Feb. 15, 1966 T. W. SHORT 3,234,620

HYPERBOLIC PARABOLOID ROOF CONSTRUCTION

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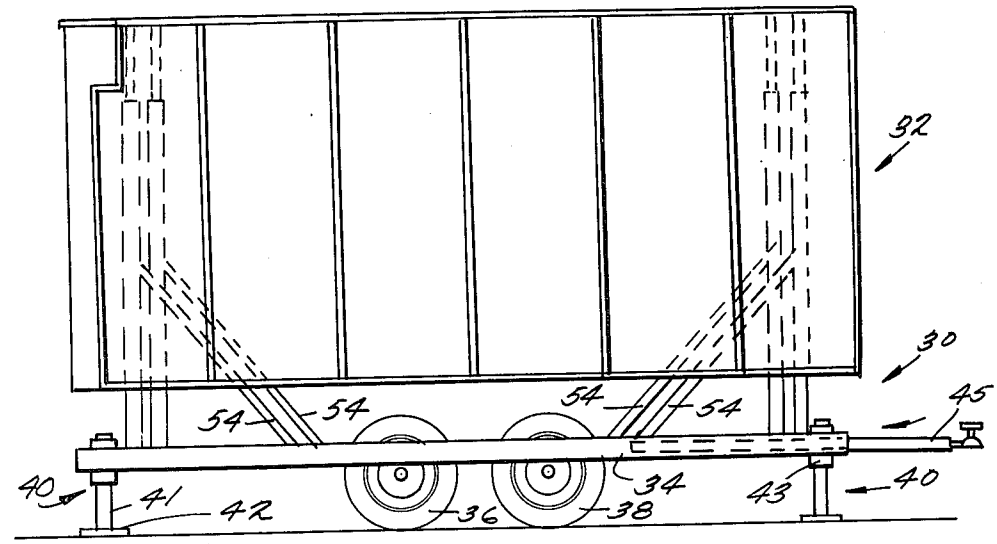


Fig. 1.

Fig. 2.

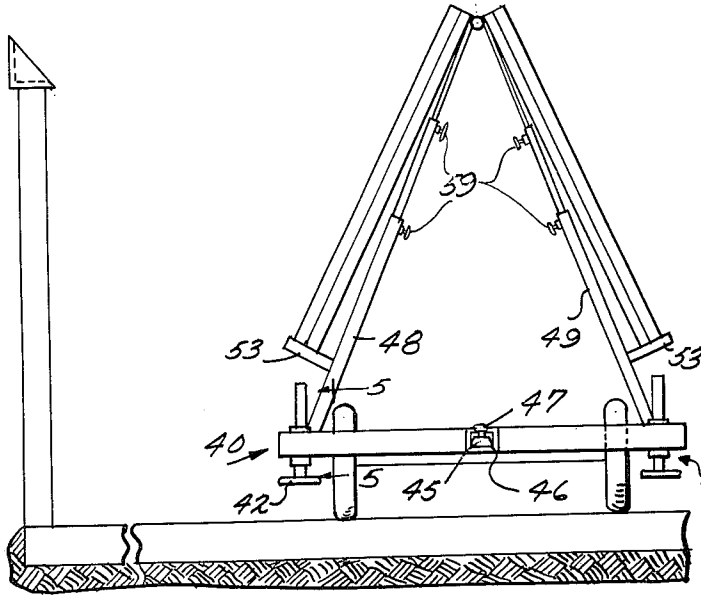
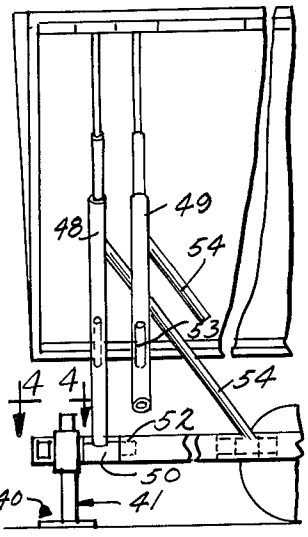


Fig. 3.



