

Sept. 26, 1944.

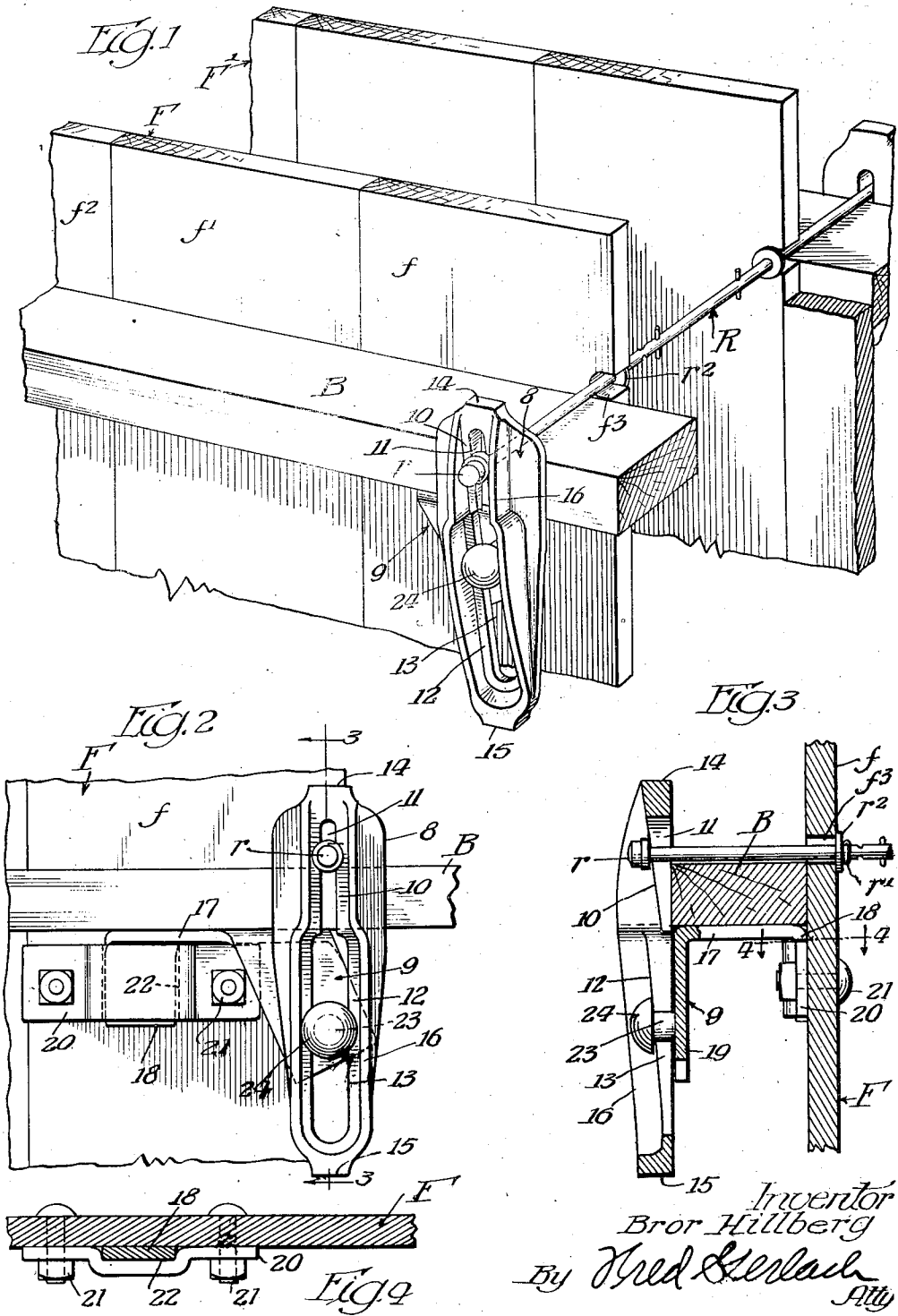
B. HILLBERG

2,358,975

WALL FORM TIE

Filed Feb. 18, 1944

2 Sheets-Sheet 1



Sept. 26, 1944.

