Sept. 22, 1959 B. HILLBERG 2,904,870

CONCRETE WALL FORM

Filed April 8, 1955 3 Sheets-Sheet 1

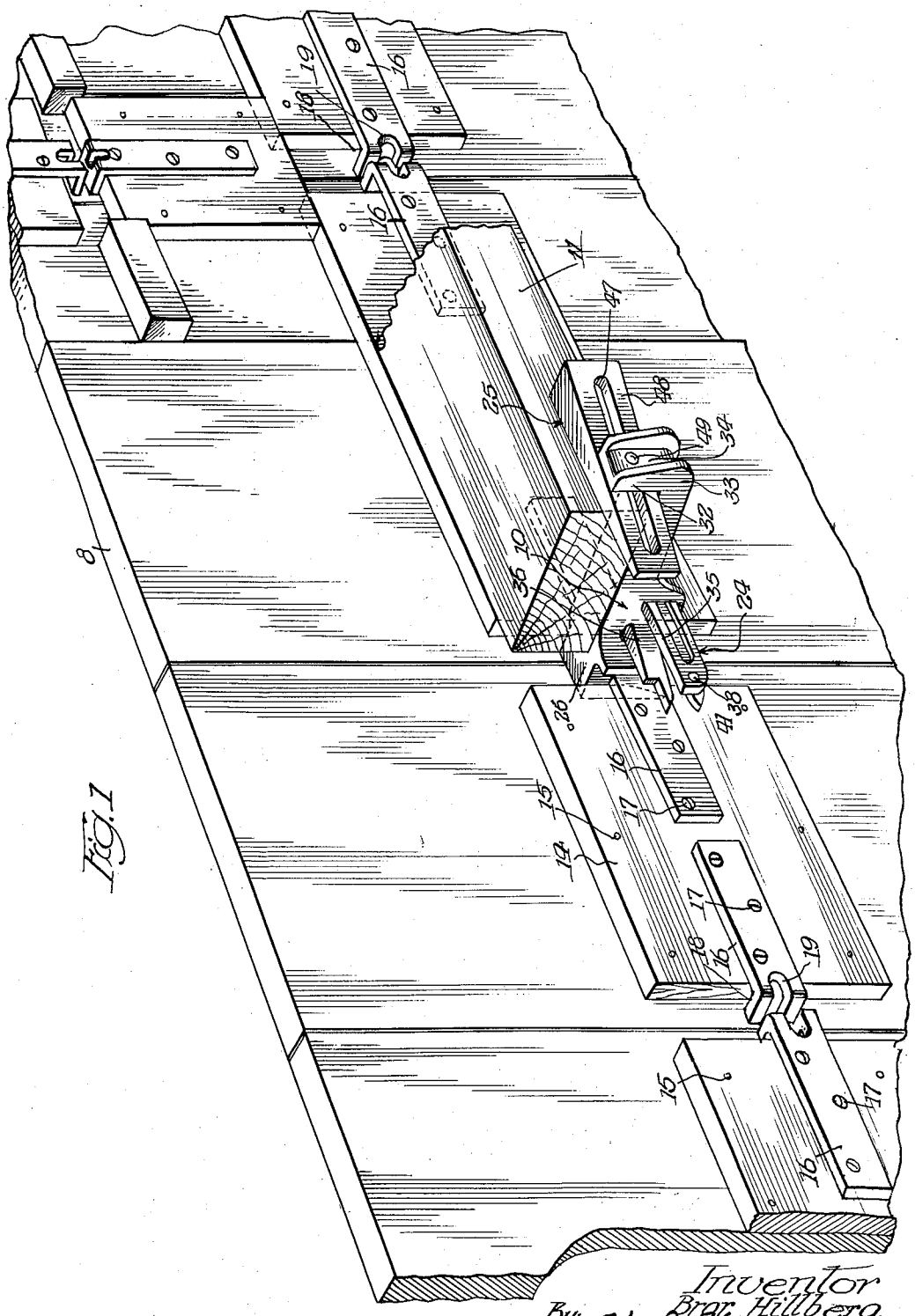


Fig. 1

Inventor
Bror Hillberg.
By Fred Gerlach Atty.