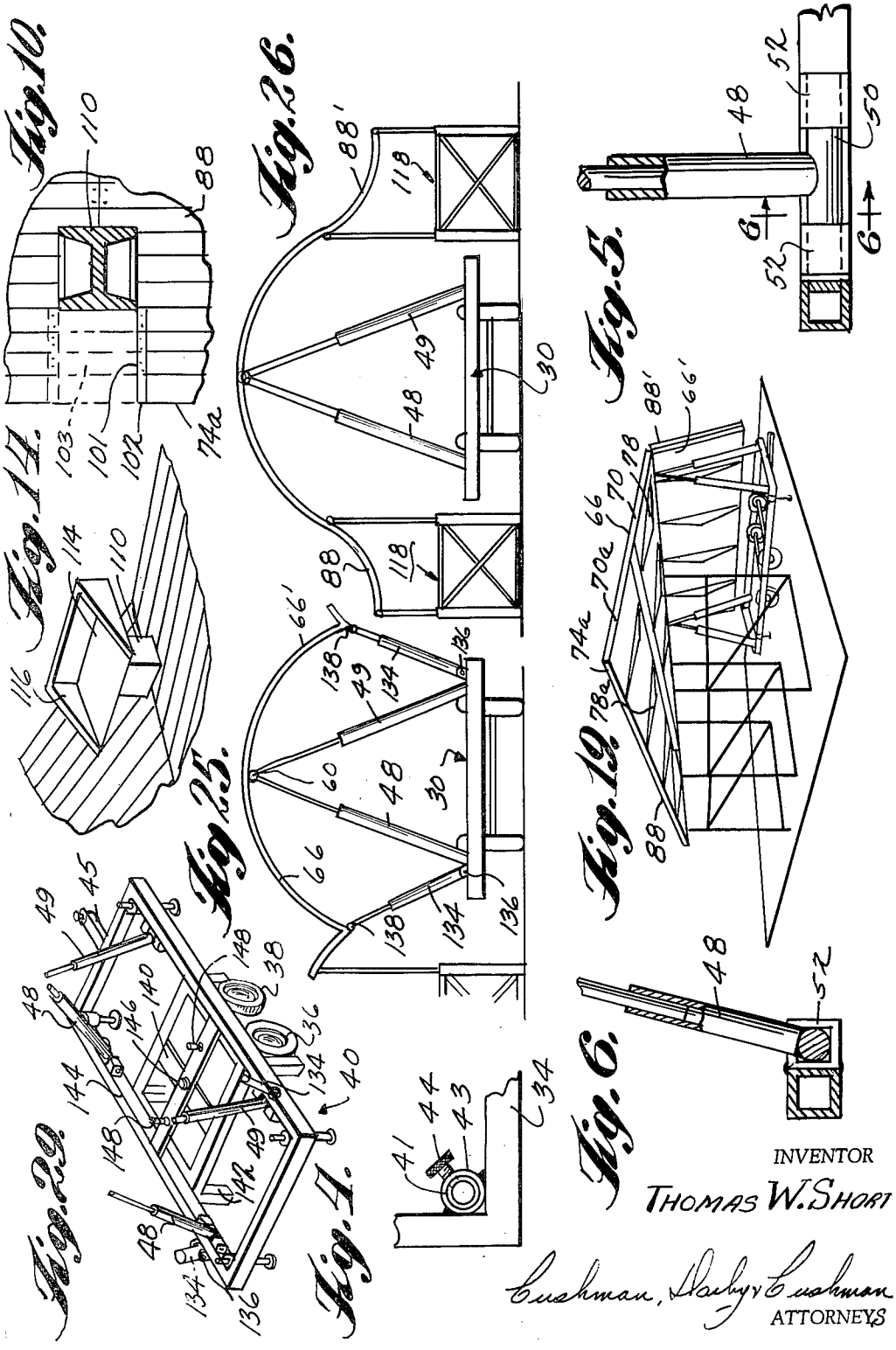
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ATTORNEYS

Feb. 15, 1966 T. W. SHORT 3,234,620

HYPERBOLIC PARABOLOID ROOF CONSTRUCTION

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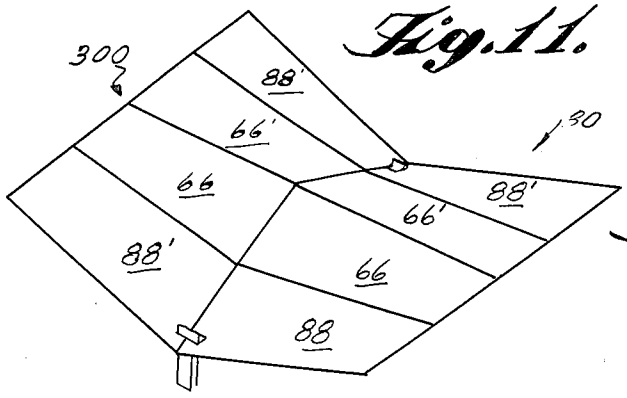


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HYPERBOLIC PARABOLOID ROOF CONSTRUCTION

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Fig. 11.



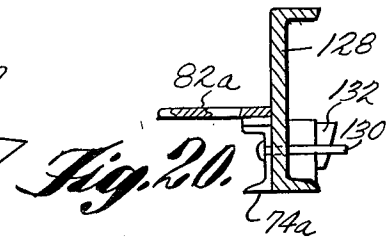


Fig. 10.

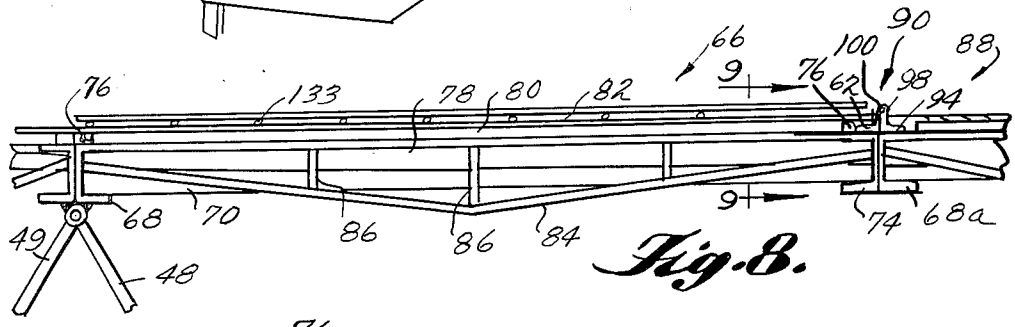


Fig. 8.

