of elevated structures such as bridges, elevated roadways and the like, as shown in FIG. 1. By means of the mobile scaffold according to the present invention, immediate access may be provided to these areas in a minimum amount of time and without installing a semi-permanent scaffolding structure. For example, a vehicle, carrying the mobile scaffold, may be moved along roadway **22** to any point where access to the underside of the roadway is desired. The boom **14** is first raised by means of hydraulic cylinder **44** such that intermediate support means **12** and boom **16** may clear the bed **98** of the vehicle. The cab **10** is now turned swinging the booms away from the vehicle, and main shaft **56** is also turned by means of hydraulic motor **84** in order to extend boom **16** away from boom **14**. Bridge extension **20** is joined to the bridge **18** as desired. The boom **14** swings the scaffold into a position clearing roadway **22** at the side of the roadway with boom **16** in a position away from the roadway. Now, main cylinder **44** may be controlled to lower boom **14** into a position wherein boom **16** may be swung under the roadway. Hydraulic cylinder **74** is controlled as desired in order to lower boom **16** to the optimum position, and main shaft **56** is further rotated to whatever degree necessary for the positioning of bridge **18** and bridge extension **20** to the proper location. Throughout the operation of the device the intermediate support means **12** as well as bridge **18** and bridge extension **20** are maintained in a substantially parallel attitude with respect to one another and with respect to cab **10**. The bridge is thus movable to any desired position without changing its working orientation with its floor parallel to the ground and the working surface.

While the mobile scaffold according to the present invention is particularly useful in providing access to the underside of elevated surfaces and the like, it should also be noted the mobile scaffold can manipulate a working bridge or the like into other desired positions and elevations. For example, the mobile scaffold can be employed with the booms **14** and **16** extending in substantially the same direction, as illustrated in FIG. 2, placing bridge **18** and bridge extension **20** at a considerable distance from the cab **10**. Moreover, the intermediate support

means 12 may be reversed if desired, so that instead of boom 16 depending from the end of boom 14, support means 12 rather extends upwardly from vertical side members 38 to place bridge 18 in a further upraised position.

While I have shown and described a particular embodiment of my invention, it will be apparent to those skilled in the art that many other changes and modifications may be made without departing from my invention in its broader aspects. I therefore intend the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

I claim:

1. A scaffold device comprising:

a base member,

an intermediate support means,

a first boom means extending from said base member to said intermediate support means wherein said first boom means comprises a pair of parallel arm means of substantially equal length pivoted upon said base member on spaced parallel horizontal axes and also pivoted to said intermediate support means on spaced parallel horizontal axes to provide for raising and lowering said first boom means and for movably mounting said intermediate support means in a substantially constant parallel attitude with respect to said base member,

said intermediate support means projecting in a vertical direction from said first boom means,

second boom means pivotally extending from said intermediate support means entirely on the same side of both the spaced horizontal axes on said intermediate support means to which said arm means of said first boom means are pivoted, wherein said second boom means has one end supported by said intermediate support means for rotary movement about a vertical axis with respect to said first boom means and for pivotal movement about a horizontal axis with respect to said intermediate support means to provide for swinging said second boom means about said vertical axis and for raising and lowering said second boom means,

means for raising and lowering said first boom means relative to said base member,

means for raising and lowering said second boom means relative to said intermediate support means,

and means for swinging said second boom means relative to said first boom means.

2. The scaffold device according to claim 1 wherein said base member comprises a rotatable body supported for rotation about a vertical axis.

3. The scaffold device according to claim 1 wherein said intermediate support means comprises a main shaft means maintained in constant vertical orientation by the arm means of said first boom means for rotatably supporting said second boom means.

4. The scaffold device according to claim 1 further including head end means at the end of said second boom means remote from said intermediate support means,

wherein said second boom means comprises first and second parallel arm means of substantially equal length pivoted upon said intermediate support means on parallel axes and pivoting said head end means on parallel axes at the remote end of said parallel arm means maintaining said head end means in a substantially constant parallel attitude with respect to said intermediate support means and said base member.

5. The scaffold device according to claim 4 wherein said head end means comprises a bridge capable of supporting an individual thereon.

6. A mobile scaffold for mounting upon a vehicle comprising a base member for mounting on said vehicle and adapted for rotation with respect to said vehicle around a vertical axis,

intermediate support means,

first boom means extending from said base member to said intermediate support means wherein said first boom means comprises a pair of parallel arms of substantially equal length pivoted for vertical rotation with respect to said base member at one end of said arms and pivoting said intermediate support means for vertical rotation at the remaining end thereof,

said intermediate support means comprising a main shaft maintained in a constant vertical orientation by the arms of said first boom means, said main shaft depending from said first boom means,

said intermediate support means further including means for rotating said main shaft with respect to said first boom means,

second boom means extending from said main shaft at a location thereon below said first boom means, said second boom means comprising first and second parallel arms of substantially equal length pivoted to said main shaft for vertical rotation with respect to said main shaft, bridge means vertically pivotally supported on the remote end of said first and second arms,

actuator means for raising and lowering the said first boom means with respect to said base member, and

actuator means for raising and lowering said second boom means with respect to said main shaft.

7. The mobile scaffold according to claim 6 further including an elongated bridge extension for attachment to the bridge at the head end of said second boom means, said bridge extension being maintained in substantially horizontal orientation thereby.

8. The mobile scaffold according to claim 6 wherein at least one arm of said first boom means and one arm of said second boom means each comprise a truss frame having vertical struts for enhancing the structural strength of said boom means.

9. The mobile scaffold according to claim 6 wherein said base member comprises an operating cab rotatably supported at the rear end of the bed of said vehicle spaced from the cab of said vehicle a distance at least equaling the length of said first boom means together with said intermediate support means, said second boom means having a length no longer than said first boom means, so that said first and second boom means may be accommodated longitudinally of said vehicle with said second boom means extending from said intermediate support means under said first boom means toward said base member.

10. The mobile scaffold according to claim 6 further including a control station located on said bridge for operating said actuating means.

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