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FIG. 2

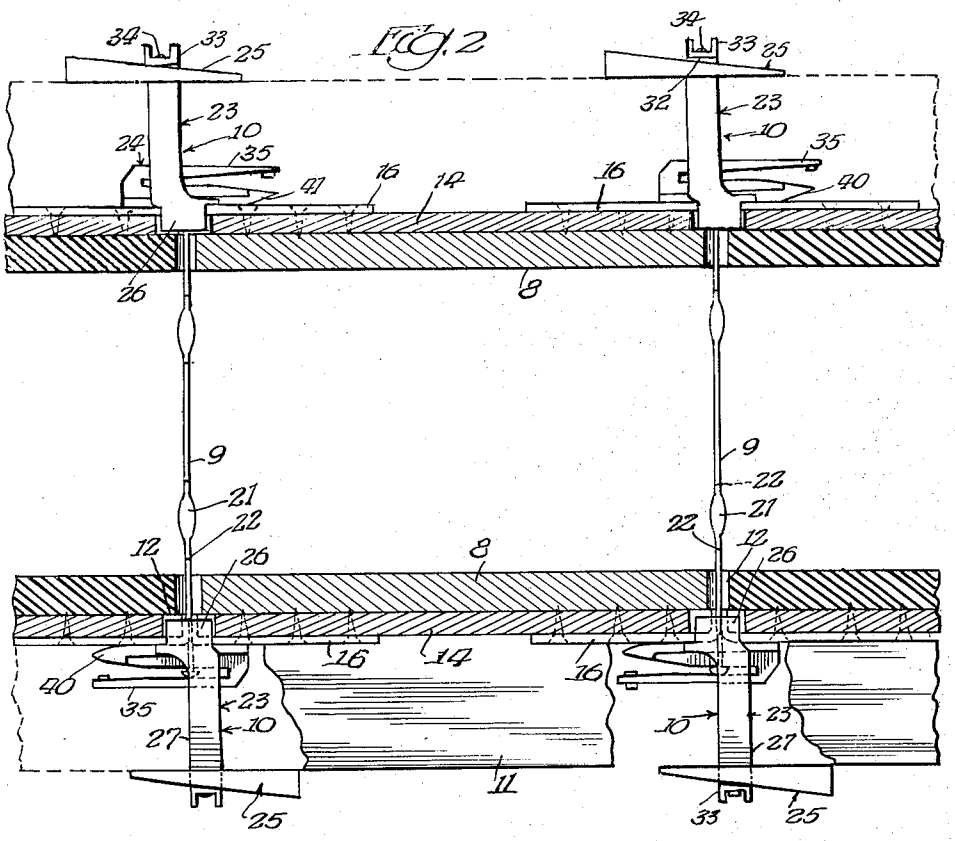
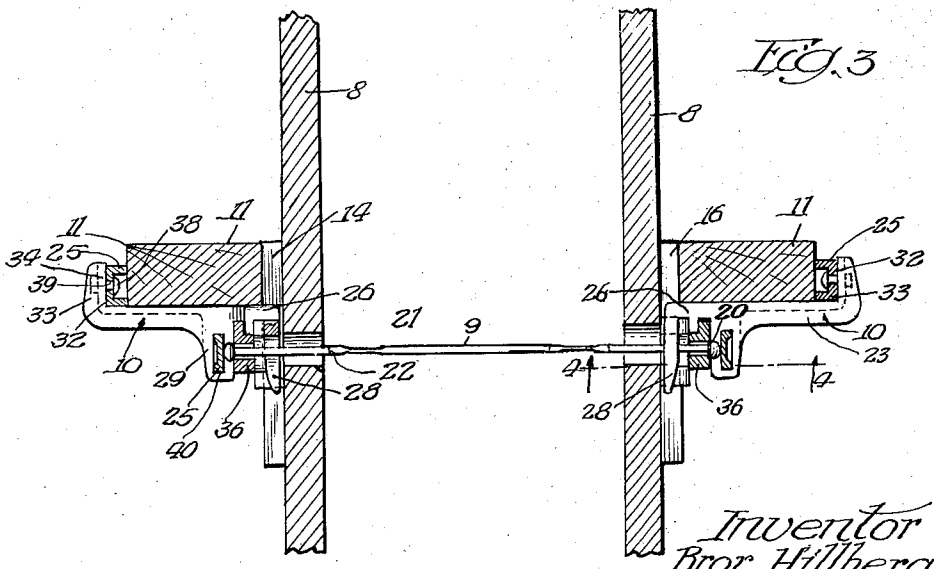


FIG. 3



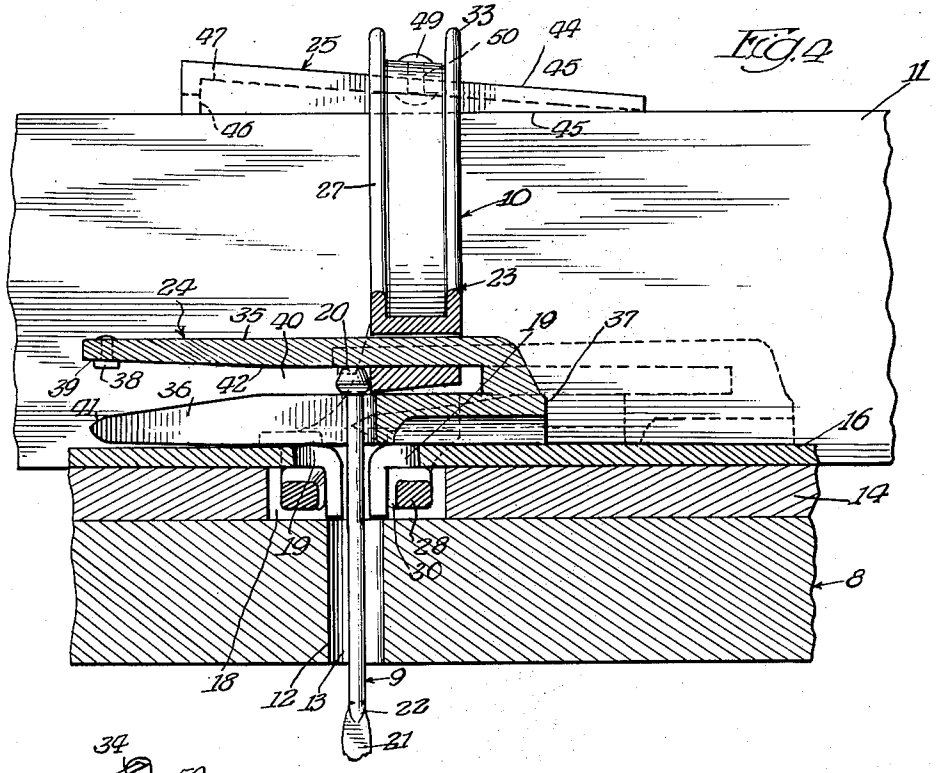
Inventor
Bror Hillberg
By Fred Herlach Atty.