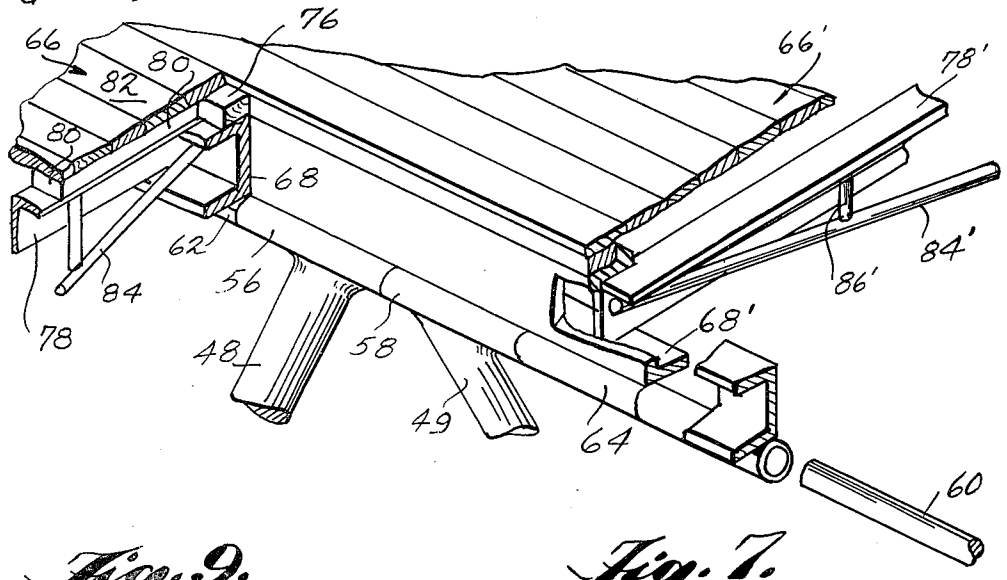
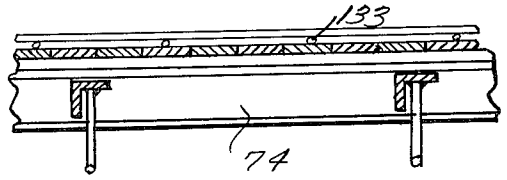


Fig. 9.

Fig. 7.



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HYPERBOLIC PARABOLOID ROOF CONSTRUCTION

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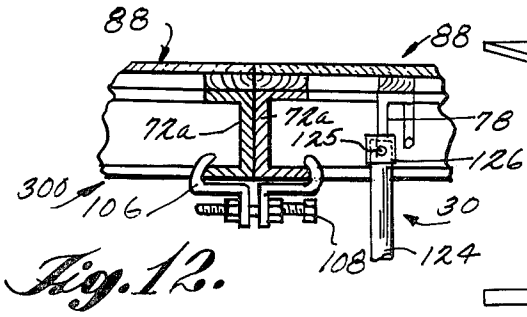


Fig. 12.

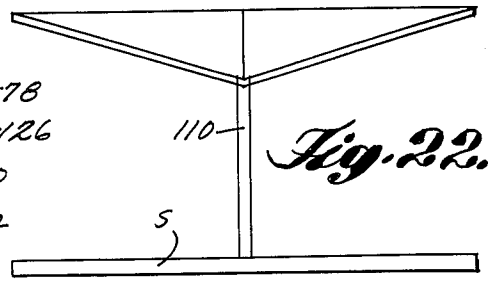


Fig. 22.

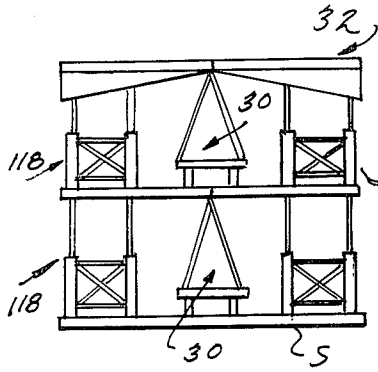


Fig. 24.

Fig. 13.

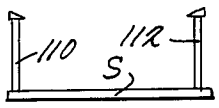


Fig. 15.

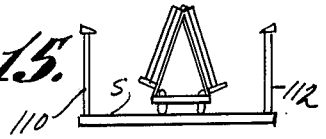


Fig. 21.

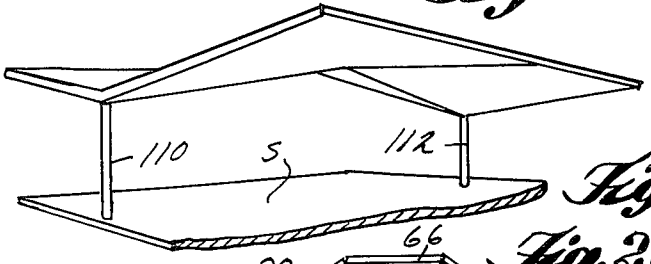


Fig. 16.

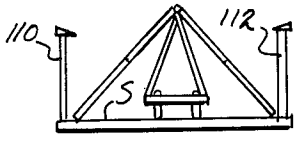


Fig. 17

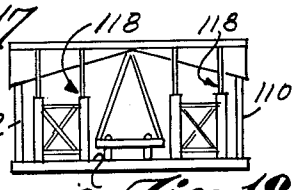


Fig. 28.

Fig. 18.

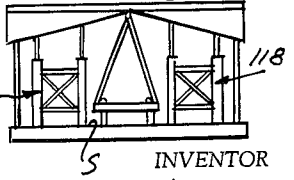
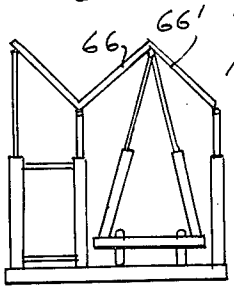


Fig. 27.



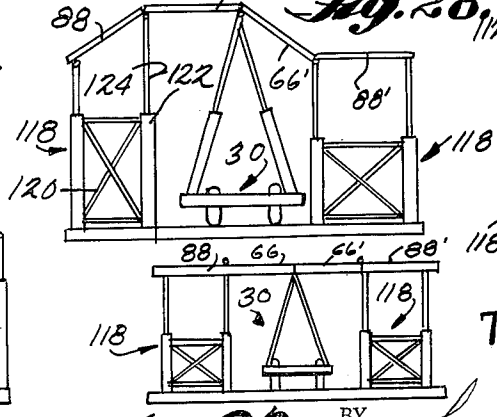


Fig. 23.

