April 19, 1966 G. F. BOWDEN 3,246,869

WALER CLAMP AND TIE ROD ASSEMBLY FOR A CONCRETE WALL FORM

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Fig. 1

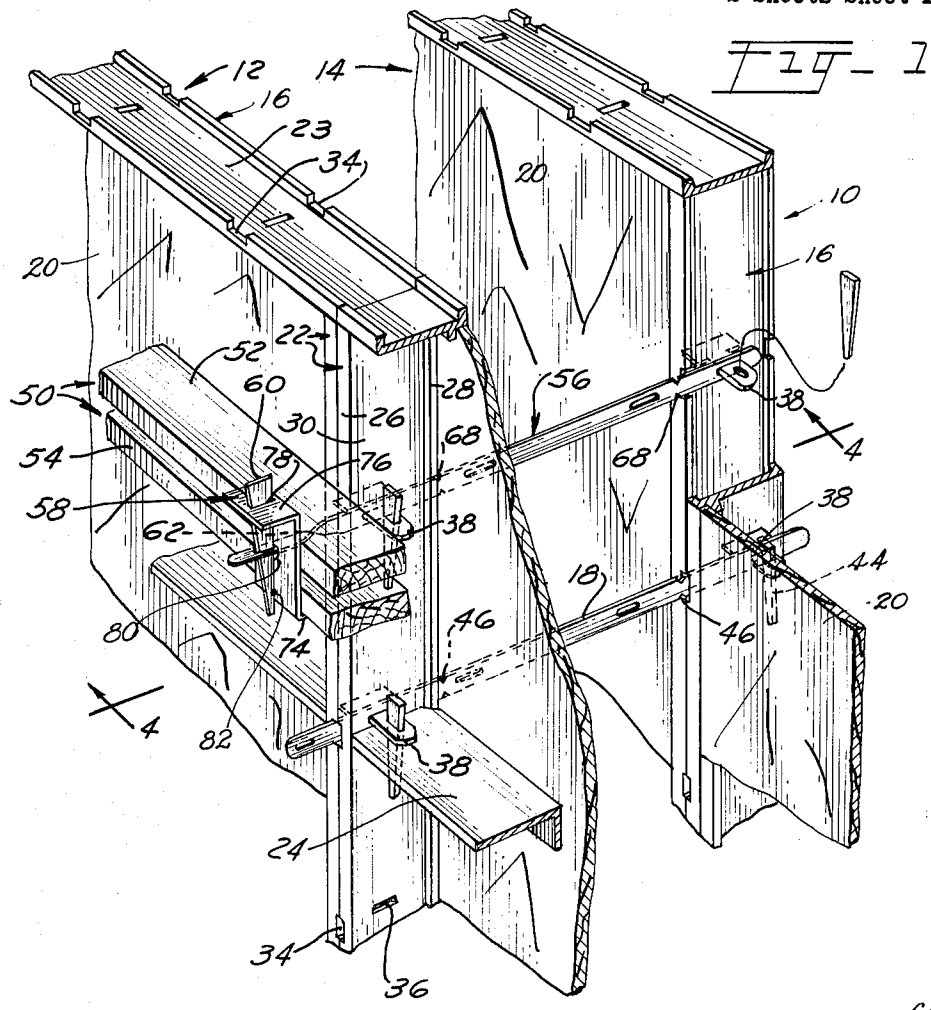
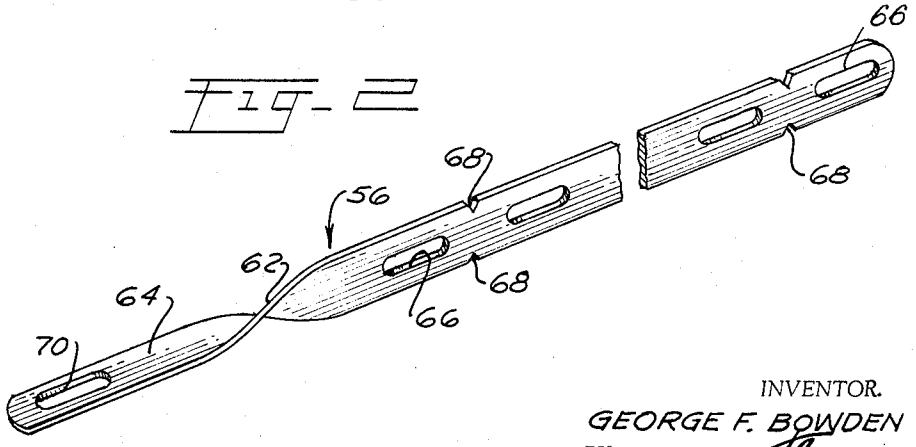