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Fig. 4



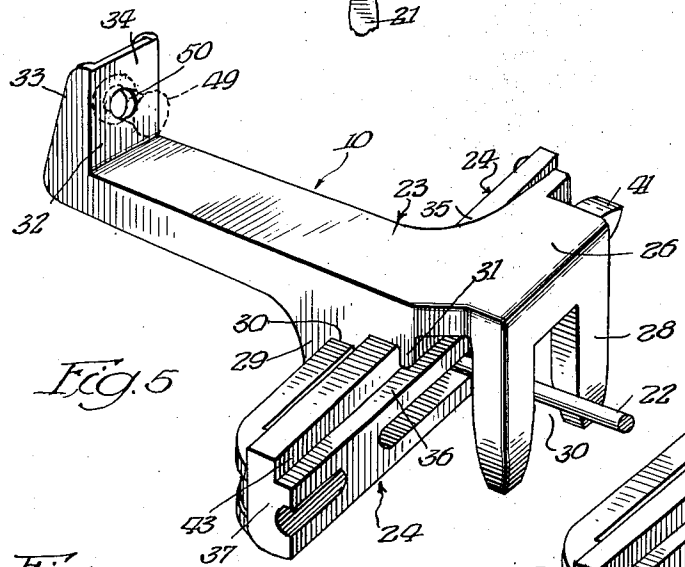


Fig. 5

Fig. 6

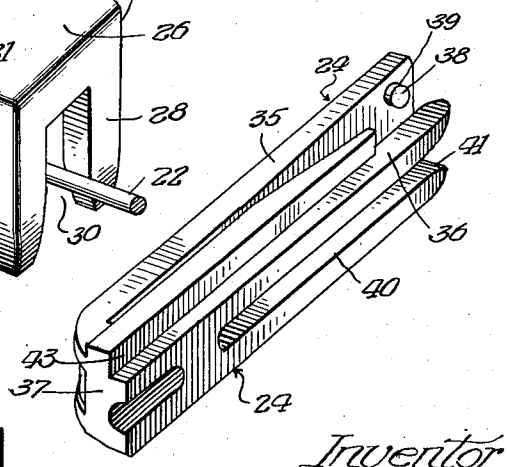
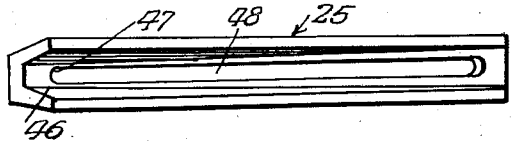


Fig. 7



Inventor
Bror Hillberg
By: Fred Gerlach Atty.

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2,904,870

CONCRETE WALL FORM

Bror Hillberg, Chicago, Ill., assignor to Superior Concrete Accessories, Inc., Chicago, Ill., a corporation of Illinois

Application April 8, 1955, Serial No. 500,107

9 Claims. (Cl. 25—131)

The present invention relates generally to wall forms. More particularly the invention relates to that type of wall form which is adapted for use in the formation of a concrete wall and comprises: (1) a series of upstanding edge to edge rectangular panels which are formed of plywood or other suitable material and have oppositely disposed hole-forming notches in the abutting side edges thereof; (2) a second series of similar upstanding rectangular panels which are disposed in opposed and spaced apart relation with the panels of the first series; (3) horizontally positioned combined tie and spreader rods which extend between and at right angles to the two series of panels and which have the ends thereof projecting through and beyond the notch formed holes between the abutting side edges of the panels and provided on their extremities with integral enlarged heads; (4) removable clamping devices which are associated with the ends of the combined tie and spreader rods and serve when in place to hold the panels in fixed relation with the ends of the rods; and (5) horizontally disposed walers which extend lengthwise of the two series of panels, are disposed adjacent to the outer faces of the panels, and serve to maintain the panels of each series in rectilinear alignment.

One object of the invention is to provide a concrete wall form which is an improvement upon, and has certain inherent advantages over, previously designed wall forms of the aforementioned type and is characterized by the fact that it is comparatively simple in design or construction, effectively and efficiently fulfills its intended purpose, and is capable of being assembled and dismantled with facility.

Another object of the invention is to provide a concrete wall form of the type under consideration in which the upstanding rectangular panels are provided on the outer faces thereof with horizontally disposed reenforcing boards which have the end edges thereof disposed adjacent to, but spaced a small distance inwards of, the hole-forming notches in the side edges of the panels and have mounted on the end portions of their outer surfaces longitudinally extending metallic strips the outer ends of which project beyond the outer end edges of the boards and are bent inwards at substantially right angles in order to form adjacent to the aforementioned notches elongated vertically extending open ended sockets; and in which the removable clamping devices embody horizontally elongated cast metal brackets which extend normally outwards from, and at right angles to, the panels, and embody on the inner ends thereof pairs of spaced apart depending fingers which are adapted to extend downwards through the aforementioned sockets and serve when in place to hold the panels in edge to edge relation.

Another object of the invention is to provide a concrete wall form of the last mentioned character in which the inner side surfaces of the pairs of depending fingers on the inner ends of the horizontally elongated brackets are downwardly divergent to the end that when they are driven downwards through the sockets in connection with mounting of the clamping devices in place they operate

automatically to draw the panels together so that the side edges thereof are in firmly clamped relation.

Another object of the invention is to provide a concrete wall form of the type and character under consideration in which the clamping devices embody horizontally disposed U-shaped locking bolts which are located a small distance outwards of the pairs of depending fingers, extend transversely of the cast metal brackets, are mounted on the brackets so that they are horizontally and longitudinally slidable back and forth, embody plain or solid outer side parts and bifurcated inner side parts, and are adapted when slid in the direction of their open ends after the brackets are mounted in place to have the outer and inner side parts thereof brought into straddled relation with the enlarged heads on the extremities of the combined tie and spreader rods to the end that the panels are held in fixed relation with the ends of the rods.

Another object of the invention is to provide a concrete wall form of the last mentioned character in which the cast metal brackets of the removable clamping devices are provided with integral depending lugs which are disposed a small distance outwards of the pairs of depending fingers and have vertically extending slots through which the outer side parts of the U-shaped locking bolts extend slidably.

Another object of the invention is to provide a concrete wall form of the aforementioned character in which the cast metal brackets of the clamping devices are L-shaped, have the short legs thereof at their inner ends, and have flat top surfaces for supporting the walers of the form.

Another object of the invention is to provide a concrete wall form of the character under consideration in which the L-shaped brackets of the clamping devices embody on the outer ends of their long legs integral upstanding lugs, and the clamping devices embody, in addition to the U-shaped locking bolts, horizontally slidable wedges which fit slidably against the inner surfaces of the aforementioned upstanding lugs on the outer ends of the long legs of the brackets and are adapted when driven in the direction of their small ends to clamp the walers against the reenforcing boards on the outer faces of the panels.