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United States Patent Office 3,234,620 Patented Feb. 15, 1966

3,234,620

HYPERBOLIC PARABOLOID ROOF CONSTRUCTION

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Filed Aug. 23, 1962, Ser. No. 218,901
14 Claims. (Cl. 25—131.6)

This invention has reference to a new and improved method for forming thin-shell roofs of reinforced concrete and the like, the invention also including a new and improved method and apparatus for handling forms for concrete construction purposes.

Building construction embodying reinforced concrete has gained enhanced reception in the building industry due to the low cost of materials and the reliable and rugged structures obtained by employing such materials. However, the low materials cost of such building constructions, particularly in the field of small buildings, is offset to a considerable degree by virtue of the expense involved in setting up the forms for pouring purposes. Depending upon the particular building to be constructed, scaffolding and the like is commonly constructed at the building site with a consequent expense of time, labor, and materials.

This invention contemplates the provision of a new and improved arrangement for forming a thin-shell reinforced concrete roof or the like which involves an expeditious handling of the roof forms and associated supporting structure so that the roof forms can be assembled at the building site in a rapid and efficient manner with minimum expenditure of time, labor, and materials. This invention is particularly designed for forming hyperbolic paraboloid roofs of thin-shell reinforced concrete although it will become evident that this invention is also well-suited for forming other roof configurations as well.

According to one feature of this invention, there is provided a trailer vehicle which carries along its longitudinal axis upright supporting members of an inverted V-shaped configuration. Inner roof forms are pivotally mounted on each side of the V-frames at the apex thereof for pivotal movement between a lower transporting position and an upper position which defines at least a portion of the roof configuration. These inner forms carry outer roof forms along their lateral outside edges which outer forms are pivotally connected to the inner forms. The trailer vehicle is adapted to be stably supported at the building site, and the V-frames are preferably of telescoping construction so that the entire roof form assembly can be raised to its predetermined elevation. The roof forms are then positioned as appropriate to form the desired roof configuration, part of the roof forms being supported by building columns already formed at the site, and part of the roof form being supported by removable scaffolding positioned alongside the trailer, as necessary.

When the trailer and roof forms have been so positioned, the edges of the roof forms are built up as necessary to contain the concrete. A pattern of reinforcing rods is then laid on the upper surface of the roof forms and the concrete is poured. The roof forms have been positioned so that the concrete, when set, is carried by the supporting columns; and, after the concrete has set, the scaffolding is removed and the roof forms are simply pivoted downwardly and the trailer is ready for transportation to another building site where the steps are repeated.

Also, the invention contemplates such a method of building construction wherein two or more trailers are used together, the adjacent edges of the roof forms of the respective trailers being clamped together as necessary to form a continuous concrete receiving surface. This arrangement is particularly suited for forming hyperbolic paraboloid roofs; thus, in one form of the invention, when two trailers are positioned in end-to-end relationship, the apex of the supporting members supports the adjacent inner edges of the inner roof forms in a straight longitudinal line while the transverse outermost edges are likewise supported in straight lines perpendicular to this longitudinal line. When the roof forms of adjacent trailers are clamped together, this meeting edge takes the form of a V-shape so that the hyperbolic paraboloid configuration is obtained. Variations of this basic arrangement are likewise provided, depending upon the edges of the adjacent trailer roof forms which are clamped together. However, it will be appreciated that the instant arrangement is suitable for other roof configurations such as that of an arch-shape, saw tooth configurations, flat roofs, or multi-story buildings and the like.

Further objects of this invention include: the provision of a roof form of new and improved construction; a method of forming a roof with transportable roof forms; a roof-form trailer of new and improved construction; and rapid and reliable method of forming thin-shell reinforced concrete roofs.

These and still further objects, advantages, and novel features of the present invention will become apparent in the specification and claims and the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevation view of a roof-form trailer according to this invention;

FIGURE 2 is a front elevation view of the trailer in FIGURE 1;

FIGURE 3 is a broken-out longitudinal section view of the rear of the trailer;

FIGURE 4 is a detail plan view of a trailer stabilizing bracket, taken along line **4—4** in FIGURE 3;

FIGURE 5 is a detail elevation view taken along line **5—5** in FIGURE 2;

FIGURE 6 is a section view taken along line **6—6** in FIGURE 5;

FIGURE 7 is a broken-out perspective view of the roof form construction and its connection to the trailer;

FIGURE 8 is a transverse sectional view of the roof forms on one side of the trailer, pivoted to an upward position;

FIGURE 9 is a sectional view taken along line **9—9** in FIGURE 8;

FIGURE 10 is a partial plan view of the corner of an outer roof form at one end of the trailer;

FIGURE 11 is a diagrammatic perspective view of the roof forms of two adjacent trailers positioned adjacent one another to define a hyperbolic paraboloid roof;

FIGURE 12 is an elevational section view showing the connection of the adjacent roof forms of the two trailers;

FIGURE 13 is a diagrammatic elevation view of the building site prior to forming the roof;

FIGURE 14 is a detail perspective view of the upper end of one of the roof supporting columns;

FIGURES 15–19 are diagrammatic views showing various stages of the roof forming method;

FIGURE 20 is an elevational section view taken through an edge of one of the assembled roof forms showing the manner in which the edges are built up to receive concrete;

FIGURE 21 is a perspective view of the completed roof;

FIGURE 22 is a side elevation view of the completed roof;

FIGURES 23–28 are diagrammatic elevation views of variations of the method of forming the roof according to this invention; and

FIGURE 29 is a rear elevation view of a modified trailer construction according to this invention.

