

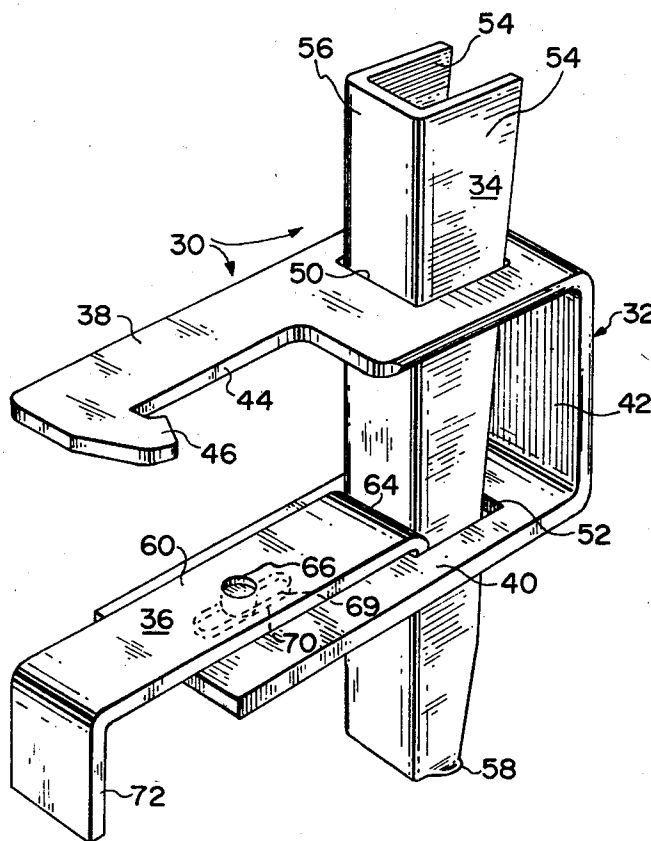
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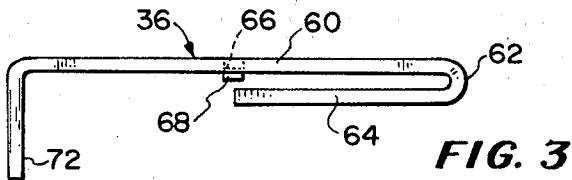
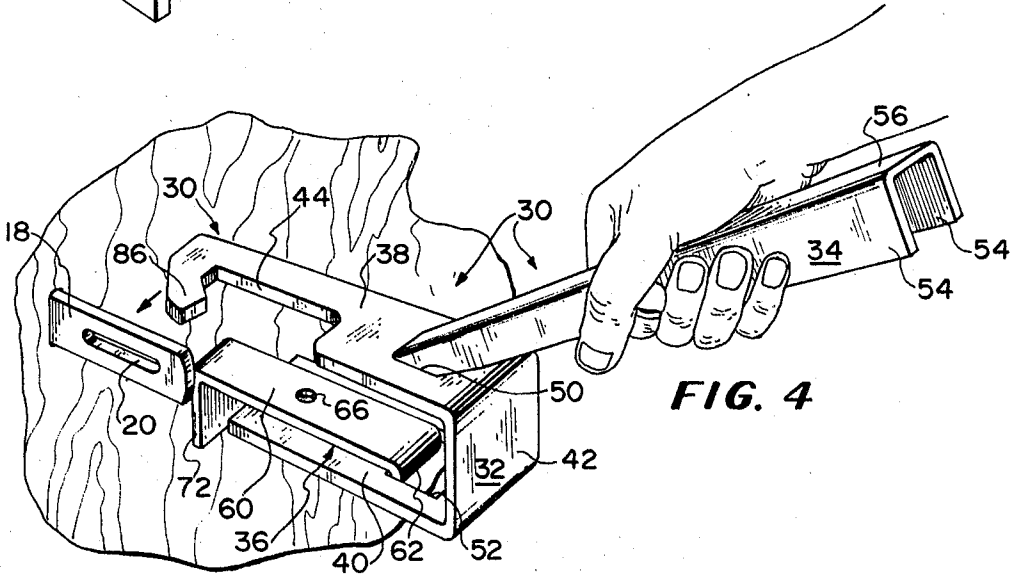
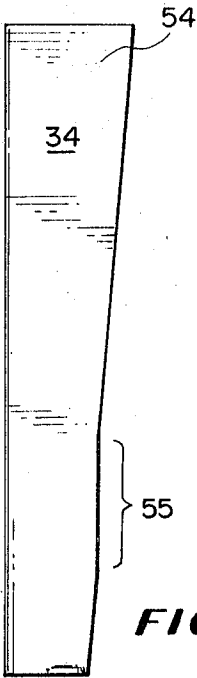
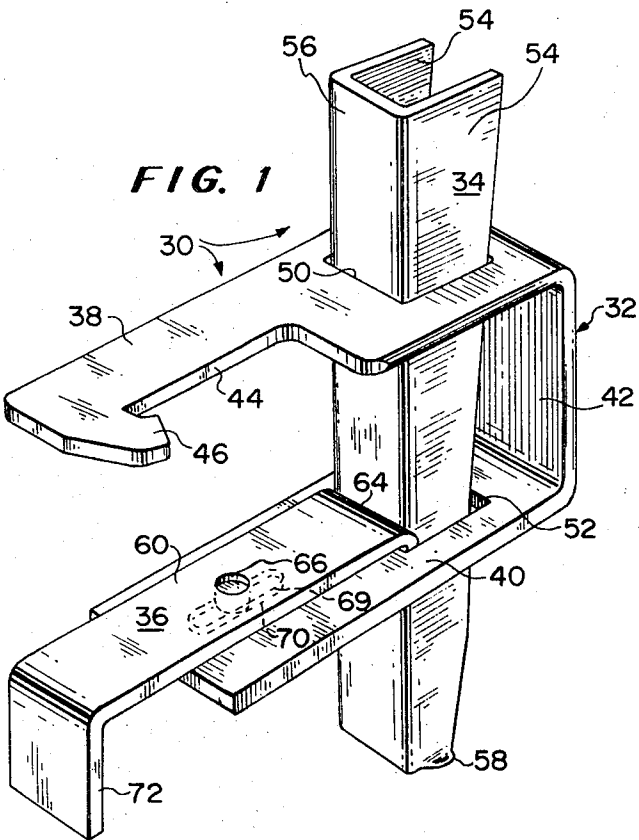
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[54] **SELF-CONTAINED WALER CLAMP ASSEMBLY
FOR CONCRETE WALL FORM**
11 Claims, 16 Drawing Figs.