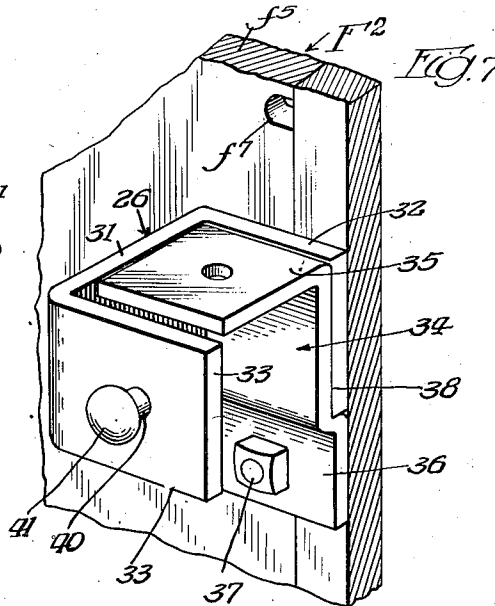
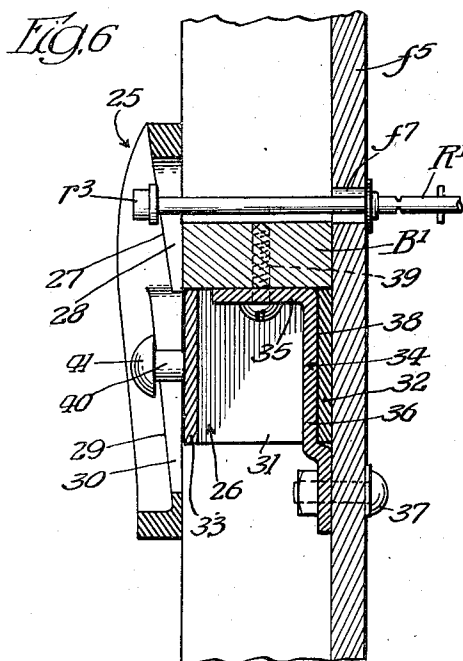
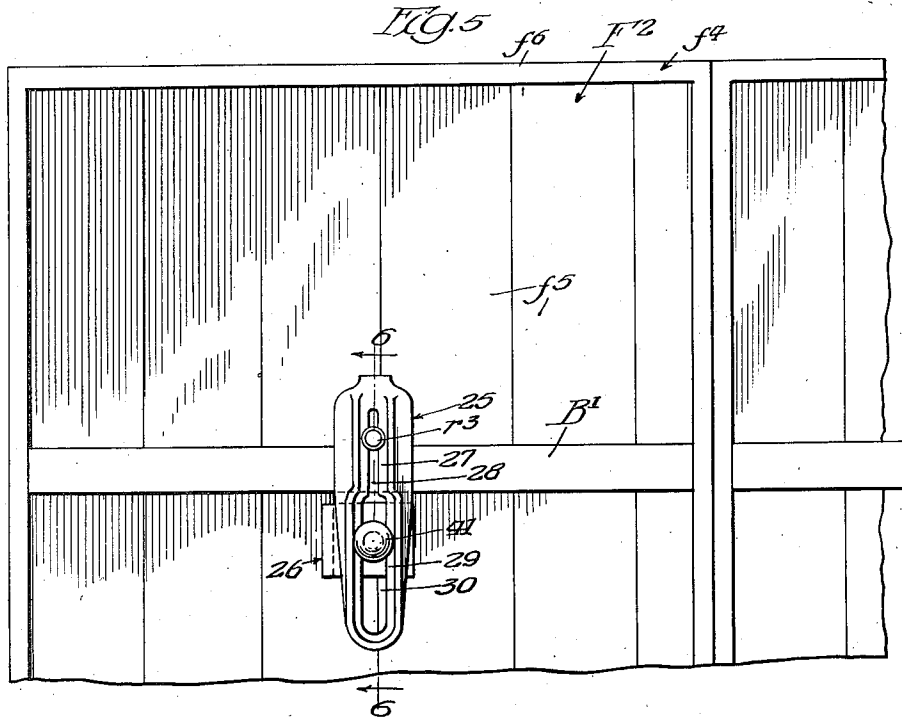
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,358,975