The trailer and roof form construction, FIGURES 1–10

Referring first to FIGURES 1–3, there is shown a trailer **30** of generally rectangular configuration in plan which is operative to carry roof forms **32** for constructing a thin-shell reinforced concrete roof. The trailer is in the form of a generally rectangular frame **34**, in plan, to which is joined two sets of ground-engaging wheels **36** and **38**, in the usual fashion. These wheels are preferably spaced inwardly of the sides of the frame **34** so that no parts extend beyond the frame, for reasons to become apparent.

The frame **34** carries at each of its four corner regions stabilizing supports **40** which take the form of vertically movable pipes **41** having abutment plates **42** at their lower ends. These pipes **41** are vertically adjustable, passing through appropriate vertical pipes **43** carried by the frame **34** (FIGURE 4). Suitable bolt clamps **44** or the like are provided for selectively tightening the stabilizing brackets **40** in their desired vertical position. By virtue of this arrangement the trailer **30** may be stably positioned on a concrete slab at a fixed elevation above the surface thereof. Alternative stabilizing arrangements, such as jacking mechanisms, will be evident to those skilled in the art.

A trailer hitch **45** is carried in telescoping engagement with a guide rod **46** carried at the forward end of the trailer frame **34**. Any suitable means are provided for fixing the position of the trailer hitch **45** relative to the guide rod **46**, there being shown a tightening screw **47** for this purpose. This arrangement allows the trailer hitch **45** to be positioned within the frame **34** when not in use. Thus, when the trailer **30** is positioned at a building site, the same is rectangular in plan without any undesirable protrusions—and the trailer **30** may thus abut another trailer of like construction along any of its sides, as will be explained in detail.

The roof forms **32** are carried for stable support along the longitudinal axis of the trailer **30** by opposed supporting members **48** and **49** at the front and rear of the trailer. The supporting members **48** and **49** take the form of telescoping pipes, the lower ends being pivotally connected to the frame **34** along its sides by horizontal rods **50** (FIGURES 5 and 6) which are welded to the bottom end of the lowermost pipe and retained for pivotable movement about a horizontal axis by spaced apart angle plates **52**. Three such telescoping pipes are shown in FIGURES 2 and 3 although it will be appreciated the number of pipes can be varied for desired conditions. Moreover, the lowermost pipes of the telescoping supporting members **48** and **49** carry laterally extending bracket plates **53** for supporting the forms **32**, and angularly extending supporting struts **54** which are likewise pivotally connected at their lower ends to the frame **34** in a manner identical to that shown in FIGURES 5 and 6.

As best shown in FIGURE 7, the upper ends of the supporting members **48** and **49** are flattened and carry longitudinally extending pipe segments **56** and **58**, respectively, as by welding. A long rod **60** passes through the adjacent pipe segments **56** and **58** so that the supporting members **46** and **48** are exandable to an elevated position and retractable in telescoping relationship with one another by virtue of the pivot connection at their upper ends to one another and their lower ends to the trailer frame **34**. Any convenient means for fixing the position of the telescoping pipes relative to one another may be provided, FIGURE 2 showing the clamping screws **59** threaded into each of the lower pipes.

Also rotatably carried on the rod **60** are pipe segments **62** and **64** longitudinally adjacent one another in alternating relationship. The pipe segments **62** are adapted to carry an inner roof form **66**, while the pipe segments **64** adapted to carry an adjacent opposed inner roof form **66'**. These inner roof forms **66** and **66'** are thus pivotal with respect to the trailer **30**, as will now be explained.

The inner roof forms **66** and **66'** are of identical opposed construction and the roof form **66** will be described in detail and like prime reference numerals designating identical elements in the roof form **66'**. For the present, suffice to note that the inner roof form **66** is a generally rectangular configuration, there being welded to the pipe segments **62** spaced along the rod **60** a long, outwardly facing inner side channel **68**, its extreme ends carrying end channels **70** and **72** and an outside channel **74**. Wood blocking members **76** extend along the top flange surface of these channels **68–74**, being joined to these channels by screws or the like. Furthermore, generally parallel angle bars **78** are disposed in parallel and spaced apart relationship to the end channels **70** and **72**, being welded at their extreme ends to the inner and outer channels **68** and **74**. Long wood strips **80** are carried along the top of these angles **78** as by screws or the like. A continuous tongue-and-groove wood deck **82** is nailed across the wood strips **76** and **80** in longitudinally aligned relationship relative to the apex of the supporting members **48** and **49**, defined by the rod **60**, to form an upper surface for the pouring operation to be later described. In order to reinforce the inner roof form **66** sufficiently to support the weight of the concrete, a reinforcing truss-like arrangement is joined as by welding to the angles **78**. This takes the form of a long rod **84** of V-shaped configuration, welded at its ends at the ends of the angles **78**, with vertical bracing members **86** positioned therealong, as by welding.

An outer form **88** is pivotally connected to the outside channel **74** and in a like manner an outer form **88'** is pivotally connected to the outside channel **74'** of the respective inner roof forms **66** and **66'**. These outer forms **88** and **88'** are of generally identical construction to the description of the inner forms **66** and **66'** with minor variations to be discussed. Thus, the outer form **88** has side channels **68***a* and **74***a* and channels **70***a* and **72***a*, reinforced angles **78***a* with appropriate wood strips carrying a similar tongue and groove deck **82***a*. Corresponding prime numerals designate like elements in the outer roof form **88'**. The outer roof form **88** is pivotally connected along its channel **68***a* to the upper surface of the outside channel **74** of the inner form **66** via a pin connection **90**, of any suitable construction. Conveniently, this may take the form of opposed angle plates **92** and **94** having their bottom flanges welded to the top surface of the outside channel **74** and the adjacent channel **68***a*, respectively. A pipe segment **98** is welded to one angle plate **94** while a longitudinally spaced pipe segment (not shown) is welded to the angle plate **92** and a long pin **100** passes through these pipe segments to form a pivotal connection between the inner and outer roof forms along their upper surface.