[52] U.S. Cl. 249/219,
25/131T
[51] Int. Cl. E04g 17/00
[50] Field of Search 249/219,
219 (N), 216, 215, 213; 25/131 (T), (CM), (CP),
(CW)

ABSTRACT: An inseparable waler clamp assembly for convenient manual application to the protruding end of a tie rod for securely clamping either a single or a dual waler hard against the outer side of a series of upstanding and edge-to-edge wall form panels. In one form of the waler clamp assembly, the design thereof is such that it will accommodate attachment to a flat tie rod.





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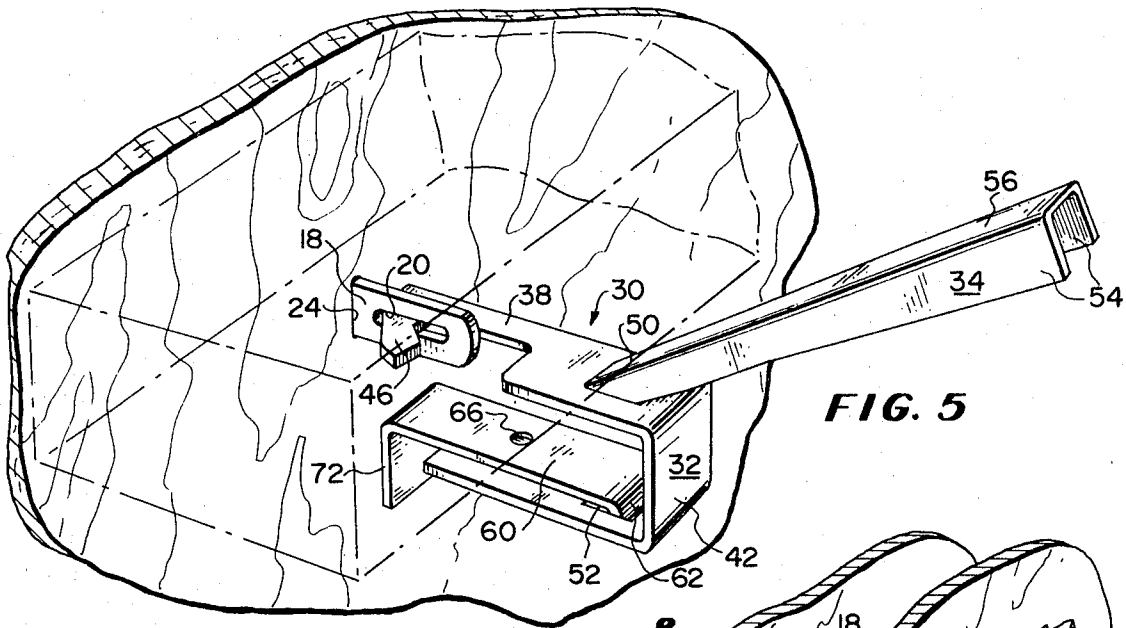


FIG. 5

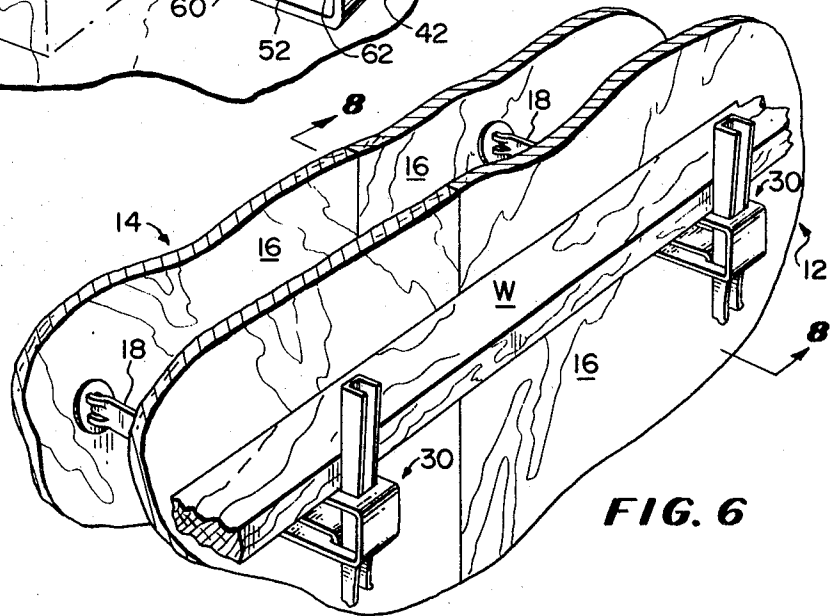


FIG. 6

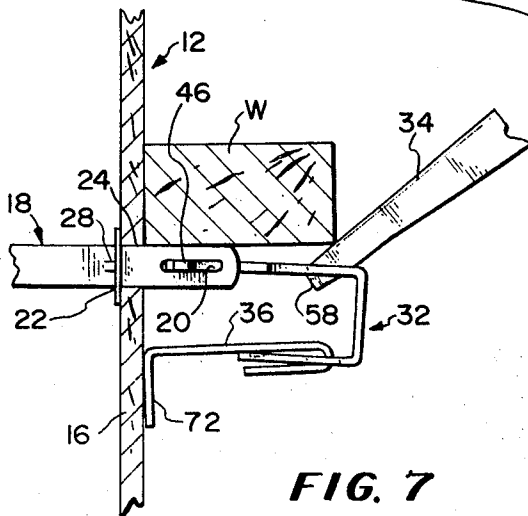


FIG. 7

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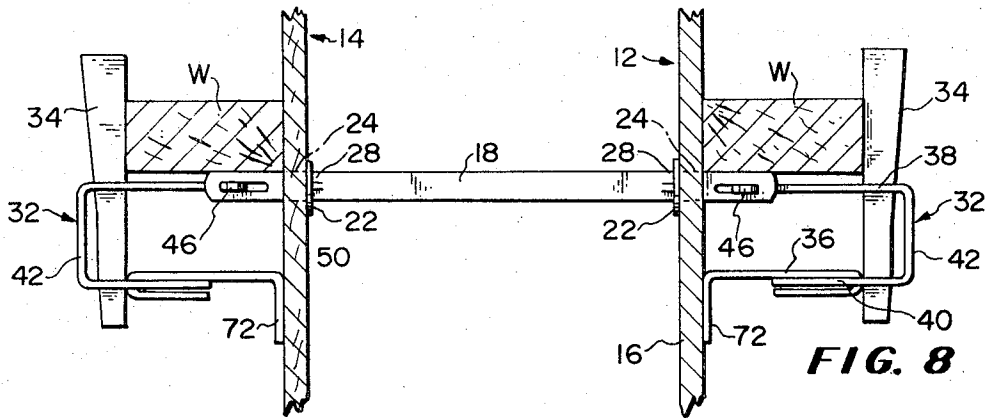