Fig. 2



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Fig. 3

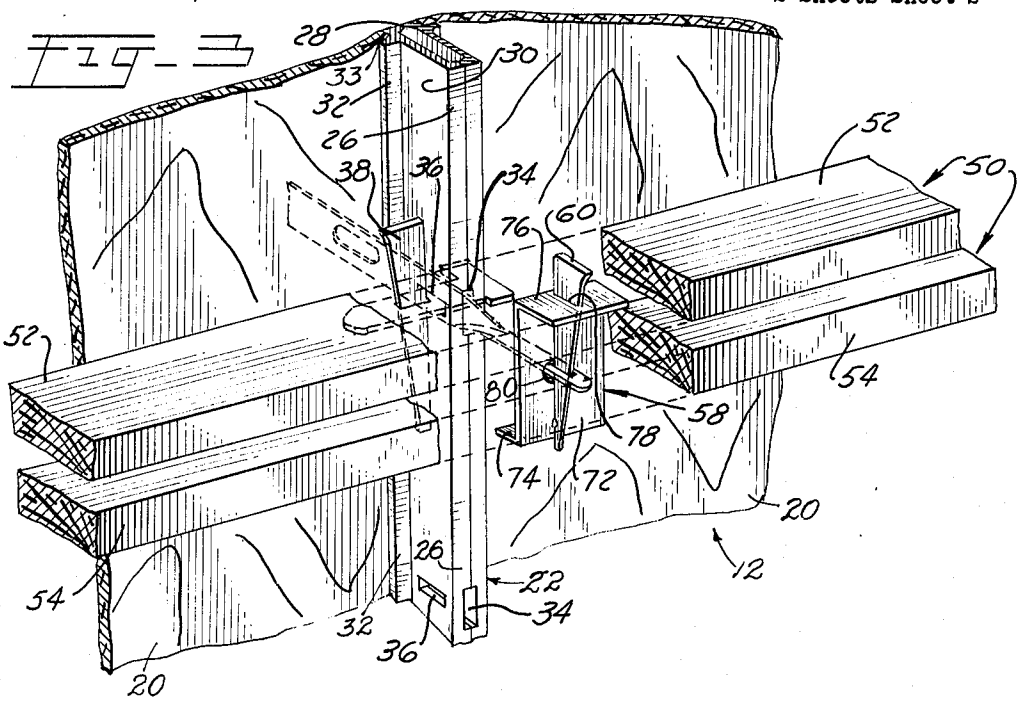
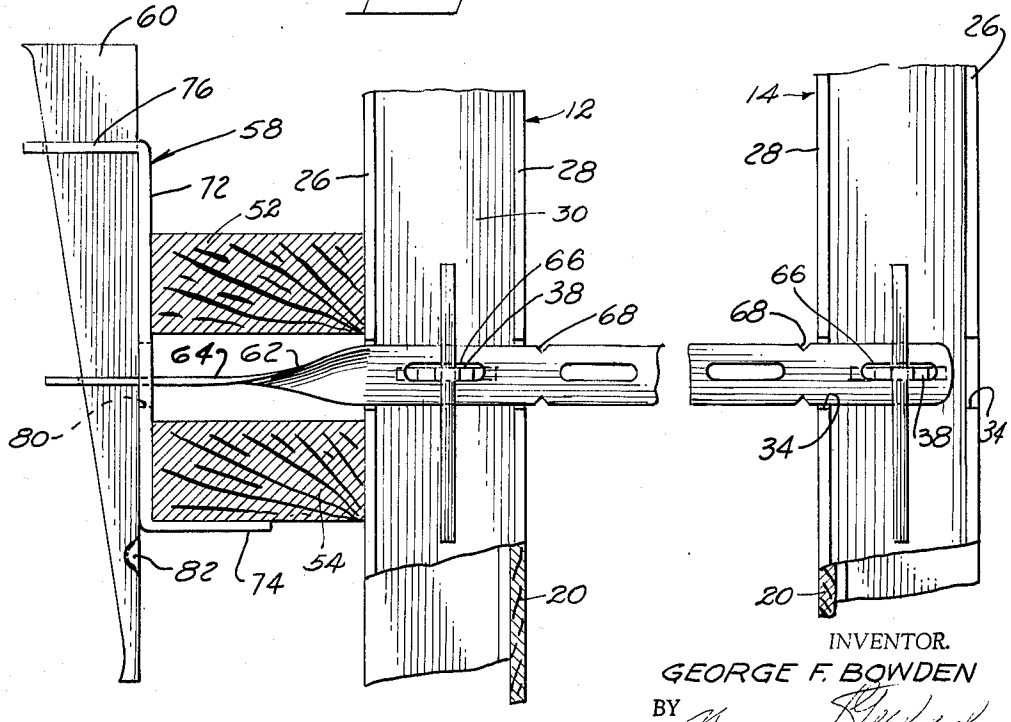