A further modification of the outer roof forms **88**, **88'** resides in the provision of a cut-out portion at the intersection of the channels **72***a* and **74***a*, and **72***a'*, **74***a'*, respectively. As shown in FIGURE 10, there is here provided a rectangular cut-out portion **101**, a short channel length **102** being spaced in parallel relationship to the end channel **72***a*. For reasons to become apparent, this allows a small portion **103** of the wood deck **82***a* in this region to be nailed down after the forms have been elevated to assume their roof configuration.

The roof-forming method, FIGURES 11–22

The roof forms **66**, **88**, and **66'**, **88'** form segments of a hyperbolic paraboloid roof. In the preferred embodiment of this invention, there is defined a straight line along the longitudinal pivot axis defined by the rod **60** carried by the supporting members **48** and **49**, while the roof forms at the rear of the trailer **30** define a straight line with channels **70**, **70'**, **70***a*, **70***a'* which are perpendicular to the straight line defined by the rod **60**. Moreover the opposite end of these forms at the front

of the trailer **30** takes in an inverted V-shaped form, having its apex at the rod **60**. Thus channels **72** and **72***a* define one leg thereof while channels **72'** and **72***a'* define the other leg. The roof forms thereby assume an elevated position when pivoted to their upper positions thereby forming a segment of a hyperbolic paraboloid roof as shown diagrammatically in FIGURE 11. Moreover, trailer **30** with the roof forms **66**, **66'** and **88**, **88'** is constructed and arranged to define a thin-shell hyperbolic paraboloid roof when another trailer **300** of identical construction to that shown and described is mounted in end-to-end relationship with the trailer **30**, likewise as shown in FIGURE 11.

Referring now to FIGURE 12, the adjacent end channels **72**, **72***a* and **72'**, **72***a'*, the trailers **30** and **300** may be joined together by spaced apart C-clamps **106** along their underside. Any conventional C-clamp or like means may be provided for this purpose. As shown, an oppositely threaded screw **108** is operative to draw the C-clamp segments together.

Reference is now made to FIGURES 13–20 which show the assembly of the roof forms. First of all, the concrete slab S is poured in the usual fashion and centrally located opposed columns **110** and **112** are positioned in the slab S as shown in FIGURE 13. Carried at the top of these columns are short angle plates **114** (FIGURE 14) which face one another and are reinforced at their ends by web plates **116**. The trailers **30** and **300** are moved onto the slab S and aligned with their cut-out portions **101**, **101'** adjacent to the columns **110** and **112**. The outer roof forms **88**, **88'** are then pivoted downwardly relative to the supporting members **48** and **49**, as shown in FIGURE 16 and all these forms are raised to their desired elevation, whereby they assume the configuration previously described. Any suitable means may be provided for this purpose, such as workmen raising the same with a longitudinal rod or bar which is temporarily clipped or hung to the apex of the supporting members **48** and **49** in transverse relationship. Thus, the inverted V-shaped configuration of the roof forms is positioned adjacent the columns **110**, **112** with the columns received in the cut-out portions **101**, while the opposite outer ends are positioned in a straight line. In order to provide the additional support for the load of the roof forms, prefabricated scaffolds **118** are positioned along opposite sides of the two trailers **30** and **300** for engagement with the underside of the outer roof forms **88**, **88'**, as best shown in FIGURES 17–19. These scaffolds conveniently take the form of a base portion **120** having opposed upright pipes **122** which receive telescoping pipes **124** which are independently movable and operative to be positioned at any desired elevation by a suitable clamping arrangement, such as a machine bolt (not shown) threaded through the upright pipes **122** at their upper ends. In order to insure that the upper ends of the pipes **124** are temporarily fastened to the outer roof forms in secure fashion, there are provided depending bracket plates **126** (FIGURE 12) suitably apertured and welded at their upper ends to the angles **78***a*, **78***a'*.

A pin **125** is placed through the bracket **126** and an aligned aperture at the upper end of each pipe **124**, to thereby retain the telescoping pipe in engagement with the roof form. Thus, the angular inclination of the roof forms is easily maintained due to the flexibility of the scaffolding support provided. Likewise, the rear end of the adjacent trailer **300** is positioned adjacent the front end of the trailer **30** and the adjacent roof forms clamped together as shown in FIGURE 12 and supported in an identical fashion. The wood deck portion **103** is then nailed to the cut-out portion **101** outside of the columns so that the decks **82***a* and **82***a'* are continuous.

In order to build up the edges of the forms which define the configuration of the hyperbolic paraboloid roof to be formed, channels **128** or the like (FIGURE 20) are joined to the outside channels of the assembled roof forms, these channels **128** extending upwardly above the deck to the distance of the finished roof to be formed. These channels **128** may be joined to the roof form channels by any suitable means, FIGURE 20 showing a vertically slotted, removable pin **130** extending outwardly through an aligned aperture in the outside channel of one of the roof forms, the channel **128** being received by the pin **130** and retained in place by a wedge pin **132** which is manually driven through the vertical slot in the pin **126**. Such a connection is repeated a long the outside channels of the roof forms as necessary to mount the channels **128** in a rigid fashion. Alternative arrangements for building up the edges of the assembled roof forms will be evident to those skilled in the art.