FIG. 8

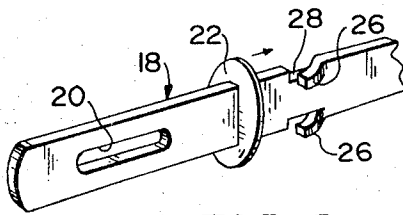


FIG. 9

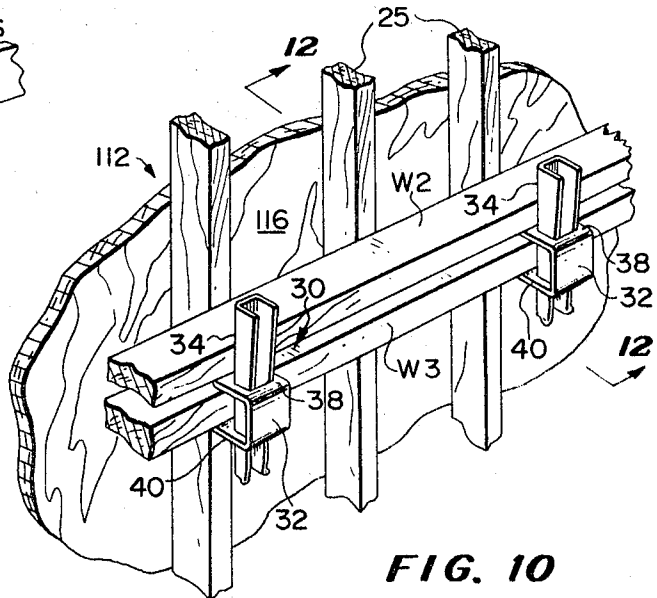


FIG. 10

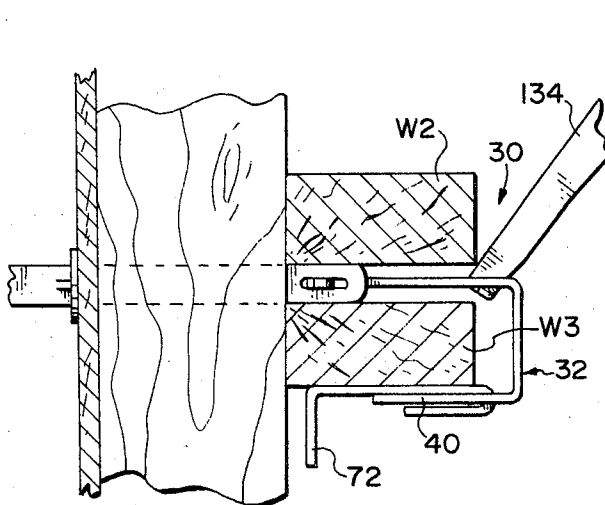


FIG. 11

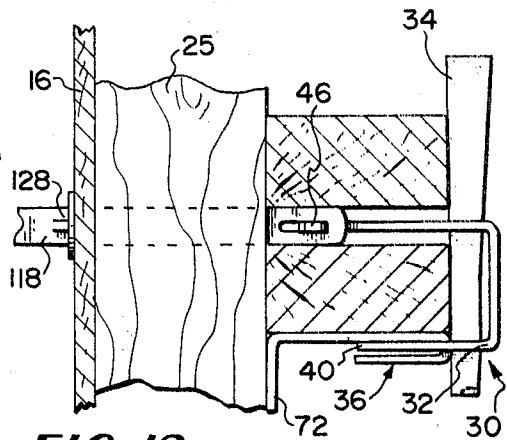


FIG. 12

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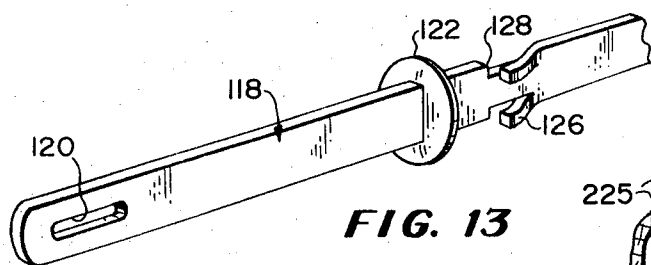