Fig. 4



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United States Patent Office 3,246,869 Patented Apr. 19, 1966

3,246,869

WALER CLAMP AND TIE ROD ASSEMBLY FOR A CONCRETE WALL FORM

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Filed Feb. 5, 1964, Ser. No. 342,697
2 Claims. (Cl. 249—45)

The present invention relates generally to a concrete wall form of the panel type and wherein the opposed front and rear sides of the form are each constructed of a group or series of rectangular panels in upstanding and edge-to-edge relationship and are adapted to have wet concrete, for wall-forming purposes, poured into the space between them, the two form sides being connected together by horizontally extending combined tie rod and spreader devices in order that they are properly held in place and prevented from outward bulging or spreading under the lateral thrust of the poured wet concrete. The panels which are commonly employed in connection with a concrete wall form of the aforementioned character are of the type that consists of a rectangular facing of plywood against which the wet concrete is adapted to abut, and a rectangular stiffening frame which is applied to the outer side of the facing, such frame including marginal horizontal and vertical members and, in addition, intermediate crossbars which extend either vertically or horizontally and are connected at their ends to either the horizontal or the vertical marginal frame members. When a concrete wall form of the panel type is of considerable length, it is customary to obtain further reinforcement of the form as a whole and also to maintain the upstanding edge-to-edge panels of one or both sides of the form in longitudinal alignment by means of relatively heavy walers which extend horizontally across the outer sides of the panels, bear against the vertical marginal members of the rectangular reinforcing frames, and have associated therewith means including wedges for clamping the walers hard against said vertical marginal frame members to the end that the latter are brought into accurate alignment with one another. The present invention is particularly concerned with the provision of novel, simple and improved means for securing the horzontally extending walers against the vertical marginal members of the frames of the rectangular panels of a concrete form of the general character outlined above.

The present invention has particular reference to a concrete wall form of the specific type that is known as a prefabricated concrete wall form by reason of the fact that the individual panels thereof are assembled at the factory rather than in the field, and the vertical and horizontal marginal members of the rectangular reinforcing frames of the panels are in the form of channel stock lengths which are formed of steel or other suitable metal, are rolled to special shape, and are perforated, notched, grooved or otherwise fashioned in order properly to receive the adjacent edges of the plywood facing of the panels, as well as to facilitate the use of special fastening devices or other concrete wall form hardware whereby adjacent panels may be clamped together in edge-to-edge manner.