A further object of the invention is to provide a concrete wall form of the last mentioned character in which the wedges and the upstanding lugs have rivet and slot connections between them in order that the wedges are permanently connected to the brackets while at the same time they are free to slide back and forth into and out of their operative position wherein they serve to clamp the walers in place.

A still further object of the invention is to provide a concrete wall form which is generally of new and improved construction, possesses an extremely long life, and is capable of being manufactured or fabricated at a comparatively low cost.

Other objects of the invention and the various advantages and characteristics of the present wall form will be apparent from a consideration of the following detailed description.

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

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a fragmentary perspective view of a concrete wall form embodying the invention;

Figure 2 is a fragmentary horizontal section showing

four of the clamping devices in their operative position with respect to two combined tie and spreader rods;

Figure 3 is a vertical transverse section illustrating in detail the manner in which the U-shaped locking bolts straddle the enlarged heads on the extremities of the combined tie and spreader rods and also the manner in which the wedges serve to clamp the walers against the reenforcing boards on the outer faces of the panels;

Figure 4 is an inverted horizontal section taken on the line 4—4 of Figure 3 and illustrating in detail the manner in which the pairs of depending fingers on the inner ends of the cast metal L-shaped brackets of the clamping devices fit within the sockets and serve to hold the panels in firmly clamped edge to edge relation;

Figure 5 is a perspective view showing one of the clamping devices without the wedge therefor;

Figure 6 is a perspective view of one of the U-shaped locking bolts; and

Figure 7 is a perspective view of one of the wedges.

The wall form which is shown in the drawings constitutes the preferred form or embodiment of the invention. It is adapted for use in the formation of a concrete wall (not shown) and comprises two similar series of upstanding edge to edge panels 8, combined tie and spreader rods 9 for holding the two series of panels against relative lateral displacement, clamping devices 10 for holding the panels in fixed or rigid relation with the combined tie and spreader rods, and walers 11 for maintaining the panels of each series in rectilinear alignment. The two series of panels are spaced apart a distance corresponding to the desired thickness of the concrete wall to be formed therebetween and are adapted to have concrete in plastic or unset form poured between them for wall forming purposes. After setting or hardening of the concrete the form is dismantled as hereinafter described and then the projecting ends of the combined tie and spreader rods are severed or broken at points adjacent to the sides of the concrete wall as well understood in the art.

The panels 8 are rectangular and have flat inner and outer faces. They are preferably formed of plywood and have oppositely disposed semi-circular notches 12 formed in their abutting side edges. Each oppositely disposed pair of notches forms a circular hole 13 for receiving one end of a combined tie and spreader rod 9. The plywood panels 8 are reenforced by horizontally disposed boards 14 which extend across the outer faces of the panels and are secured in place by screws 15 or similar attaching devices. The boards 14 are preferably positioned so that the imaginary longitudinal center lines thereof are in alignment with the semi-circular notches 12 in the side edges of the panels. As shown in the drawings the end edges of the reenforcing boards 14 are disposed a small distance inwards of the side edges of the panels. Each of the reenforcing boards 14 is provided on the end portions of its outer face with a pair of horizontally extending metallic strips 16. Such strips are located midway between the upper and lower edges of the reenforcing boards as best shown in Figure 1 and are fixedly secured in place by way of screws 17. The outer ends of the strips 16 project beyond the end edges of the reenforcing boards and are bent inwards at substantially right angles so as to form elongated vertically extending open ended sockets 18 which are positioned adjacent to the semicircular notches 12. The inwardly bent outer ends of the metallic strips 16 are provided with notches 19. The latter are in alignment with the semi-circular hole-forming notches 12 in the abutting side edges of the panels 8 and are adapted to have the ends of the combined tie and spreader rods 9 extend through them.

The combined tie and spreader rods 9 are horizontally positioned and extend between and at right angles to the two series of panels. The ends of the rods project through and an appreciable distance beyond the notch-formed holes 13 and are provided at their extremities with integral enlarged heads 20. The portions of the combined tie and spreader rods that are disposed inwards of the inner faces of the panels are provided with flats 21 and break-off points 22. The flats prevent the central portions of the rods from turning in connection with break-off of the ends of the rods after formation of a concrete wall between the two series of panels. The break-off points 22 are in the form of notches and permit the end portions of the rods to be readily fractured when they are bent and then turned at the conclusion of a wall forming operation. As shown in Figure 4 of the drawings, the portions of the combined tie and spreader rods 9 that are directly outwards of the notch-formed holes 13 fit within and extend through the notches 19 in the inwardly bent outer ends of the metallic strips 16 on the end portions of the outer faces of the reenforcing boards 14.

The removable clamping devices 10 of the form are twice as many in number as the combined tie and spreader rods 9 and are associated with the ends of the rods respectively. They serve to hold the panels 8 in fixed or rigid relation with the ends of the rods and consist of elongated brackets 23, U-shaped locking bolts 24 and wedges 25.

The brackets 23 of the clamping devices 10 are preferably in the form of one-piece castings of iron or any other suitable metal. They are generally L-shaped so far as configuration or shape is concerned and consist of short legs 26 and long legs 27 at right angles to the short legs. As shown in the drawings the L-shaped brackets when in use extend outwards from, and at right angles to, the panels 8 and are positioned or arranged so that the short legs 26 thereof are disposed adjacent to the inwardly bent outer ends of the metallic strips 16 on the panels. The outer side portions of the short legs 26 of the brackets 23 are provided with pairs of spaced apart depending fingers 28. The latter are formed integrally with the ends or corners of the outer side portions of the short legs 26 and are downwardly tapered. They are spaced apart a distance corresponding to the distance between the adjoining pairs of sockets 18 and are adapted when the clamping devices are in their operative position to extend downwardly through said sockets 18 as best shown in Figures 2, 3 and 4. In connection with mounting of the clamping devices the brackets 23 are positioned so that the pairs of spaced apart depending fingers 28 overlie the pairs of adjoining sockets 18. Thereafter hammer blows are imparted to the short legs 26 of the brackets so as to drive the brackets downwards and cause the fingers 28 to slide downwards into and through the sockets. By reason of the fact that the fingers are downwardly tapered the inner or opposed side surfaces of the pairs of fingers are downwardly divergent. Because of this and due to the lateral spacing of the fingers of the pairs, the opposed inner side faces of the pairs of fingers engage the inner side surfaces of the inwardly bent inner ends of the metallic strips 16 with a wedge or cam action in connection with downward sliding movement of the fingers and cause the panels to be drawn together in such manner that their abutting side edges are in firmly clamped relation. When the pairs of depending fingers are in place in the sockets 18, the panels 8 are held fixedly in place and cannot be separated. When the brackets 23 are in their operative position, the end portions of the combined tie and spreader rods that are outwards of the metallic strips 16 extend through the spaces between the oppositely disposed inner side faces of the fingers 28. The top surfaces of the short legs 26 of the brackets 23 are flat as best shown in Figure 5. The inner end portions of the long legs 27 of the brackets 23 are provided with integral full width depending integral lugs 29. The latter are spaced outwards a comparatively short distance from the short legs 26 of the brackets and