FIG. 13

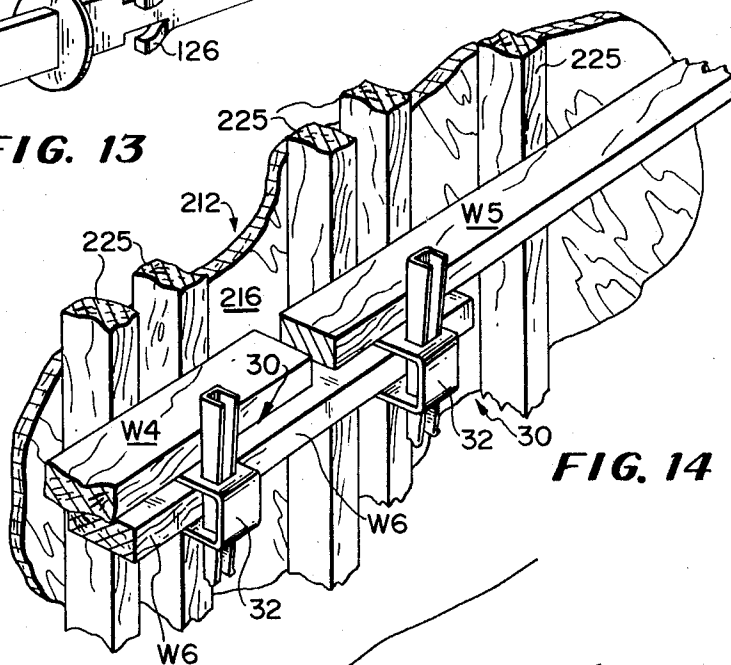


FIG. 14

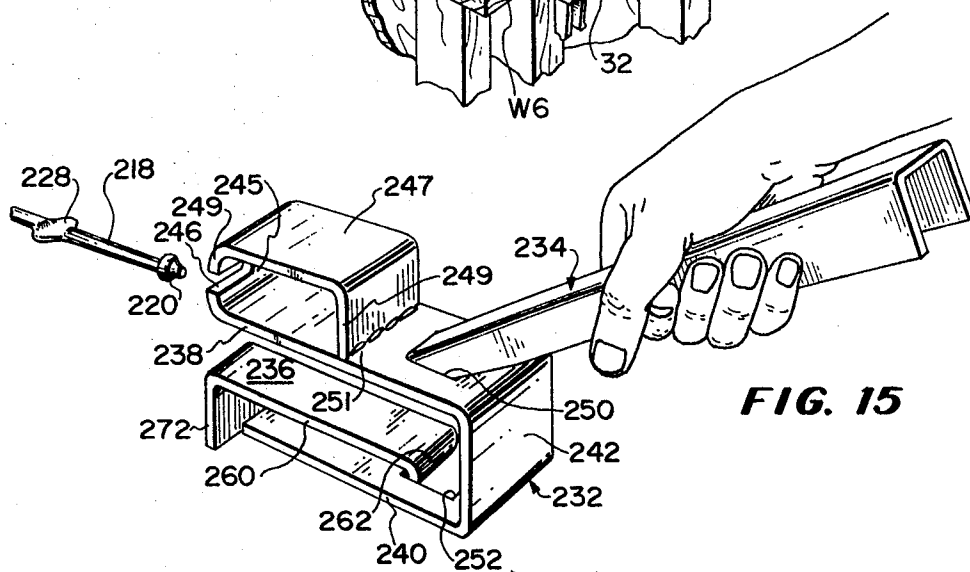


FIG. 15

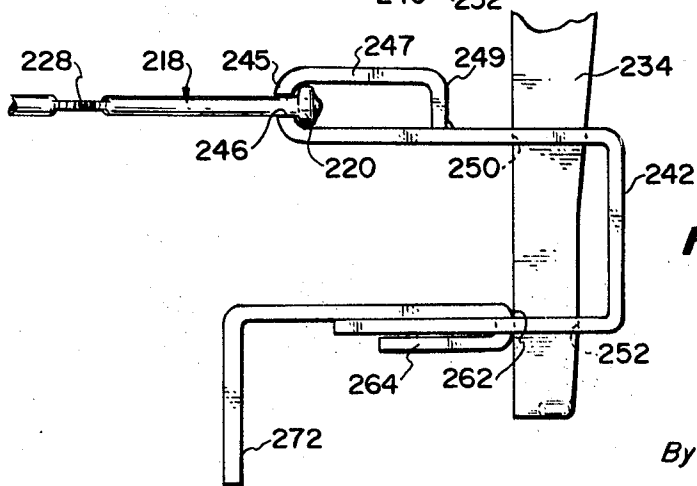


FIG. 16

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SELF-CONTAINED WALER CLAMP ASSEMBLY FOR CONCRETE WALL FORM

The present invention relates generally to a concrete wall form of the type wherein the opposed and spaced-apart front and rear sides of the form are each constructed of a series of rectangular plywood panels in upstanding and edge-to-edge relationship and are adapted to have wet concrete poured into the space between them, the two form sides being connected together by horizontally and transversely extending combined tie rod and spreader devices so that they are properly held in place and prevented from outward bulging or displacement under the pressure of the wet poured concrete. The invention is particularly concerned with a novel waler-clamping bracket assembly which may conveniently, and with very little manipulation, be applied to the protruding end of a tie rod on one side of the form and hooked in position thereon and against the adjacent plywood panel so that, in combination with similarly positioned identical clamping bracket assemblies at other spaced regions along the one side of the concrete wall form, it serves loosely to receive a single or a dual waler thereon, after which, by a single impact blow, the assembly may be tightened against the waler so that it will draw the same hard against the adjacent plywood panel.

While there are currently in use a substantially large number of different waler-clamping assemblies or devices which effectively perform the function for which they are intended, varying degrees of skill are required for their manipulation in their operative positions. Invariably, such assemblies or devices involve the use of both hands, and in some instances, they can best be applied by the joint efforts of two workmen, one to manipulate the clamping devices and the other to guide the walers into position. The present invention obviates these difficulties by providing a relatively simple three-piece waler-clamping bracket assembly which, after assembly at the factory, remains as an inseparable self-contained unit. In the field, a workman equipped with a number of these self-contained waler-clamping bracket assemblies may walk along the concrete wall form so that, in passing and with the use of only one hand, he may easily and rapidly hook the bracket assemblies in position on the adjacent protruding ends of the tie rods which project from the adjacent side of the form. Thereafter, the initially positioned bracket assemblies assume positions or postures where they may loosely receive thereon a horizontal board-type single or dual waler, after which the workman may make a second pass along the adjacent side of the concrete wall form in order successively tighten the clamping assemblies against the waler and draw the latter hard against the form. If a dual waler consisting of upper and lower waler boards is to be installed upon the concrete wall form, the initial application of the bracket assemblies to the adjacent protruding tie rod ends remains the same but a slight variance in installing the two sets of waler boards on the brackets is resorted to, all in a manner that will be described in detail presently.

Ease of application into operative condition constitutes one of the principal features of the present invention and, by reasons of it, a completely novel method of waler application to a form is made possible, the method being applicable with but slight modification to various types of waler constructions such, for example, as single board walers placed in end-to-end relationship, dual board walers consisting of two tiers with the boards of each tier similarly placed in end-to-end relationship, or staggered board walers where the waler boards have overlapping ends.

The provision of a waler-clamping bracket assembly which is simple in its construction any may, therefore, be manufactured at a low cost; one of which is rugged and durable and, therefore, will withstand rough usage; one which is repeatedly useable in successive concrete wall form installations; one which is fashioned entirely of sheet metal stampings thereby further contributing to low cost; 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.

The invention consists in the several novel features which are hereinafter described and are more particularly described and are more particularly defined by the claims at the conclusion hereof.

In the accompanying four sheets of drawings forming a part of this specification, two illustrative embodiments of the invention are shown.

In these drawings:

FIG. 1 is a perspective view of the improved waler-clamping bracket assembly of the present invention, the assembly being designed for use in connection with a flat tie rod;

FIG. 2 is a side elevational view of the wedge which is employed in connection with the invention and forms a component or part of the improved waler-clamping bracket assembly;

FIG. 3 is a side elevational view of one of the component parts of the bracket assembly, showing the same in a detached condition;

FIGS. 4 and 5 are perspective views, schematic in their representation, illustrating the manner in which the bracket assembly may be manually applied to the protruding end of a flat tie rod;

FIG. 6 is a fragmentary perspective view of a limited portion of a concrete wall form, showing a pair of the improved waler bracket assemblies operatively applied thereto and serving to support a single waler board;

FIG. 7 is a fragmentary vertical transverse sectional view of the structure of FIG. 6 and showing the bracket assembly prior to tightening thereof;

FIG. 8 is a vertical transverse sectional view taken on line 8-8 of FIG. 6 and showing the improved waler-clamping bracket assemblies in waler-supporting relationship and after final tightening thereof against the waler;

FIG. 9 is a perspective view of one end of a tie rod which is useable in connection with the improved waler bracket assembly in connection with the single waler board installation of FIG. 6;

FIG. 10 is a fragmentary perspective view similar to FIG. 6 but illustrating the manner in which the waler-clamping bracket assembly of the present invention serves to support a so-called dual waler;

FIG. 11 is a vertical transverse section view of the structure of FIG. 10, showing the bracket assembly prior to tightening thereof;

FIG. 12 is a section taken on line 12-12 of FIG. 10 and showing the waler-clamping bracket assembly in waler-supporting relationship and after final tightening of the assembly against the dual waler;

FIG. 13 is a fragmentary perspective view similar to FIG. 9 but showing the protruding end of a tie rod which is useable in connection with the dual waler installation of FIG. 10;

FIG. 14 is a fragmentary perspective view similar to FIGS. 6 and 10 but illustrating the manner in which the waler-clamping bracket assembly is used for supporting a so-called staggered board waler;

FIG. 15 is a perspective view similar to FIG. 5 but illustrating a slightly modified form of the invention wherein the waler-clamping bracket assembly is designed for use in connection with a tie rod or tie wire of the type which is commonly referred to as a button head tie; and

FIG. 16 is a side elevational view of the waler-clamping bracket assembly of FIG. 15.