In connection with a prefabricated concrete wall form such as has been briefly outlined above, one type of combined tie rod and spreader device which is commonly employed for maintaining the opposed sides of the form in their proper spaced relationship is in the form of an elongated strip of flat narrow metal stock which projects completely through the wall form sides and the intervening mass of poured wet concrete so that, after hardening of the concrete and removal of the panels of the form, the projecting ends of the device may be bent, twisted or otherwise manipulated in various directions in order to weaken the metal of the strip at the regions where the strip enters the concrete and ultimately to break said projecting ends from the medial concrete-embedded portion of the flat metal strip. To assist in thus rupturing the projecting ends of the combined tie rod and spreader device, it is common practice to weaken the flat metal strip which forms the device by notching it at regions which lie at slight distances inwards of the side faces of the hardened concrete wall so that after breaking away the ends of the device, there will be no protruding strip portions to interrupt the continuity of the side faces of the finished concrete wall. A combined tie rod and spreader device of this character is illustrated and described in United States Patent No. 2,948,045, granted on August 9, 1960 and entitled "Tie Rod Assembly For Concrete Wall Forms and Cone Therefor." Such a device is not readily adaptable for use in connection with or as an element of a standard waler clamping bracket, as is the more conventional combined tie rod and spreader device that is made from cylindrical rod stock. The last-mentioned device is illustrated in United States Patent No. 2,580,330 and may readily be turned in any direction to position the usual looped ends thereof in positions appropriate for passage therethrough of the usual wedges by means of which the walers are drawn hard against the adjacent parts of the associated concrete wall form. Because a combined tie rod and spreader device of the flat stock type is invariably, and by necessity, positioned in the associated concrete wall form with the plane of the flat stock extending vertically, the wedge-receiving slots which are always provided in the end regions thereof are incapable of receiving the wedges in any position other than a horizontal one. When the wedges in the ends of a combined tie rod and spreader device of the flat stock type are disposed horizontally, the adjacent horizontal walers interefere with proper driving of the wedges through the aforesaid slots in the ends of the device.

The present invention is concerned specifically with a novel waler clamping means or assembly which embodies as an element thereof a flat tie rod which has at least one end region thereof turned laterally out of the general plane of the tie rod through an angle of 90° so that when the tie rod is operatively installed in a prefabricated-type concrete wall form in the usual manner of installation with its general plane extending vertically for proper cooperation with adjacent rectangular panels, the wedge-receiving slot in the laterally turned end is so disposed that it may receive a wedge therethrough in a vertical direction to the end that there will be no interference by the adjacent waler or walers to convenient driving of the wedge to its home position.

The provision of a waler clamping means embodving such a tie rod being among the principal objects of the invention, another and important object is to provide a novel combination of such a tie rod with a two-piece bracket and wedge assembly, the latter being so designed that it embodies a captured wedge which, when the bracket is operatively positioned against a waler, maintains the wedge substantially in vertical alignment with the wedge-receiving slot in the adjacent laterally turned end of the tie rod, thus not only facilitating guided entry of the wedge into the slot, but also holding the wedge erect after initial entry has been effected so that a glancing blow inadvertently applied to the wedge, will not dislodge the wedge or bend either the wedge or the tie rod.

The provision of a waler clamp and tie rod assembly which is comprised of but three parts and, therefore, may be manufactured at a low cost; one which is extremely

simple in its construction; one which is rugged and durable and, therefore, will withstand rough usage; one which is simple in its application and requires no particular skill for its installation or removal from a prefabricated-type concrete wall form; one which requires no nailing and otherwise will not mutilate the lumber of the associated waler or walers; one in which two of the three component parts are capable of repeated use; and one which, otherwise, is well-adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

Other objects and advantages of the invention, not at this time enumerated, will become readily apparent as the following description enuses.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention has been shown.

In these drawings:

FIG. 1 is a perspective view of a waler clamp and tie rod assembly constructed in accordance with the principles of the present invention, the assembly being shown operatively applied to the medial region of a horizontal waler arrangement and serving to force the same hard against the outer side edges of a pair of adjacent panels of a conventional or standard prefabricated-type concrete wall form;

FIG. 2 is a fragmentary perspective view of tie rod which constitutes an element of the improved waler clamp and tie rod assembly;

FIG. 3 is a fragmentary perspective view of the structure of FIG. 1 but viewed from a different angle; and

FIG. 4 is an enlarged fragmentary vertical sectional view taken substantially along the vertical plane indicated by the line 4—4 of FIG. 1 and in the direction indicated by the arrows.