are provided with open ended slots 30 which extend transversely of the long legs 27 and are disposed in parallel relation with the short legs 26. The purpose of the slots will be described hereafter. The inner end corners of the long legs 27 of the brackets are provided with integral depending or downwardly extending ribs 31. Such ribs are positioned substantially midway between the lugs 29 and the pairs of fingers 28 and extend lengthwise of the short legs 26 of the brackets. The purpose of the ribs 31 will be described hereafter. The outer ends of the long legs 27 of the brackets 23 are provided with integral upstanding lugs 32. The latter are provided at the end margins thereof with integral outwardly extending reenforcing ribs 33 and have flat inner side surfaces 34 which extend at right angles to the top surfaces of the long legs 27 but are arranged at a comparatively small acute angle with respect to the short legs 26 of the brackets 23 as shown in Figure 4. The top surfaces of the long legs 27 are flat, and in addition, they are flush with the top surfaces of the short legs 26. The walers 11 of the form are adapted to rest on the flat top surfaces of the short and long legs of the brackets 23 as shown in the drawings.

The locking bolts 24 of the clamping devices 10 are preferably in the form of one-piece castings of iron or other suitable material. They are U-shaped and extend horizontally. As best shown in Figure 6 the locking bolts 24 consist of outer side parts 35, inner side parts 36 and intermediate connecting parts 37 between certain opposed ends of the outer and inner side parts. The outer side parts 35 of the locking bolts are plain or solid and extend through, and fit slidably in, the slots 30 in the depending lugs 29. The sliding connections between the outer side parts 35 and the depending lugs 29 permit the locking bolts 24 to be slid back and forth in parallel relation with the short legs 26 of the brackets 23. As shown in the drawings the open ends of the locking bolts extend in the same direction as the short legs extend from the long legs of the brackets. The intermediate parts 37 of the locking bolts coact with the lugs 29 to limit sliding movement of the locking bolts in the direction of their open ends; and head-equipped rivets 38 on the free ends of the outer side parts 35 coact with the lugs 29 to limit sliding movement of the locking bolt in the opposite direction. The rivets 38 extend through holes 39 in the free ends of the outer side parts 35 and serve permanently to retain the locking bolts 24 in connected relation with the brackets 23. As best shown in Figures 4 and 6, the outer side parts 35 are of uniform height from end to end but taper in width in the direction of their outer or free ends. The inner side parts 36 of the locking bolts are bifurcated by way of longitudinally extending slots 40 which are formed in their central and outer end portions. The slots 40 are disposed substantially midway between the top and bottom surfaces of the inner side parts 36 and are adapted to receive the portions of the combined tie and spreader heads 9 that are directly inwards of the enlarged heads 20 as shown in Figure 4. The outer ends of the furcations of the inner side parts 36 are beveled or tapered as at 41 in order that the outer ends of the slots 40 are outwardly flared to the end that entry of such portions of the rods into the slots is facilitated in connection with sliding movement of the U-shaped locking bolts in the direction of their open ends. The height of the slots 40 except at the flared outer ends thereof is but slightly greater than the diameter of the end portions of the combined tie and spreader rods 9. The inner side surfaces of the inner side parts 36 of the locking bolts are angled as shown in Figure 4 in order that the spaces between the inner and outer side parts of the locking bolts are outwardly flared. Such spaces are designated in the drawings by the reference numeral 42 and are adapted to receive the enlarged heads 20 of the combined tie and spreader rods when the locking bolts 24 are in their operative position. When the locking bolts are in such position, the heads 20 are straddled by and wedged between the outer and inner side parts 35 and 36 as shown in Figure 4 with the result that the panels 8 are maintained in rigid or fixed relation with the ends of the combined tie and spreader rods 9. When the locking bolts are slid to their fullest extent in the direction of the intermediate parts 37, i.e., towards the right as viewed in Figure 4, the free ends of the furcations of the inner side parts 36 are located to one side of the head-equipped ends of the combined tie and spreader rods and consequently the heads 20 of the rods are positioned so as to enter the spaces 42 in connection with sliding movement of the locking bolts in the opposite direction. It is contemplated that in connection with mounting of the clamping devices after proper positioning of the panels 8 with respect to the combined tie and spreader rods 9, the locking bolts will first be shifted to their farthest extent in the direction of the intermediate parts 37. Thereafter, the brackets 23 of the devices will be manipulated so as to bring the pairs of depending fingers 28 into firmly seated relation with the pairs of sockets 18. After proper manipulation of the brackets, the locking bolts 24 will then be slid in the opposite direction so as to cause the heads 20 to enter the spaces 42 between the outer and inner parts 35 and 36 of the locking bolts. Sliding movement of the locking bolts in the opposite direction is preferably accomplished by hammering on the intermediate parts 37. When the locking bolts are hammered as far as possible in the direction of their open ends the enlarged heads 20 on the outer ends of the combined tie and spreader rods 9 become jammed between the central portions of the inner side surfaces of the outer and inner side parts 35 and 36 with the result that the locking bolts together with the brackets 23 serve to hold the panels 8 in fixed or rigid relation with the ends of the rods 9. By employing the locking bolts 24 as parts of the clamping devices 10, it is unnecessary to provide the combined tie and spreader rods 9 with stops or abutments for preventing inward displacement of the panels 8. The inner upper corner portions of the inner side parts 36 of the locking bolts are provided with longitudinally extending grooves 43 which slidably receive the depending ribs 31 on the inner corner portions of the long legs 27 of the brackets 23 and coact therewith to prevent either horizontal or vertical tilting of the locking bolts.