Referring now to the drawings in detail and in particular to FIGS. 6 and 7, a fragmentary portion or an erected concrete wall form of conventional or standard construction is illustrated therein. The concrete wall form is made up of an upstanding front side 12 and an upstanding rear side 14, the two sides being spaced apart and adapted to have wet concrete poured therebetween, as is well understood in the art, for wall-forming purposes. Each form side consists of a rectilinear se-

ries of rectangular plywood panels 16 which are disposed in side-by-side or edge-to-edge relationship. The panels of the two sides are maintained in spaced parallel relationship by means of a horizontal series of spaced-apart conventional tie rods 18 which preferably, but not necessarily, are formed of flat tie rod stock and have longitudinal slots 20 formed in the end regions thereof. The slots 20 are adapted for cooperation with the waler-clamping bracket assemblies of the present invention in a manner that will become clear when the nature of the assemblies has been fully set forth hereafter. Spacer washers 22 are slidably disposed on the end portions of the tie rods so that when such end portions of the tie rods are projected through the usual apertures or slots 24 in the plywood panels 16 during erection of the concrete wall form, these washers will bear at their outer sides against the inner surfaces of the panels and at their inner sides against respective pairs of offset tongues 26 for wall form spreading purposes. The offsetting of the tongues 26 of the tie rods 18 establishes breakbacks 28 which remain embedded in the hardened concrete so that the protruding end portions of the tie rods may be broken off by working the same back and forth or by twisting the same to fracture the tie rods at the regions of the breakbacks 28 in a manner well known in the art. No claim is made herein to any particular novelty in the tie rods 18 except insofar as they cooperate with the waler-clamping bracket assemblies of the present invention. Other forms of tie rods including wire or rod-type tie rods having looped ends and other forms of breakbacks are available for use in connection with the present invention.

Referring now to FIGS. 1 to 3, inclusive, wherein the present waler-clamping bracket assembly is disclosed in detail, the bracket assembly is in the form of a three-part unit which is designated in its entirety by the reference numeral 30. This clamping bracket assembly is comprised of a supporting bracket 32, a wedge 34 and a sliding thrust member of plate 36. The bracket 32 of the three-part assembly 30 is generally of C-shaped configuration and includes an upper leg 38, a lower leg 40 and an intermediate flat web or bight portion 42. One side margin of the outer region of the upper leg 38 of the bracket 32 is formed with a laterally facing relief area 44 which establishes a reentrant hook 46 at the outer extremity of said upper leg 38. The upper leg 38 of the bracket 32 is formed or provided with a relatively large rectangular opening 50 near the base or inner end region thereof and the lower leg 40 is provided with a similar but slightly larger rectangular opening 52. The two openings 50 and 52 are in vertical alignment and are designed for reception therethrough of the wedge 34 as illustrated in the drawings.

The wedge 34 is formed of stamped plate metal and is U-shaped in transverse cross section, it being provided with flat sides 54 and a connecting flat base 56. As clearly shown in FIG. 1, the wedge is of tapered channel shape design and has its large end disposed upwardly. The width of the opening 52 is slightly greater than the width of the opening 50 and the length of the opening 52 is greater than the length of the opening 50 by an extent substantially equal to the thickness of the metal of the thrust plate 36 so as to compensate for a portion of this plate which projects through the opening 52 in a manner and for a purpose that will be subsequently set forth. The lower outer corner regions of the two sides 54 of the wedge 34 are formed with small coined ears 58 which may pass freely through the opening 52 in the lower leg 40 of the bracket but which are unable to pass through the opening 50 in the upper bracket leg 38. The overall transverse dimensions of the wedge 34 in the upper regions thereof are greater than the corresponding dimensions of the upper opening 50 so that the wedge is unable to pass downwardly completely through the opening 50. By the same token, the small coined ears 58 prevent the wedge from passing upwardly completely through the opening 50, and thus, the wedge is effectively captured by the supporting bracket 32 and, hence, cannot become disassociated from it. However, the coined ears 58 are so designed and positioned on the wedge 34 that when the wedge is pulled

upwardly to the fullest extent of which it is capable of moving, it may be caused to rest in the inclined position in which it is shown in FIGS. 4 and 5, the wedge thus serving as a lifter or manipulator, much in the manner in which a circular iron stove lid is supported from its lifting handle. As best illustrated in FIG. 2, the rear inclined edges of the two sides 54 of the wedge 34 are formed with vertical or noninclined sections which are designated by the bracket 55 in this figure. These noninclined sections of the edges, in effect, render the wedge uniform in thickness in a fore-and-aft direction and serve a function that will be set forth subsequently.

The thrust plate 36 is in the form of a length of flat plate metal stock and embodies a horizontal thrust leg 60 the rear end of which is formed with a reverse or C-shaped bend 62 which provides or forms a reentrant section 64.

The reverse bend 62 passes through the opening 52 in the lower leg 40 of the bracket 32 and as a result the horizontal thrust leg 60 of the thrust plate 36 rests upon said lower leg 40 while the reentrant section 64 underlies this leg in close proximity thereto. The medial region of the thrust leg 60 is provided with a downwardly punched circular depression 66 which forces the metal of the leg downwardly to provide a depending protuberance 68. This protuberance projects into an elongated longitudinally extending slot 70 (see FIG. 1) which is formed in the medial region of the lower leg 40 of the supporting bracket 32, thus providing an interlock which limits the extent of fore-and-aft sliding movement of which the thrust plate is capable, the interlock and reverse bend 62 also serving to maintain approximate alignment of the thrust leg 60 and the underlying reentrant section 64. The forward end region of the thrust member 36 is formed with a downturned bearing flange 72 which is adapted to bear against the outer side of the adjacent wall form panel 16 when the waler-clamping bracket assembly is installed thereon.

The above described waler-clamping bracket assembly 20 is capable of use in a wide variety of concrete wall form installations having upstanding panels, several such installations being illustrated in the drawings. In FIGS. 5 to 8, inclusive, the waler-clamping bracket assembly is shown as being operatively applied to a single waler board W for the purpose of maintaining the latter in a horizontal position with one edge thereof bearing directly against the outer sides or faces of the adjacent plywood panels 16, it being understood, of course, that plural waler-clamping bracket assemblies will cooperate with one another for waler-supporting and clamping purposes, two of the assemblies appearing in FIG. 6. It will also be understood that cooperating pairs of waler-supporting and clamping assemblies will be employed on opposite sides of the wall form for common attachment to the slotted ends of respective tie rods 18.