Referring now to the drawings in detail and in particular to FIG. 1, a fragmentary portion of a prefabricated concrete wall form of conventional type or construction is illustrated therein and designated in its entirety by the reference numeral **10**. Such concrete wall form is made up of a front side **12** and a rear side **14**. The two sides are spaced apart and are adapted, as well understood in the art, to have wet concrete poured therebetween for wall-forming purposes. Each side consists of a group or series of rectangular panels **16** in edge-to-edge relationship. The panels **16** of the two form sides or series are maintained in spaced parallel relationship by means of conventional combined tie rod and spreader devices one of which is shown at **18**. The individual panels **16** are of the prefabricated type that is known as "Steel-Ply" panel. Such a panel is manufactured and sold by Symons Mfg. Company of Des Plaines, Illinois and consists of a rectangular plywood facing **20** having a marginal rectangular reinforcing frame of steel or other suitable metal applied to the outer face thereof. The reinforcing frame of each panel **16** includes vertical marginal members **22** and horizontal marginal members **23**. At appropriate levels, each frame is provided with suitable horizontal crossbars **24** which are of angle shape design and have the ends thereof connected to the opposed vertical marginal frame members **22**.

Specifically, each vertical marginal frame member **22** is in the form of a structural steel bar which is generally of shallow U-shape cross section and comprises spaced marginal outwardly extending parallel ribs **26** and **28** and a connecting base or web portion **30**. On each web portion is a shallow inwardly and longitudinally extending rib **32** and this defines a groove or recess **33**. The purpose of the recesses **33** is to receive the vertical edge regions of the plywood panel facings **20**. The ends of the horizontal crossbars **23** are welded to the inner faces of the web portions **30** of the vertical marginal frame members **22**. At vertically spaced regions along the vertical marginal members **22** of the reinforcing frames, the ribs

26 and **28** are provided with notches **34** to accommodate the slotted ends of the combined tie rod and spreader devices **18**, while the web portions **30** of the vertical marginal frame members **22** are formed with rectangular slots or openings **36** which are in horizontal register with the notches **34** and are adapted to receive therethrough the bolts of conventional connecting bolt and wedge assemblies **38** by means of which adjacent panels are clamped together, all in a manner that will be made clear presently. The horizontal marginal frame members **23** are similar in design and construction to the vertical marginal frame members **22**.

Each combined tie rod and spreader device **18** is of conventional design and may be of the type that is shown and described in aforementioned United States Patent No. 2,948,045. Briefly, each device **18** is in the form of a length of flat sheet metal stock of rectangular cross section and of a longitudinal extent somewhat greater than the over-all width of the form **10**. Slots **44** are provided in the end portions of the devices for register with the openings **36** in the web portions **30** of the vertical marginal frame members **22** when the form **10** is assembled. The openings **36** and the slots **44** are adapted to receive the bolts of the bolt and wedge assemblies **38** when the devices **18** are in position within the notches **34**. At regions which are spaced inwardly from the ends of the devices **18** and which, when the devices are in actual use, are disposed within the confines of the poured concrete, the devices are relieved by the provision of pairs of notches **46**, thus weakening the devices at these regions. The medial sections of the devices **18** between the pairs of notches **46** are adapted to remain embedded in the hardened concrete, while the end portions or regions of the devices may be broken off by working the same back and forth, or by twisting the same to fracture the devices at the notched regions, as is well known in the art.

The arrangement of parts thus far described is purely conventional and no claim is made herein to any novelty therein, the novelty of the present invention residing rather in the construction of the hereinafter described waler clamping means including a special form of tie rod. Such waler clamping means will now be described in detail.

Referring now to FIGS. 1, 3 and 4, a waler **50** extends horizontally across the outer side surfaces of the panels of the front side **12** of the form **10** and its purpose is to maintain longitudinal alignment of said panels throughout the full length of the concrete wall form. The waler **50** is sufficiently long as to span several panels and, in accordance with conventional practice, the waler includes upper and lower wales **52** and **54** of the wooden 2" x 4" variety. Such wales alternate lengthwise and are slightly offset vertically so that their end portions overlap at vertical joints between adjacent panels.