The wedges 25 of the removable clamping devices 10 are horizontally disposed and fit slidably against the inner side surfaces 34 of the upstanding legs 32 on the outer ends of the long legs 27 of the brackets 23. They are preferably in the form of castings of iron or similar material and embody flat outer side surfaces 44 and flat inner side surfaces 45 which are disposed or positioned at a comparatively small acute angle with respect to one another. The outer surfaces 44 of the wedges fit flatly and slidably against the inner side surfaces 34 of the upstanding lugs 32 and coact therewith to confine the wedges to back and forth horizontal and longitudinal sliding movement. The acute angle at which the outer side surfaces 44 extend with respect to the inner side surfaces 45 is the same as the acute angle with which the inner side surfaces 34 of the upstanding lugs 32 extend with respect to short legs 26 of the brackets 23 and hence in connection with back and forth sliding movement of the wedges 25 the inner side surfaces 45 are always in parallel relation with said short legs 26. The purpose of the wedges 25 is to clamp the walers 11 against the reenforcing boards 14 on the panels 8. The wedges are provided with longitudinal cavities 46 which face onto the inner side surfaces 45 and result in the wedges being for the most part U-shaped in cross section and embodying outer side walls 47. Such outer side walls are provided with longitudinally extending slots 48. In order permanently to connect the wedges 25 to the brackets 23 while at the same time permitting the wedges to slide horizontally back and forth head-equipped rivets 49 are provided.

The shanks of the rivets 49 extend through the slots 48 and also holes 50 in the central portions of the upstanding lugs 32 as shown in Figure 4. The heads of the rivets are positioned so that they are in sliding engagement with the inside surfaces of the outer side walls 47. When the wedges 25 are driven horizontally in the direction of their small ends, the inner side surfaces 45 move towards the reenforcing boards 14 on the panels 8 and when the wedges are reversely driven said inner side faces move away from the reenforcing boards.

The walers 11 of the form extend horizontally and are disposed directly outwards of the two series of panels. They are preferably in the form of wooden beams (2 x 4's) and serve when in place to maintain the panels of each series in true rectilinear alignment. As heretofore indicated, the walers are adapted to rest on and be supported by the flat top surfaces of the short and long legs 26 and 27 of the L-shaped brackets 23 of the removable clamping devices 10. As best shown in the drawings, the walers when in place are positioned so that the sides of greater width extend at right angles to the panels, i.e., horizontally. The walers are also positioned so that their inner vertically extending sides are in abutment with the outer surfaces of the reenforcing boards 14 and their outer vertically extending sides are disposed adjacent to the flat inner side surfaces of the wedges 25. It is contemplated that after the walers are properly positioned on the flat top surfaces of the short and long legs of the L-shaped brackets 23 the wedges 25 will be driven horizontally in the direction of their small ends. When the wedges are so driven to their fullest extent they operate firmly to clamp the walers against the outer surfaces of the reenforcing boards 14 and thus cause the walers to maintain in true rectilinear alignment the panels of each series.

In assembling the wall form, the panels 8 are positioned in two opposed spaced apart series and so that the side edges thereof are in edge to edge relation. Thereafter the combined tie and spreader rods 9 are inserted through the notch-formed holes 13 in such manner that the head-equipped ends thereof project equal distances away from the outer faces of the panels. After proper positioning of the rods, the brackets 27 are manipulated into place. As heretofore pointed out, this is accomplished by positioning the brackets so that the pairs of depending fingers 28 overlie the pairs of sockets 18, and then hammering or driving the brackets downwards so as to cause the fingers to slide downwards through the sockets and cause the panels to be drawn or clamped together into firm edge to edge relation. After the brackets 23 of the removable clamping devices 10 are mounted in place, the U-shaped locking bolts 24 are driven horizontally as far as possible in the direction of their open ends. This results in the outer and inner side parts 35 and 36 of the locking bolts being brought into firm straddled relation with the enlarged heads 20 on the extremities of the combined tie and spreader rods 9. As soon as the locking bolts are driven into place, they coact with the brackets 23 to hold the panels 8 in fixed or rigid relation with the ends of the rods. At the conclusion of the aforementioned steps, the walers 11 are placed on the flat top surfaces of the short and long legs 26 and 27 of the brackets 23. Thereafter, the wedges 25 are driven in the direction of their small ends in order firmly to clamp the walers against the outer surfaces of the reenforcing boards 14 on the panels 8. As soon as the wedges are driven into place the wall form as a whole is in a rigid condition and the two series of panels are held in fixed spaced apart relation. After complete assembly of the form concrete in plastic or unset condition is poured into the space between the two series of panels. Upon hardening or solidifying of the poured concrete, the form is dismantled by first driving the wedges 25 in the direction of their large ends so as to release the walers 11. As soon as the walers are released they are removed from the brackets 23 by raising them and then shifting them laterally away from the panels. After removal of the walers the U-shaped locking bolts 24 are driven in the direction of their intermediate parts 37 in order to disengage them from the enlarged heads 20 on the extremities of the combined tie and spreader rods 9. After disengaging the locking bolts from the heads the brackets 23 are removed by driving them upwards so as to withdraw the depending fingers 28 thereof from the sockets 18. After release of the brackets the panels 8 are free and hence may be removed from the sides of the concrete wall. After removal of the panels the projecting ends of the combined tie and spreader rods 9 are bent and then turned or twisted so that they fracture at the break-off points 22.