The nature of the final application of each waler-clamping bracket assembly 30 in the wall form may best be appreciated by an understanding of the manner in which such application is made. It will be understood that prior to application of the bracket assemblies 30 to the concrete wall form, the two sides 12 and 14 will be erected in their proper spaced relationship and the various tie rods 18 will be projected through the slots 24 in the plywood panels 16 so that their end regions will project outwardly beyond the form sides to expose the slots 20 in the tie rods 18 for cooperation with the respective waler-clamping bracket assemblies 30. Considering now the application of only one of the bracket assemblies to one end of a tie rod 18, the operator will raise the wedge 34 from the position in which it is shown in FIG. 1 until the two small coined ears 58 engage the portions of the upper leg 38 that define the sides of the rectangular opening 50, after which he will incline the wedge until it assumes the position shown in FIG. 4, so that by supporting the wedge with one hand, the supporting bracket 32 may be guided in a horizontal plane to position the hook 46 so that it registers with the slot 20 in the tie rod 18. Thereafter, by moving the assembly to the left as viewed in FIG. 4, the hook will enter the slot 20 and, at that time, the operator may release his grip on the wedge, thus leaving the entire assembly

in the position in which it is illustrated in FIG. 5. At this time, the weight of the waler-clamping bracket assembly 30 will cause the hook 46 to engage the outer end of the slot 20 in the tie rod 18 while the downturned bearing flange 72 will bear or abut against the outer face of the adjacent plywood panel 16 and force the slidable thrust member 60 rearwards with respect to the supporting bracket 32 until the depending protuberance 68 engages the rear end of the slot 70 in the lower leg 40 of the supporting bracket as shown in FIG. 8. The outer end of the slot 20 will thus constitute, in effect, an inwardly facing reaction shoulder which assimilates the outward thrust that is exerted by the hook 46 when the bracket assembly 30 is thus "hung," so to speak, from the outer end of the tie rod 18. The operator will then proceed along the form and make similar application of other waler-clamping bracket assemblies to other protruding end portions of the various tie rods 18 at remote locations in the same horizontal plane. After all of the waler-clamping bracket assemblies 30 along the front side 12 of the concrete wall form have thus been installed on their respective tie rods, the single waler board W will be caused to rest upon the upper edges of the protruding portions of the tie rods as shown in FIG. 8, and as shown in dotted lines in FIG. 5.

As soon as the waler board W is in place, the operator will push forwards the upper end of the inclined wedge 34 of each waler-clamping bracket assembly 30, i.e., toward the wall form, and at the same time force it downwardly so that the extreme lower end of the wedge will move behind the reverse bend 62 of the thrust plate 36 and force the latter bodily forwardly as the lower end of the wedge enters the rectangular opening 52. Thereafter, the operator with the blow of an impact tool such as a hammer will drive the wedge to its home position wherein it is shown in FIG. 7. In such position of the wedge, the thrust plate 36 remains under compression with the downturned bearing flange 72 bearing against the outer face of the adjacent plywood panel 16 and with the tie rod 18 under tension, it being assumed, of course, that the opposing waler-clamping bracket assembly on the opposite side of the concrete wall form has been previously and similarly applied. The waler board W itself will be securely clamped between the upper portion of the wedge 34 and the outer face or side of the adjacent panel 16.

Removal of the waler-clamping bracket assembly is effected by a reversal of the procedure outlined above, the wedge being initially loosened by an upward blow of the impact tool.

From the above description, it will be apparent that the present waler-clamping bracket assembly facilitates large scale multiple application of a waler installation on a concrete wall form, the operator being able to traverse the length of the form in one direction in order initially to apply the bracket assemblies to the protruding ends of the tie rods 18 and then to traverse the length of the form in the opposite direction with his impact tool to drive all of the wedges successively to their home positions.

In FIGS. 10, 11, 12 and 14, the present waler-clamping bracket assembly is shown as being installed in a concrete wall form installation which employs a dual waler in the form of an upper waler board W2 and a lower waler board W3. Again, as was the case in connection with the previously described installation of FIGS. 5 to 8, inclusive, the nature of the installation can best be ascertained by a description of the installation procedure which is involved. The wall form assembly remains substantially the same as that previously described with the exception that vertical studs which are designated by the reference numeral 25 are positioned against the outer faces of the plywood panels 116 of the front side 112 of the concrete wall form and the two waler boards W2 and W3 are positioned against these studs in bridging relationship. Because of the greater distance which the waler-clamping bracket assemblies must be spaced from the outer surfaces of the panels 116 due to the width of the studs 25, the end portions of the tie rods 118 which extend beyond the breakbacks 128 are longer than are the corresponding end portions of the tie rods 18. Other-

wise, the tie rods 118 remain substantially the same as the tie rods 18, and in order to avoid needless repetition of description, similar reference numerals but of a higher order are applied to the corresponding parts as between the disclosures of FIGS. 10 to 13, inclusive, and FIGS. 6 to 9, inclusive. The depending downturned bearing flanges 72 on the waler-clamping brackets are adapted to bear against the outer sides of the strongbacks 25 instead of directly against the outer faces of the plywood panels and, therefore, due to the greater lengths of the tie rods 118, the slots 120 are disposed in proper positions so that the operator may effect the initial singlehanded manual hooking of the bracket assemblies that was described in connection with the disclosures of FIGS. 3 and 4. According to one method of installation, after the various bracket assemblies 30 have been thus hooked or applied to the projecting end regions of the tie rods 118 with the hooks 46 projecting through the slots 120 in the tie rods 118, and the wedges 34 have been moved to assume the positions illustrated in FIGS. 4, the lower waler boards W3 may be threaded through the supporting brackets 32 so that it rests upon the slidable thrust plates 36 and is thus supported indirectly from the lower legs 40 of the supporting brackets 32. The upper waler board W2 is then caused to rest upon the adjacent protruding portions of the tie rods 118 as previously described in connection with the application of the single waler board W. With both waler boards W2 and W3 thus in position and the parts of each bracket assembly assuming the positions in which they are shown in FIG. 11, the wedge 34 is then successively swung towards the concrete wall form and driven downwardly through the opening 52 in the lower leg 40 as heretofore described and the wedge is thus caused to bear inwardly against the outer sides of both waler boards as shown in FIGS. 10 and 11, thus forcing the waler boards W2 and W3 hard against the panel reinforcing studs 25.