The waler clamping means of the present invention is for the purpose of clamping the wales **52** and **54** hard against the vertical marginal members of the frames of the panels **16** of the front side **12** of the form **10** and comprises a three-piece assembly including a specially constructed tie rod **56** (see FIG. 2), a one-piece clamping bracket **58**, and a wedge **60**.

The tie rod **56** is similar to the conventional combined tie rod and spreader device **18**, but is modified for proper cooperation with the bracket **58** and the wedge **60**. The length of the tie rod **56** is greater than the length of said device **18** in order to accommodate the added width of the waler **50**. Whereas the device **18** is flat throughout its entire length, the front end portion of the tie rod **56** is twisted sharply as at **62** to provide a short laterally turned end portion **64** which lies in a plane extending at an angle of 90° to the general plane of the main body portion of said tie rod **56**. Slots **66** and notches **68** corresponding in design, position and function to the slots **44** and notches **46** in the combined tie rod and spreader device **18** are

provided in the main body portion of the tie rod **56**. The rear end region of the tie rod **56**, that is, the end portion that is remote from the laterally turned end portion **64** remains unmodified and is designed for cooperation with the bolt of one of the bolt and wedge assemblies **38** in such manner that said rear end region of the tie rod is anchored to two adjacent panels **16** of the rear side **14** of the frame **10**. The laterally turned front end portion **64** of the tie rod **56** is formed with a longitudinally extending slot **70** and this is designed for cooperation with the wedge **60** in a manner that will be described presently.

The bracket **58** of the three-part waler clamping means is generally of Z-shape in vertical cross section and includes a medial rectangular plate portion **72** which is adapted to extend vertically and bridge the two wales **52** and **54** of the waler **50** and bear against the outside vertical surfaces thereof, as best seen in FIGS. 1 and 4. In addition to the plate portion **50**, the bracket **58** comprises a laterally extending in-turned lower flange **74** and a laterally extending out-turned upper guide flange **76**. These two flanges are formed integrally with the lower and upper end parts of the plate portion **72** respectively. The laterally in-turned upper flange **74** underlies and supports the lower wale **54**. The vertical extent of the plate portion **72** of the bracket **58** is greater than the vertical dimension of the composite waler **50** so that the upper out-turned guide flange **76** is disposed at an elevation somewhat above the level of the upper wale **52**. The guide flange **76** is formed with a slot **78** for slidable reception therethrough of the wedge **60**. The slot **78** extends in such direction that it is in parallel relation with the slot **70**.

When the tie rod **56** is in its proper position in the concrete wall form **10**, the front end portion thereof projects outwardly beyond the panels **16** of the front side **12** of the form **10** with the twisted portion **62** and the laterally turned end portion **64** passing between the two wales **52** and **54** as shown in FIG. 4. The central part of the plate portion **72** of the bracket **58** of the waler clamping means is formed with a relatively large circular opening **80** through which the laterally turned front end portion **64** of the tie rod **56** projects loosely. When so projected through the opening **80**, the longitudinally extending slot **70** in said end portion is in vertical register with and underlies the slot **78** in the laterally extending out-turned guide flange **76**. The wedge **60** may then be driven downwardly through both slots in order to draw the plate portion **72** of the bracket **58** hard against the wales **52** and **54** and, in turn, clamp the latter against the vertical marginal members **22** of the reinforcing frames of the panels **16** of the front side **12** of the concrete wall form **10**.

The lower region of the wedge **60** is provided with a small laterally extending protuberance **82** which may be formed either by laterally deforming the metal of the wedge or by application of a spot of weld metal to the wedge. In either case, the protuberance **82** presents a laterally extending element which prevents removal of the wedge from the slot **78** in the laterally extending out-turned guide flange **76** of the bracket **58**. By such an arrangement, the danger of losing or misplacing the wedge **60** is avoided.