WALL FORM TIE

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20 Claims. (Cl. 25—131)

The present invention relates generally to clamps for use in tying together and holding against separation laterally spaced, upstanding forms for concrete walls or like structures. More particularly the invention relates to that type of clamp which is known in the building trade or art as a tie clamp, is adapted to be applied to one end of a combined tie and spreader rod extending between and through the forms, and comprises a holder member which is designed to fit against the outer surface of a single reinforcing beam, such as a stud or wale, on the outer face of the form through which the one end of the tie rod extends, and has on the outer side thereof an elongated, inclined or angularly disposed surface which has a longitudinal slot therethrough for receiving the one end of the tie rod and is adapted when the holder member is slid in one direction relatively to the reinforcing beam to engage an enlargement on the extremity of said one end of the tie rod with such a wedge action as to urge the holder member inwards and cause it to clamp the beam against the adjacent form and hold the beam and form in connected relation with the combined tie and spreader rod.

One object of the invention is to provide a clamp of this type which is an improvement upon, and has certain inherent advantages over, previously designed tie clamps of the same general character and is characterized by the fact that it is so designed and constructed that the clamping pressure resulting from sliding the holder member into wedged relation with the enlargement on the combined tie and spreader rod does not tend to roll or rock the reinforcing beam relatively to the adjacent form.

Another object of the invention is to provide a tie clamp of the type under consideration which comprises in addition to the holder member a U-shaped bracket which is positioned on the side of the reinforcing beam that is opposite the enlargement equipped end of the rod and has one leg thereof detachably connected to the adjacent form and its other leg provided with an outwardly extending head equipped shank which extends through a slot in the holder member and serves to connect the holder member to the bracket while at the same time permitting the holder member to slide relatively to the bracket in connection with shift thereof into its operative position.

Another object of the invention is to provide a tie clamp of the last mentioned character in which the slot in the holder member for the

head equipped shank on the outer or other leg of the U-shaped bracket is formed in a second elongated inclined or angularly disposed surface on the outer side of the member, and such surface is longitudinally aligned with the inclined surface that coacts with the enlargement on the combined tie and spreader rod and is so designed and arranged that in connection with sliding of the holder member into its operative position it engages the head of the shank with such a wedge action as additionally to urge the holder member into clamped relation with the reinforcing beam on the outer face of the adjacent form.

A further object of the invention is to provide a clamp of the type and character under consideration in which the slot in the holder member for the head equipped shank on the outer leg of the U-shaped bracket is wider than, and communicates with, one end of the slot for the enlargement equipped end of the rod with the result that the enlargement equipped end of the tie rod may be inserted through the slot for the head equipped shank and then slid into its own slot in connection with manipulation of the holder member into operative relation with the combined tie and spreader rod.

A still further object of the invention is to provide a tie clamp which is generally of new and improved construction, effectively and efficiently fulfills its intended purpose, and may be mounted and dismantled with facility and also produced at a comparatively low cost.

Other objects of the invention and the various advantages and characteristics of the present tie clamp 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 claims at the conclusion hereof.

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

Figure 1 is a fragmentary perspective view showing a pair of laterally spaced, upstanding wall forming forms with a combined tie and spreader rod therebetween, and also showing a clamp embodying one form of the invention applied to one end of the tie rod;

Figure 2 is a front view of the clamp of Figure 1 illustrating in detail the construction, design and mode of operation of the holder member and the U-shaped bracket;

Figure 3 is a vertical section taken on the line 3—3 of Figure 2 and illustrating the manner in which the two inclined or angularly disposed surfaces on the outer side of the holder member of the clamp coact respectively with the enlargement on the combined tie and spreader rod and the head of the shank to produce a clamping action which serves to clamp the reinforcing beam against the adjacent form and also to hold the beam and form in connected relation with the rod;

Figure 4 is a horizontal section taken on the line 4—4 of Figure 3 and illustrating in detail the manner in which the inner leg of the U-shaped bracket of a clamp is detachably connected to the adjacent form;

Figure 5 is a front view of a clamp embodying a second or modified form of the invention;

Figure 6 is an enlarged vertical section taken on the line 6—6 of Figure 5; and

Figure 7 is a perspective view showing in detail the construction and design of the U-shaped bracket of the clamp of Figures 5 and 6 and illustrating the manner in which the inner leg of such bracket is detachably connected to the adjacent form.