With the roof forms supported by the trailers **30** and **300** and the scaffolds **118** as described, and the peripheral edges of the assembled roof forms being built up, the roof may be completed. To this end a pattern of reinforcing rods **133** is laid on the deck, certain of the reinforcing rods being carried within the opposed web angle plates **114**. The concrete is then poured onto the surface and distributed thereover as by workmen who can walk on the assembled roof forms. The concrete pouring and finishing operation in itself is well-known in the art and need not be described in detail.

After the concrete has set, the thin-shell reinforced concrete roof of hyperbolid paraboloid configurations is rigidly supported by the supporting columns **110** and **112**. The scaffolds **118** are removed, the roof forms of the adjacent trailers **30** and **300** are unclamped, the deck portions **103** are removed, and the roof forms are pivoted downwardly and back onto the trailer. The telescoping supporting members **48** and **49** are lowered. The stabilizing pipes **41** are raised and the trailers **30** and **300** are then ready for transportation to another building site and the roof-forming operation is repeated. The finished roof is shown in FIGURES 21 and 22.

Variations of the roof-forming method and trailer construction, FIGURES 23–29

While the formation of one shape of a hyperbolic paraboloid roof has been described, variations of this basic method of roof construction will now be discussed.

In FIGURE 23 the roof forms **66**, **66'** and **88**, **88'** are shown as being flat so that a flat roof is formed, the roof forms being supported by the trailers **30** and **300** with scaffolds **118**, as described.

In order to form a multi-story building, a floor may be formed as shown in FIGURE 22 and trailers **30** and **300** then lifted as by a crane onto the upper surface of the flat roof and supported thereon to form a hyperbolic paraboloid roof of a multi-story building in a manner identical to that described. Such an arrangement is shown in FIGURE 23. The only difference may reside in the placement of the building columns on the first-mentioned flat floor as necessary to distribute the load in an efficient manner.

Likewise, it will be evident to those skilled in the art that instead of providing two opposed columns **110** and **112** in the center of the roof forms of the two trailers such columns may be provided at each of the corners or elsewhere and the cut-out portions **101** rearranged accordingly. Further, instead of the adjacent clamped edges of the roof forms being of inverted V-shaped configuration, they may be of an upright V-shaped configuration in which instance the peripheral edges of the assembled roof forms would lie in a common plane and the lowermost portion of the roof would be at the geometric center thereof. If such an arrangement is utilized, it will be desirable to provide a central supporting column at the lower apex of the roof, this central column also operating as a drainage pipe in addition to providing the necessary structural support.

Still a further variation of this roof construction method is shown in FIGURE 25 wherein the inner roof forms

66, 66' are of quadrant-shaped configuration pivotally connected along the central rod 60 defining the apex of the supporting members in a downwardly facing arcuate configuration. As a further variation, the outer ends of the inner roof forms are here shown as being supported directly on the trailer 30 by hydraulic cylinders 134 pivotally connected at their lower ends 136 to the trailer frame 34 and pivotally connected at their opposite piston rod ends 138 to the outside edges of the quadrant-shaped roof forms. Two such roof forms define a downwardly facing arch configuration and it is evident that an arch-shaped roof can be provided by such construction. A variation of this design is shown in FIGURE 26 wherein there is provided inner roof forms 66, 66' of quadrant-shaped construction, as described, and outer roof forms 88, 88' define an oppositely extending quadrant curve so that the roof when completed is alternatively concave and convex in elevation.

Still further variations are shown in FIGURES 27 and 28, wherein the roof forms are flat, as in FIGURE 22 and are positioned to provide a saw-tooth roof configuration or a corrugated roof configuration. Depending upon the pivot connection between the adjacent roof forms, the same roof configuration may be obtained by the trailer in FIGURE 23, as is apparent.

Numerous further variations in roof construction will be evident to those skilled in the art.

Reference is now made to FIGURE 29 which shows a modified construction of the trailer 30. Means are here provided for pivoting the supporting members 48 and 49 as a unit relative to the ground-engaging wheels 36 and 38 so that the trailer may be angularly adjusted for alignment with the columns, such as in instances where the trailer is to be positioned at a remote and otherwise inaccessible area.

In this embodiment of the trailer 30 there is provided a first lower frame 140 to which the ground-engaging wheels 36 and 38 are joined by suitable bracket plates 142. A second upper frame 144 is positioned on the lower frame 140 and connected thereto by a vertical pivot pin 146 so that the upper frame 144 is rotatable in a horizontal plane relative to the lower frame 140. The construction of the upper frame 144 is otherwise the same as that of trailer 30 in FIGURES 1–6, like numerals referring to the same elements.

In order to lock the upper frame 144 in the longitudinal position in instances where the trailer is to be transported from building site to building site, spaced apart locking pins 148 are conveniently dropped into corresponding apertures (not shown) in the lower frame so that these frames may be held rigid with respect to one another, as desired. The supporting members 48 and 49 are joined to the upper frames 144 in an identical manner to that already disclosed. This embodiment of the invention also shows the hydraulic cylinders 134 pivotally connected at their lower ends 136 to the sides of the upper frame 144. This latter arrangement of the hydraulic cylinders being similar to that shown in FIGURE 25.

From the foregoing description of the various embodiments of this invention, it is evident that the objects of this invention, together with significant practical advantages are successfully achieved. While preferred embodiments of my invention have been described, numerous further modifications may be made without departing from the scope of this invention.

Therefore, it is to be understood that all matters herein set forth or shown in the accompanying drawings are to be interpreted in an illustrative and not in a limiting sense.