It is to be noted that in assembling the waler clamp and tie rod assembly of the present invention, the various parts may initially be loosely assembled in the approximate positions which they will assume when finally assembled, the tie rod **56** being confined within the registering slots **34** and the projecting end thereof serving to retain the bracket **58** and the wedge **60** loosely thereon. It will be understood that attachment of the rear end of the tie rod **56** to two adjacent panels **16** of the rear side **14** of the form **10** will first be made by use of one of the bolt and wedge assemblies **38**, after which a second bolt and wedge assembly will be employed to fasten the front end of the tie rod **56** to two adjacent panels **16** of the front side **12** of the form. The lower wale **54** may be caused to rest directly upon the in-turned flange **74** of the bracket **58**, while the upper wale **52** may be caused to rest on the projecting front end region of the tie rod **56** after the tie rod has been fastened to the rear and front sides of the form **10**. Thereafter, the wedge **60** may be driven downwardly to effect the desired clamping action on the waler **50** in the manner previously described.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. For example, if desired, both end regions of the tie rod **56** may be twisted or turned laterally for use with two of the composite bracket and wedge assemblies **58**, **60** when it is desired that walers shall be applied to both sides of the concrete wall form. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a concrete wall form, in combination, front and rear opposed upstanding spaced apart sides, each side being comprised of a series of individual panels disposed in edge-to-edge relationship, each panel including a rectangular plywood panel facing and a rectangular marginal reinforcing frame including vertical steel side members and horizontal steel end members, each panel having one of its vertical side members abutting a vertical side member of an adjacent panel, there being a hole in each of the abutting side members at substantially the same height in the wall form whereby the holes are in registry, a pair of vertically spaced horizontally disposed wales positioned against the outer side of the front side of the form, and a waler clamp and tie rod assembly for maintaining the form sides spaced and for clamping the wales hard against said front side, said assembly comprising an elongated horizontally extending tie rod formed from flat ribbon-like metal stock and extending transversely through the form, the rod being twisted medially of its ends to provide a rear section the plane of which extends vertically and a front section the plane of which extends horizontally, the front and rear ends of said rear section each being provided with a slot therein, said ends projecting between abutting side members, clamping devices projecting through the registering holes and the slots in the front and rear ends of the rear section of the tie rod and serving to clamp the abutting side members together, the medial region of the rear section of the tie rod spanning the distance between the two form sides, said front section of the tie rod projecting horizontally between the wales and having its extreme forward region overhanging the outer surfaces of the wales, there being a slot in the overhanging extreme forward region of said front section, a vertically disposed wedge projecting through the last mentioned slot and serving effectively to apply tension to the tie rod and thus force the wales hard against said front form side, and a flat metal plate interposed between the wedge and wales for transmitting the force of the wedge to said wales, the upper edge of said plate being formed with an out-turned flange having a slot therein overlying and in vertical register with the slot in the overhanging region of the tie rod, said wedge projecting through both of said slots.

2. In a concrete wall form, in combination, front and rear opposed upstanding spaced apart sides, each side being comprised of a series of individual panels disposed in edge-to-edge relationship, a pair of vertically spaced horizontally disposed wales positioned against the outer side of the front side of the form, and a waler clamp and tie rod assembly for maintaining the form sides spaced and for clamping the wales hard against said front side, said assembly comprising an elongated horizontally extending tie rod formed from flat ribbon-like metal stock and extending transversely through the form and between

adjacent pairs of panels, the rod being twisted medially of its ends to provide a rear section the plane of which extends vertically and a front section the plane of which extends horizontally, the rear end of said rear section being secured to the rear form side and the front end region of said rear section projecting horizontally between the wales and having its extreme forward region overhanging the outer surfaces of the wales, the twisted portion of the tie rod being disposed between said wales, there being an elongated axially extending slot in the overhanging extreme forward region of said front section, a vertically disposed downwardly tapered wedge projecting downwardly through said slot with its narrow lower end disposed below the slot, and a clamping bracket having a flat plate portion interposed between the wedge and wales, there being a hole in said plate portion through which the front section of the tie rod projects, the upper edge of said plate portion of the clamping bracket being turned laterally outwardly and providing a guide flange for the wedge, there being a slot in said guide flange in vertical register with the slot in the overhanging region of said front section and through which the upper large end of the wedge normally projects, the lower edge of said plate portion of the clamping bracket being turned laterally inwardly and establishing a ledge upon which the lower wale rests and is supported.

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