An alternative and somewhat simpler method of installing a dual waler on the form side 112 may be carried out by first manually placing the lower boards W3 against the studs 25 with the left hand and then by utilizing the right hand slipping the bracket 32 of an assembly 30 over the board in straddling relationship near the middle of the board. Thereafter, the operator carries out the hooking operation by causing the hook 46 to enter the slot 120 in the adjacent protruding end of the tie rod 118. Upon manual release of the waler-clamping bracket assembly and the lower waler board W3, the board will be captured by the bracket assembly, and furthermore, it will be substantially balanced thereon by reason of its support on the thrust plate 36. The operator is then free to make similar loose application of the other waler clamping bracket assemblies to remote regions of the lower waler board W3 and to their respective tie rods 118. After all of the bracket assemblies have thus been loosely applied to the form side 112 and to the lower waler board W3, the upper waler board W2 will be placed in position on the bracket assemblies 30 in the manner previously described in connection with the placement of the single waler board W. When both waler boards W2 and W3 are in position as shown in FIG. 12, impact tightening of the wedges 34 may be resorted to so that both waler boards W2 and W3 will be forced hard against the various studs 25.

The wedge section 55 which is of uniform thickness in a fore-and-aft direction as previously described is provided for the purpose of preventing binding of the wedge against the lower waler board W3 in the event that manufacturing tolerances are exceeded so that such lower board is appreciably wider than its rated width. In the absence of the section 55, there would be a tendency for the wedge to bind against the board W3 at the expense of full pressure being applied to the upper waler board W2 by the upper region of the wedge 34. Conversely, in the event of an unduly wide upper waler board W2, binding of the wedge against such board would prevent adequate pressure from being applied to the rear end of the thrust plate 36 by the wedge when the latter is driven to its home position. The section 55 also facilitates

loosening of the wedge during dismantlement or release of the waler-clamping bracket assembly.

No illustration is made herein of the application of the present waler-clamping bracket assembly to a dual waler when the studs 25 are omitted and the upper and lower waler boards bear directly against the outer faces of the panels 16 of the concrete wall form. It is believed that the nature of such an application will be obvious since it is merely necessary to employ the shorter tie rods 18 instead of the longer tie rods 118. The absence of the strongbacks 25 will obviously bring the hooks 46 of the upper legs 51 of the supporting brackets 32 of the waler-clamping bracket assemblies closer to the wall form where these hook portions will register horizontally with the tie rod slots 20.

In FIG. 14 a further application of the present waler-clamping bracket assembly 30 is illustrated. Heretofore, where single waler boards have been employed in connection with a form side, it has been necessary to fit adjacent waler boards together so that they are disposed in contiguous or abutting end-to-end relationship. A conventional waler-clamping bracket of one sort or another is then applied to both boards so that it straddles the "seam" between adjacent abutting board ends. Both adjacent ends of the boards are thus securely clamped in position. Otherwise, one or both boards would present loose ends. According to the method of waler installation shown in FIG. 14, it is not necessary to cut or fit the waler boards together and fairly wide separation between the adjacent opposed waler board ends may be tolerated. This results in an appreciable saving of lumber and labor costs since random lengths of boards may be used as waler boards without necessitating cutting lumber on the job to predetermined lengths.

As shown in FIG. 14, utilizing similar reference numerals of a still higher order to designate the corresponding form parts as between the disclosures of FIGS. 10 and 14, where the opposing ends of the two upper waler boards W4 and W5 fail to meet, a short filler section in the form of a length of waler stock W6 is applied to the two illustrated waler-clamping bracket assemblies 30 in the manner described in connection with the lower waler board W3 of FIG. 10. The short waler board W6 underlies and bridges the split or separation between the opposed ends of the upper waler boards W4 and W5 and rigidifies the entire waler assembly against outward bulging in the vicinity of the separation. It is deemed unnecessary to describe the specific application of the waler-clamping bracket assemblies 30 to the waler boards W4, W5, and W6 since the placement of these assemblies with respect to the waler boards is precisely the same as the placement of one of the assemblies 30 on the upper and lower waler boards W2 and W3 of FIGS. 10, 11 and 12.

It is deemed pertinent at this point to state that in dismantling any of the installations previously described, as soon as an upward impact blow is imparted to the wedge 34 of any given assembly 30, the wedge will be loosened in the vertically aligned openings 50 and 52 and the forward pressure exerted by the wedge against the reentrant bend 62 in the thrust plate 36 will be relieved. The pressure of the thrust plate 36 against the adjacent panel 16 or the adjacent studs 25, as the case may be, will also be relieved so that the various tensional and compressional forces existing in the various parts of the waler-clamping bracket assembly 30 as a whole will be alleviated and the entire assembly will assume a loose condition where it may readily be lifted from the adjacent wall form side. In the absence of the thrust plate 36, the extreme compressional force which is inherent in the lower leg 40 of the supporting bracket 32 will cause binding of the assembly with consequent extreme difficulty in removing the same from the installation.

Whereas in FIGS. 1 through 14, the illustrated waler-clamping bracket assembly 30 is designed for use in connection with a flat tie rod 18, in FIGS. 15 and 16 of the drawings there is shown a slightly modified form of waler-clamping assembly 230 which is specifically designed for use in connection with a tie rod or tie wire 218 of the "button head" type. Due to the

similarity between the bracket assemblies 30 and 230, and in order to avoid needless repetition of description, similar reference numerals but of a higher order have been applied to the corresponding parts as between the disclosures of FIGS. 15 and 5.

As clearly shown in FIG. 15, the bight portion 242. The reentrant section 264, and the thrust plate 236 remain identical to the bight portion 42. The reentrant section 64, and the thrust plate 36 respectively of the assembly 30. Only the character of the upper leg 238 has been changed, this change being for the purpose of enabling the assembly 230 to accommodate attachment thereof to a conventional button head tie rod 218. This tie rod is formed of cylindrical rod stock and the breakbacks 228 are in the form of a small flattened areas or flats (see FIG. 16). The end extremities of the tie rod 218 are provided with buttonlike enlargements 220 and the upper leg 238 is designed for hooking engagement with the adjacent enlargement.

Accordingly, the hook 46 in the upper leg has been eliminated, and instead, this leg is made longer and is reversed upon itself to provide a reentrant bend 245, a reentrant section 247 and a downward flange 249, the latter being welded at 251 to the upper face of the leg 238. A horizontal slot 246 extends partially across the reentrant bend 245 and, in effect, establishes a hook portion which is capable of being hooked behind the adjacent buttonlike enlargement 220 of the tie rod 218.

The wedge 234 remains the same as the wedge 34 and is similarly provided with noninclined sections 255 corresponding to the noninclined sections 55 of the wedge 34.