The clamp which is shown in Figures 1, 2, 3 and 4 of the drawings constitutes one form of the invention. It is essentially of the so-called tie variety and is illustrated in connection with a combined tie and spreader rod R and a pair of upstanding wall forming forms F and F¹. The forms are disposed in laterally spaced relation and are adapted to have concrete poured therebetween for wall forming purposes. The rod R extends horizontally across the space between the two forms and together with the clamp serves to prevent separation of the forms during pouring of the concrete. As well understood in the art, the forms are removed after hardening or setting of the concrete. The form F, as shown in Figure 1, is in the form of a horizontal series of vertically extending planks f, f¹, and f². The latter are arranged so that the side edges thereof are in abutment. One end of the combined tie and spreader rod R extends through the form F¹ and is anchored to the latter in any suitable manner. The other end of the rod extends through a notch f³ in one of the side margins of the plank f and projects outwards beyond the form F. Such projecting end of the rod directly overlies a horizontal reinforcing beam B, such as a stud or wale, on the outer face of the form F. The beam B serves not only as a reinforcing instrumentality for the form F, but also as a medium for aligning the various planks constituting the form F. The outer extremity of the end of the combined tie and spreader rod R that projects through the notch f³ in the plank f projects slightly beyond the outer surface of the reinforcing beam B and is provided with an enlargement r. The notch f³ in the plank f of the form F is of sufficient size to permit the enlargement r to pass therethrough in connection with assembly of the combined tie and spreader rod with respect to the form F. Immediately adjacent the inner end of the notch f³ the rod R is provided with a bulge r¹ and a washer r². The washer is snugly mounted on the rod and is interposed between the bulge r¹ and the inner face of the plank f. It serves to prevent out-flow of concrete through the notch f³ and coacts with the bulge r¹ to form a stop shoulder whereby inward movement of the form F with respect to the combined tie and spreader rod R is limited.

The clamp of Figures 1, 2, 3 and 4 is associated with the projecting end of the combined tie and spreader rod R, i. e., the end that extends through the notch f³ and embodies at its extremity the enlargement r. It serves to support the horizontal reinforcing beam B and clamp it against the form F. It also serves to clamp the plank f against the washer r² and thus hold the form F in fixed or connected relation with the combined tie and spreader rod R. As its component parts the clamp under consideration comprises an elongated holder member 8 and a U-shaped bracket 9.

The holder member is preferably in the form of a one-piece casting and is adapted in connection with use thereof to extend vertically and fit against the outer surface of the reinforcing beam B. The inner side or face of the holder member 8 is flat in order that the member is free to slide vertically relatively to the outer surface of the reinforcing beam. On the upper central portion of the outer side of the holder member a vertically elongated, inclined or angularly disposed surface 10 is provided. This surface is inclined downwards and inwards and is adapted to engage, and coact with, the enlargement r on the extremity of the projecting end of the combined tie and spreader rod R. A vertically extending slot 11 is formed in, and extends transversely through, the upper end of the holder member 8 and this slot is centrally positioned with respect to the side edges of the downwardly and inwardly inclined surface 10 and is adapted slidably to receive the portion of the rod R that is directly inwards of the enlargement r. The upper end of the slot 11 is closed. The width of the slot 11 is slightly greater than the thickness or diameter of the combined tie and spreader rod R but is less than the width of the enlargement r. On the lower central portion of the outer side of the holder member 8 a vertically elongated, inclined or angularly disposed surface 12 is formed. This surface is downwardly and inwardly inclined in substantially the same manner as the surface 10 and functions as hereinafter described. A vertical slot 13 is formed in, and extends transversely through, the lower end of the holder member 8. This slot is centrally positioned with respect to the side edges of the inclined surface 12. It is of greater width than the slot 11 in the upper end of the holder member 8 and is sufficiently wide to accommodate the enlargement r on the projecting end of the rod R. The lower end of the slot 13 is closed and the upper end of the slot opens onto or communicates with the lower end of the slot 11. In assembling the holder member 8 with respect to the enlargement equipped end of the combined tie and spreader rod R, i. e., the end which projects through the notch f³ in the plank f of the form F, the member is manipulated so as to bring the enlargement equipped end of the rod into the slot 13 and also to cause the lower central portion of the inner side or face of the member to engage the outer surface of the reinforcing beam B. Thereafter the member is slid downwards so as to cause the portion of the rod R directly inwards of the enlargement to enter the lower end of the slot 11 and the enlargement r to engage the inclined or angularly disposed surface 10 on the upper central portion of the outer side of the member 8. When the member is further slid downwards the surface 10 engages the enlargement r with a wedge action and causes inward movement of the member 8 with respect to the projecting or enlargement equipped