The herein described concrete wall form effectively and efficiently fulfills its intended purpose and due to its particular construction may be produced at a comparatively low cost. Because of the particular design of the removable clamping devices 10 the form may be assembled and dismantled with facility. By having the slidable U-shaped locking bolts 24 and the slidable wedges 25 in connected relation with the brackets 23 the clamping devices are of unitary character.

Whereas the panels 8 have been described as extending vertically, it is to be understood that in some instances certain of the panels may extend horizontally as illustrated in the upper right hand corner of Figure 1. In such case the removable clamping devices for the horizontally extending panels will be positioned at right angles to the position shown in the drawings. It is also to be understood that the invention is not to be restricted to the details set forth since they may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

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

1. A concrete wall form including as parts thereof: a pair of flat vertically extending panels arranged in edge to edge relation, provided at their abutting edges with means forming a hole at substantially right angles to the plane in which the panels lie, and embodying on their outer faces means forming a pair of sockets outwards and at opposite sides of the hole and in substantially parallel relation with said plane; a horizontally disposed combined tie and spreader rod having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels and the socket-forming means, and provided on its extremity with an enlarged head; and a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panels and provided on the inner end thereof with a pair of spaced apart tapered fingers extending at substantially right angles to the bracket, projecting through, and fitting both slidably and removably in the sockets, and serving when driven into the respective sockets to draw the edges of the panels together and hold the panels in edge-to-edge relation, and a locking bolt slidable transversely through the bracket at a location outwards of said fingers, said bolt having a bifurcated inner side part adapted when the bolt is slid through the bracket in one direction to straddle the rod immediately inwards of said head and, by a wedging action effective on the panels, to engage the head and urge the same outwards of the panels, said bolt further having an outer side part spaced from the inner bifurcated side part a distance less than the longitudinal thickness of the head and adapted, when the bolt is slid in said one direction to engage the distal end of the head and, bind the head between said inner and outer side parts.

2. A concrete wall form including as parts thereof: a pair of upstanding rectangular panels arranged in side

by side and edge to edge relation and provided in their abutting side edges with oppositely disposed notches forming a transverse and horizontal hole; horizontally disposed reenforcing boards extending across, and secured to, the outer faces of the panels and arranged so that certain end edges thereof are disposed adjacent to, but spaced a small distance inwards of, the notches; horizontal metallic strips extending lengthwise of, and connected to, the outer faces of the boards and having certain ends thereof projecting beyond said certain end edges of the boards and bent inwards so as to form a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod having one end thereof projecting through the hole, terminating a short distance outwards of the inwardly bent ends of the strips, and provided on its extremity with an enlarged head; and a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panels and provided on the inner end thereof with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, and a locking bolt mounted movably on the bracket at a location outwards of the fingers and shaped and adapted so that when moved in one direction it securely grips said enlarged head and operates through the medium of the bracket to hold the panels in fixed relation with said one end of the rod.

3. A concrete wall form including as parts thereof: a pair of flat upstanding panels arranged in side by side and edge to edge relation, provided in their abutting side edges with oppositely disposed notches forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels and the socket-forming means, and provided on its extremity with an enlarged head; and a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panels, embodying at a location a short distance outwards of its inner end a depending lug with a transverse slot therethrough, and provided on its inner end with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, and a horizontally disposed U-shaped locking bolt positioned transversely of the bracket and outwards of the fingers, embodying an outer side part and a bifurcated inner side part, having its outer side part extending slidably through the slot in the depending lug and straddling the rod to the end that the bolt is mounted for longitudinal sliding movement through the bracket, and adapted when slid in the direction of its open end to have the side parts thereof brought into straddled and gripping relation with the inside and distal faces respectively of the enlarged head to fixedly secure the head, and consequently the rod, against axial shifting movement relative to said bracket.

4. A concrete wall form including as parts thereof: a pair of flat upstanding panels arranged in side by side and edge to edge relation, provided in their abutting side edges with oppositely disposed notches forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels and the socket-forming means, and provided on its extremity with an enlarged head; and a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panel, embodying at a location a short distance outwards of its inner end a depending lug with a transverse slot therethrough, and provided on its inner end with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, a horizontally disposed U-shaped locking bolt positioned transversely of the bracket and outwards of the fingers, embodying an outer side part and a bifurcated inner side part, having its outer side part extending slidably through the slot in the depending lug to the end that the bolt is mounted for longitudinal sliding movement, and adapted when slid in the direction of its open end to have the side parts thereof brought into straddled and gripping relation with the enlarged head in order that it operates through the medium of the bracket to hold the panels in fixedly connected relation with said one end of the rod, and means operative to prevent horizontal and vertical tilting of the locking bolt relatively to the bracket and consisting of a depending rib formed on the bracket substantially midway between the lug and the fingers and a longitudinal groove formed in the upper portion of the bifurcated side part of the bolt and arranged in sliding relation with said rib.

5. A concrete wall form including as parts thereof: a pair of flat upstanding panels arranged in side by side and edge to edge relation, provided at their abutting side edges with means forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole, a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels and the socket-forming means, and provided on its extremity with an enlarged head; and a removable clamping device comprising a horizontally disposed L-shaped bracket extending outwards from and at right angles to the panel, consisting of a short inner leg and a long outer leg, having on the inner end of its long leg a depending lug with a transverse slot therethrough, and provided on the end portions of its short leg with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, and a horizontally disposed U-shaped locking bolt positioned transversely of the bracket and outwards of the fingers, embodying an outer side part and a bifurcated inner side part, arranged so that its open end extends in the same direction as the short leg of the bracket extends from the long leg, having its outer side part extending slidably through the slot in the depending lug and straddling the rod to the end that the bolt is mounted for longitudinal sliding movement through the bracket, and adapted when slid in the direction of its open end to have the side parts thereof brought into straddled and gripping relation with the inside and distal faces respectively of the enlarged head to fixedly secure the head, and consequently the rod, against axial shifting movement relative to said bracket.