The operation of the waler-clamping bracket assembly 230 is believed to be obvious without detailed description, suffice to say that manipulation of the assembly 230 is accomplished substantially in the same manner which is employed in connection with the waler-clamping assembly 30. In FIG. 15, the bracket assembly 230 is shown as being shaped or designed for immediate cooperation with the enlargement 220 on the adjacent end of a tie rod 218 so that upon movement of the assembly bodily to the left, the slot 246 or hook portion of the bracket 232 will straddle the tie rod 218 and encompass the adjacent enlargement 220 with the parts assuming the positions in which they are shown in FIG. 16. The wedge 234, the openings 250 and 252 and the thrust plate 236, being identical with the wedge 34, the openings 50 and 52, and the thrust member 60 respectively, are capable of identical manipulation from the time of initial grasping of the wedge 234 for lifting and guiding purposes until the hooked engagement with the tie rod 218 has been effected and the wedge 234 driven to its home position wherein the waler or walers, as the case may be, is or are clamped securely against the adjacent wall form side.

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. Neither is the invention to be limited to the several environments in which it is disclosed herein. For example, although the waler-clamping bracket 30 is shown and described in FIGS. 1 through 14 as being applied to a flat tie rod such as the rod 18, it is obvious that the hook 46 which is provided at the outer or forward end of the upper leg 38 of the bracket 32 is capable of being engaged with the looped end of a cylindrical tie rod or with the projecting end of any tie rod in a wall form installation which presents a slot, hole or other opening through which the hook 46 may be projected. Similarly, the waler-clamping bracket 230 which, for exemplary purposes, is shown in FIGS. 15 and 16 as being applicable to a button-head-type tie rod 230, is capable of cooperating with the projecting end of any tie rod which presents an enlargement at or near its outer end or a rearwardly facing reaction shoulder capable of entering the hook portion or horizontal slot 246 in the reentrant bend 245 at the outer end of the upper leg 238 of the bracket 232. Therefore, only insofar as the invention is particularly 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. A three-piece waler-supporting and clamping bracket assembly designed for attachment to a horizontal tie rod one end of which projects outwardly from one side of a concrete wall form and has a slot therein, said bracket assembly comprising a U-shaped bracket having upper and lower horizontal legs and a connecting bight portion, the distal end of said upper leg being provided with a reentrant hook designed for projection through the slot in the projecting one end of the tie rod, there being vertically aligned upper and lower openings in said legs respectively near the base portions thereof, a thrust plate slidable on said lower leg and having its forward end region overhanging the distal edge of the latter and its rear end region overhanging an edge of the lower opening, the extreme forward end of the thrust plate being engageable with the outer surface of the form side when said hook is in position within the tie rod slot, and a tapered wedge projecting vertically through said aligned upper and lower openings and adapted when driven downwardly to have the upper portion thereof above said upper leg bear against the outer side of a waler board for forcing the latter forwardly and against the form side, and the lower portion thereof bear against the rear overhanging end of the thrust plate in order similarly to force the latter forwardly and against the form side, said lower portion of the wedge being further adapted to bear against the outer side of a second waler board for forcing the latter forwardly and against the form side.

2. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 1 and wherein the overall dimension of the upper end of the wedge is greater than the overall dimension of one of said openings and the overall dimension of the lower end of the wedge is greater than the overall dimension of one of said openings whereby the wedge is inseparably captured by the bracket.

3. A three-piece waler-supporting and clamping assembly as set forth in claim 2 and wherein the upper and lower openings are generally rectangular in configuration, the tapered wedge is substantially rectangular in transverse cross section, the longitudinal and transverse dimensions of the lower end of the wedge being appreciably less than the corresponding dimensions of either of said openings, and the side edges of the wedge adjacent to the lower end thereof are provided with laterally projecting protuberances which engage the side edges of the upper opening and prevent upward removal of the wedge from the bracket proper while allowing the wedge to be inclined outwardly with respect to the form side to facilitate placement of a waler board in position above said upper leg, said wedge, when so inclined, serving as a lifting handle for manipulation of the bracket assembly when inserting said hook through the tie rod slot.

4. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 1 and wherein the portion of the slidable thrust plate which overhangs the edge of said lower opening is formed with a reverse bend which projects through said latter opening and a reentrant portion which underlies said lower leg whereby the slidable thrust plate is captured by said bracket proper.

5. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 4 and wherein the forward overhanging end region of the thrust plate is formed with a downwardly turned bearing flange designed for engagement with the outer surface of the form side.

6. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 5 and wherein said wedge is formed of a flat plate metal stock bent to channel-shape cross

section with its bight portion presented forwardly toward the distal ends of the upper and lower legs.

7. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 5 and wherein the thrust plate and lower leg of the bracket proper are provided with interengaging means for limiting the extent of sliding movement of the former on the latter.

8. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 7 and wherein said interengaging means on the thrust plate and lower leg comprises a downwardly projecting protuberance which is formed on the thrust plate and projects into a slot formed in the underlying portion of the bracket.

9. A three-piece waler-supporting and clamping bracket assembly as set forth in claim 1 and wherein the tapered wedge is provided with a medial section of limited vertical extent and of uniform thickness in a fore and aft direction and designed for sliding contact with the rear edge of the lower opening in the lower leg of the bracket and the rear overhanging end of the thrust plate when the wedge is driven downwardly and approaches its waler-clamping position.

10. A waler-supporting and clamping bracket assembly designed for attachment to a member which projects outwardly from one side of a concrete wall form and has a longitudinally extending slot therein, said bracket assembly comprising a U-shaped bracket having upper and lower horizontal legs and a connecting bight portion, the distal end of said upper leg being provided with a reentrant hook designed for projection through the slot in said member, there being vertically aligned upper and lower openings in said legs respectively near the base portions thereof, and a tapered wedge projecting vertically through said aligned upper and lower openings and adapted when driven downwardly to have the upper portion above said upper leg bear against the outer side of a waler board for forcing the latter against said one side of the concrete wall form and the lower portion thereof similarly bear against the outer side of a second waler board which is interposed between said upper and lower legs for forcing the latter waler board against said one side of the concrete wall form.

11. A waler-supporting and clamping bracket assembly designed for attachment to a horizontal tie rod one end of which projects outwardly from one side of a concrete wall form and has a longitudinally extending slot therein, said bracket assembly comprising a U-shaped bracket having upper and lower horizontal legs and a connecting bight portion, the distal end of said upper leg being provided with a reentrant hook designed for projection through the slot in the projecting one end of the tie rod, there being vertically aligned upper and lower openings in said legs respectively near the base portions thereof, and a tapered wedge projecting vertically through said aligned upper and lower openings and adapted when driven downwardly to have the upper portion above said upper leg bear against the outer side of a waler board for forcing the latter against said one side of the concrete wall form and the lower portion thereof similarly bear against the outer side of a second waler board which is interposed between said upper and lower legs for forcing the latter waler board against said one side of the concrete wall form, the overall dimension of the upper end of the wedge being greater than the overall dimension of one of said openings and the overall dimension of the lower end of the wedge being greater than the overall dimension of one of said openings whereby the wedge is inseparably captured by the bracket.