end of the rod R. Such inward movement on the part of the member serves to clamp the reinforcing beam B against the form F and results in such form being clamped against the washer r^2 and the beam and form being held or maintained in connected relation with the combined tie and spreader rod R. The upper end of the member 8 is provided with a horizontal surface 14 whereby the member may be forced downwards into its operative position by a hammer or like tool. To release the member 8 it is only necessary to slide it upwards relatively to the reinforcing beam B. When the member is slid upwards so that the inclined or angularly disposed surface 10 is out of contact with the enlargement r clamping pressure tending to urge the member 8 inwards is released. When the member 8 is shifted or slid upwards so that the enlargement r is aligned with the upper end of the slot 13 the member may be removed from the projecting or enlargement equipped end of the combined tie and spreader rod R. The lower end of the holder member 8 is provided with a flat horizontal surface 15 for receiving a hammer or other tool in connection with upward shift or release of the member. The side portions of the holder member 8 are provided with a pair of vertically extending, laterally spaced, outwardly projecting integral ribs 16 which serve transversely to reinforce or strengthen the member.

The U-shaped bracket 9 is preferably in the form of a one-piece plate metal stamping. It serves as a medium for supporting the reinforcing beam B on the outer side of the form F and consists of a horizontally extending intermediate part 17, a depending inner leg 18 and a depending outer leg 19. The inner leg 18 is adapted to fit flatly against the central portion of the outer face of the plank f of the form F at a point directly beneath the reinforcing beam and is detachably connected to said plank f by way of a horizontally elongated bracket-like fixture 20. The ends of the fixture are fixedly attached by bolts 21 to the outer surface portions of the plank f . The central portion of the fixture is outwardly offset with respect to the end portions in order to form a pocket 22 between it and the adjacent outer face portion of said plank f . The pocket 22 is open at the top and bottom and is adapted slidably to receive the inner leg 18 of the U-shaped bracket 9. The bracket is detachably connected to the fixture 20 before positioning of the reinforcing beam B with respect to the form F. In connecting or mounting the bracket the inner leg 18 is slid downwards into the pocket 22. After insertion of the inner leg 18 into the pocket the reinforcing beam B is placed on top of the intermediate part 17 of the bracket 9, as shown in Figures 1, 2 and 3. When it is desired to remove the clamp after formation of a concrete wall between the two forms F and F¹ the holder member 8 is released by shifting it upwards and then, after removal of the reinforcing beam B, the bracket 9 is shifted upwards in order to remove the inner leg 18 from the pocket 22. The intermediate part 17 of the U-shaped bracket 9 is diagonally positioned in order that the lower end of the leg 19 is in vertical alignment with the notch f^3 when the bracket is in its operative position. The lower end of the leg 19 of the bracket is provided with an outwardly extending horizontal shank 23 and this extends through, and is of slightly less width than, the slot 13 in the holder member 8 and