6. A concrete wall form including as parts thereof: a pair of upstanding panels arranged in side by side and edge to edge relation, provided at their abutting edges with means forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces

of the panels and provided on its extremity with an enlarged head; a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panels and provided on the inner end thereof with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, a locking bolt mounted movably on the bracket at a location a small distance outwards of the fingers and shaped and adapted so that when moved in one direction it securely grips said enlarged head and operates through the medium of the bracket to hold the panels in fixedly connected relation with said one end of the rod, and a horizontally disposed wedge extending transversely of the bracket and mounted over the outer end of said bracket so as to slide longitudinally back and forth; and a horizontally disposed waler extending across the outer faces of the panels, having a portion thereof resting on the bracket, and adapted when the wedge is driven in the direction of its small end to be forced towards the panels into a position wherein it serves to hold said panels in rectilinear alignment.

7. A concrete wall form including as parts thereof: a pair of upstanding panels arranged in side by side and edge to edge relation, provided at their abutting side edges with means forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels, and provided on its extremity with an enlarged head; a removable clamping device comprising an elongated horizontally disposed bracket extending outwards from and at right angles to the panels having a flat top surface, embodying an upstanding lug at its outer end, and provided on the inner end thereof with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, a locking bolt mounted movably on the bracket at a location a small distance outwards of the fingers and shaped and adapted so that when moved in one direction it securely grips said enlarged head and operates through the medium of the bracket to hold the panels in fixedly connected relation with said one end of the rod, a horizontally disposed wedge extending transversely of the bracket and mounted against the inner side surface of the upstanding lug so as to slide longitudinally back and forth, and means operative to hold the wedge in connected relation with the bracket while at the same time permitting it to slide back and forth and consisting of a longitudinal slot in the wedge and a rivet extending through the lug and said slot; and a horizontally disposed waler extending across the outer faces of the panels, having a portion thereof resting on the top surface of the bracket, and adapted when the wedge is driven in the direction of its small end to be forced towards the panels into a position wherein it serves to hold said panels in rectilinear alignment.

8. A concrete wall form including as parts thereof: a pair of upstanding panels arranged in side by side and edge to edge relation, provided in their abutting side edges with oppositely disposed notches forming a transverse and horizontal hole, and embodying on their outer faces means forming a pair of vertically extending sockets outwards and at opposite sides of the hole; a horizontally disposed combined tie and spreader rod extending at right angles to the panels and having one end thereof projecting through the hole, terminating a short distance outwards of the outer faces of the panels and the socket-forming means, and provided on its extremity with an enlarged head; a removable clamping device comprising a horizontally disposed L-shaped bracket extending outwards from and at right angles to the panels, consisting of a short inner leg and a long outer leg, embodying on the inner end of its long leg a depending lug with a transverse slot therethrough, embodying on its outer end an integral upstanding lug, having the top surfaces of its short and long legs flat and flush with one another and provided on the end portions of its short leg with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets, and serve to hold the panels in edge to edge relation, a horizontally disposed U-shaped locking bolt positioned transversely of the bracket and a small distance outwards of the fingers, embodying an outer side part and a bifurcated inner side part, arranged so that its open end extends in the same direction as the short leg extends from the long leg, having its outer side part extending slidably through the slot in the depending lug to the end that the bolt is mounted for longitudinal sliding movement, and adapted when slid in the direction of its open end to have its side parts brought into straddled and gripping relation with the enlarged head in order that it operates through the medium of the bracket to hold the panels in fixedly connected relation with said one end of the rod, and a horizontally disposed wedge extending transversely of the bracket and mounted against the inner side surface of the upstanding lug so as to slide longitudinally back and forth; and a horizontally disposed waler extending across the outer faces of the panels having a portion thereof resting on the flat top surfaces of the short and long legs of the bracket, and adapted when the wedge is driven in the direction of its small end to be forced towards the panels into a position wherein it serves to hold said panels in rectilinear alignment.

9. A concrete wall form including as parts thereof: a pair of upstanding rectangular panels arranged in side by side and edge to edge relation and provided in their abutting side edges with oppositely disposed notches forming a transverse and horizontal hole; horizontally disposed reenforcing boards extending across, and secured to, the outer faces of the panels and arranged so that certain end edges thereof are disposed adjacent to, but spaced a small distance inwards of, the notches; horizontal metallic strips extending lengthwise of, and connected to, the outer faces of the boards and having certain ends thereof projecting beyond said certain end edges of the boards and bent inwards so as to form a pair of vertically extending sockets outwards and at opposite sides of the hole; a removable clamping device comprising a horizontally disposed L-shaped bracket extending outwards from and at right angles to the panel, formed of a one-piece casting, consisting of a short inner leg and a long outer leg, having the top surfaces of its short and long legs flat and flush with one another, embodying on the inner end of its long leg an integral depending lug with a transverse slot therethrough, embodying on the outer end of its long leg an integral upstanding lug, and provided on the end portions of its short leg with a pair of spaced apart depending fingers that project downwards through, and fit both slidably and removably in, the sockets and serve to hold the panels in edge to edge relation, a horizontally disposed U-shaped locking bolt positioned transversely of the bracket and a small distance outwards of the fingers, embodying a plane outer side part and a bifurcated inner side part, arranged so that its open end extends in the same direction as the short leg extends from the long leg, having its outer side part extending slidably through the slot in the depending lug to the end that the bolt is mounted for longitudinal sliding movement, and adapted when slid in the direction of its open end to have the side parts thereof brought into straddled and gripping relation with the enlarged head in order that it operates

through the medium of the bracket to hold the panels in fixedly connected relation with said one end of the rod, and a horizontally disposed wedge extending transversely of the bracket and mounted against the inner side surface of the upstanding lug so as to slide longitudinally back and forth; and a horizontally disposed waler extending across the outer faces of the reenforcing boards, having a portion thereof resting on said flat top surfaces of the short and long legs of the bracket, and adapted when the wedge is driven in the direction of the small end to be clamped against said reenforcing boards in such manner as to hold the panels in rectilinear alignment.

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