What is claimed is:

1. An apparatus for handling forms for concrete construction comprising: vehicle means comprising vehicle frame means with ground-engaging wheels attached thereto, said vehicle means having a longitudinal axis; supporting means positioned in an upright relationship on said vehicle frame means, said supporting means comprising spaced apart front and rear inverted V-frames having telescoping legs, the lower ends of said legs being pivotally connected to said vehicle frame means and the upper ends of said legs pivotally connected to a longitudinal bar extending between the apexes of said front and rear inverted V-frames; and collapsible roof form means carried by said supporting means, said collapsible roof form means being movable between a collapsed first transporting position and a second position wherein said roof form means defines a continuous surface corresponding to the configuration of a concrete roof to be formed thereon.

2. The apparatus as defined in claim 1 additionally comprising hydraulic piston and cylinder means pivotally connected to each side of said vehicle frame means and pivotally connected to the outer region of said respective opposed collapsible roof forms to provide support for the same.

3. The apparatus as defined in claim 1 wherein said vehicle means comprises a lower vehicle frame member to which the ground-engaging wheels are joined; an upper vehicle frame member horizontally-pivotally connected to the first frame member and carrying said supporting means; means secured to said upper frame for stably supporting said upper frame at a building site; and means operatively associated with said lower vehicle frame member and said upper vehicle frame member for selectively locking said frame members together.

4. The apparatus as defined in claim 1 wherein said vehicle means additionally comprises a hitch secured to said frame means for enabling said vehicle to be pulled, said hitch being retractable within said frame means to allow said vehicle means to abut intimately another vehicle means in an end-to-end relationship.

5. The apparatus as defined in claim 1 wherein said collapsible roof form means comprises transversely opposed roof forms having a substantially continuous area and being pivotally connected to said longitudinal bar extending between the apexes of said V-frames.

6. The apparatus as defined in claim 5 wherein said opposed collapsible roof forms comprise inner roof forms and outer roof forms pivotally connected to the outer edge of each of said inner roof forms to define a substantially continuous surface area therewith.

7. The apparatus as defined in claim 6 wherein one transverse edge of said inner and outer roof forms defines a substantially straight line generally perpendicular to the longitudinal bar connecting the apexes of the supporting V-frames and the other opposite transverse edge of said inner and outer roof forms is angularly inclined relative to said longitudinal bar when said forms are disposed in an erected position so as to define a portion of a hyperbolic paraboloid roof.

8. The apparatus as defined in claim 7 wherein said rectangular inner and outer roof forms each comprise a longitudinal inner frame member joined at its opposite ends to one end of a transverse inner and a transverse outer frame member, the other end of each of said transverse inner and outer frame members being joined to a longitudinal outer frame member, said longitudinal inner and outer frame members being joined by transverse reinforcing members at spaced intervals between said transverse inner and outer frame members, the longitudinal inner frame member of the inner roof form being rigidly attached to tubular members rotatably carried on said longitudinal bar between the apexes of said V-forms, and the longitudinal outer frame members of the inner roof form being pivotally attached to the longitudinal inner frame members of the outer roof forms; a deck joined to said frame members and said reinforcing members to define a continuous surface to receive concrete; and detachable means secured to the outermost edges of said inner and outer roof forms to build up said edges and thereby contain the concrete prior to setting.

9. The apparatus as defined in claim 8 additionally comprising means depending from the underside of said

roof forms for temporarily receiving supporting scaffolds.

10. The apparatus as defined in claim 8 wherein said deck has a removable portion for receiving columns during erection, said removable portion being capable of being replaced once the roof forms and deck are in position.

11. The apparatus as defined in claim 6 wherein said inner and outer roof forms are of an arch-shaped transverse configuration.

12. The apparatus as defined in claim 6 wherein said inner and outer roof forms are of a substantially flat, rectangular configuration.

13. An apparatus for handling forms for concrete construction comprising: vehicle means comprising a frame means with ground-engaging wheels attached thereto, said ground-engaging wheels adapted to be maintained in a set position during the concrete construction; a pair of supporting means having a base end and an upper end and being disposedly positioned in an upright relationship on said vehicle frame means and supported solely from said vehicle frame means, each supporting means including means operatively associated with each supporting means for adjusting its upper end independently of the upper end of the other supporting means in a lateral direction with respect to said vehicle frame means and means operatively associated with each supporting means for adjusting its upper end independently of the upper end of the other supporting means in a direction transverse to said lateral direction; a longitudinal bar extending between said upper ends of said pair of supporting means; and collapsible roof form means connected to said longitudinal bar and being movable between a collapsed first transporting position and a second position wherein said roof form means defines a continuous surface corresponding to the desired configuration of a concrete roof to be formed thereon.

14. An apparatus for handling forms for concrete construction comprising: vehicle means comprising a vehicle frame means with ground-engaging wheels attached thereto, said ground-engaging wheels adapted to be maintained in a set position during the concrete construction; a pair of supporting means having a base end and an upper end and being disposedly positioned in an upright relationship on said vehicle frame means, each base end being pivotally secured to said vehicle frame means, each of said support means including means operatively associated with each supporting means for adjusting its upper end independently of the upper end of the other supporting means in a lateral direction with respect to said vehicle frame means and means operatively associated with each supporting means for adjusting its upper end independently of the upper end of the other supporting means in a direction transverse to said lateral direction; a longitudinal bar extending between said upper ends of said pair of supporting means; and collapsible roof form means connected to said longitudinal bar and being movable between a collapsed first transporting position and a second position wherein said roof form means defines a continuous surface corresponding to the desired configuration of a concrete roof to be formed thereon.

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