is provided at its outer end with an enlarged head 24. The head equipped shank 23 and the slot 13 in the lower end of the holder member 8 serve permanently to connect the holder member to the bracket while at the same time permitting the member to slide relatively to the bracket. The inner end of the shank 23 is welded or otherwise fixedly secured to the outer depending leg 19 of the U-shaped bracket 9 after insertion of the shank through the slot 13. The enlarged head 24 at the outer end of the shank is in sliding engagement with the downwardly and inwardly inclined surface 12 on the holder member 8 and coacts therewith in such manner that when the member is slid downwards into its operative position the lower end of the member is urged inwards. When the member 8 is driven downwards so as to bring the surface 10 at the upper end thereof into wedging relation with the enlargement r on the projecting end of the combined tie and spreader rod R the surface 12 on the lower end of the member is brought into wedging relation with the enlarged head 24 on the outer end of the shank 23. The head 24 and the inclined surface 12 coact with the enlargement r and the inclined surface 10 to urge the holder member 8 inwards when it is shifted downwards. By reason of the fact that in connection with downward shift of the holder member both the inner and upper ends of the member are urged inwards the clamping pressure of the member on the reinforcing beam B is such that there is no tendency of the reinforcing beam B to roll or rock relatively to the form F. The outer depending leg 19 of the U-shaped bracket 9 is so positioned that when the clamp is in its operative position the outer face of the leg 19 is disposed inwards of the outer surface of the reinforcing beam B. The shank 23 is of such length that the inner face of the enlarged head 24 is coplanar with the inner face of the enlargement r on the rod R. When the holder member 8 is shifted upwards in connection with release thereof the enlarged head 24 at the outer end of the shank 23 slides out of engagement with the inclined surface 12 and this releases the clamping pressure which tends to urge inwards the lower end of the member.

In using the clamp of Figures 1 to 4, inclusive, the form F is first placed in operative relation with respect to the adjacent end of the combined tie and spreader rod R. When the form is in place the enlargement equipped end of the rod projects outwards through the notch f^3 in the plank f . After proper positioning of the form F the bracket 9 is connected or attached to the plank f by inserting the inner depending leg 18 thereof into the upper end of the pocket 22 and then shifting the bracket downwards. After mounting of the bracket the reinforcing beam B is manipulated into its operative position wherein it rests on the intermediate part 17 of the bracket and underlies the projecting or enlargement equipped end of the rod R. After attaching the bracket to the bracket-like fixture 20 the holder member 8 is slid upwards and is then manipulated so as to bring the enlargement r into the upper end of the slot 13 in the lower end of the member. Thereafter the member 8 is slid downwards by hammering on the flat horizontal surface 14 at the upper end of the member. During downward shift of the member 8 the inclined surface 10 slides into engagement with the enlargement r and the inclined

surface 12 slides into engagement with the enlarged head 24. Due to the resultant wedge or cam action the member 8 is urged inwards into a position wherein it serves to clamp the reinforcing beam B against the form F and the form F¹ against the washer r² on the rod R. Since the clamping pressure on the member is applied to the upper and lower ends of such member because of the wedge action of the surface 12 with respect to the enlargement r and the wedge action of the surface 12 with respect to the enlarged head 24 the member, in connection with downward shift thereof, moves inwards in parallel relation with the outer face of the form F and hence does not exert any pressure which would tend to roll or rock the reinforcing beam with respect to the form F. After setting of the concrete which is poured between the two forms F and F¹ the clamp is released by driving the holder member 8 upwards. When such member is driven upwards to its fullest extent the upper end of the holder may be disengaged from the enlargement equipped end of the rod. After disengagement of the member from the enlargement r the clamp may be removed from the form by withdrawing the inner depending leg 19 of the bracket from the pocket 22 within the central outwardly offset portion of the bracket-like fixture 20.

The clamp of Figures 1 to 4, inclusive, effectively and efficiently fulfills its intended purpose and is capable of being produced at a low and reasonable cost. It may be assembled and dismantled with facility and is adapted or designed to be used with like clamps and combined tie and spreader rods. Whereas only a single clamp has been described it is to be understood that in practice a like or similar clamp may be used on the end of the rod R that projects through the form F¹ (see Figure 1). If it is desired merely to clamp the reinforcing beam B against the panels of the form F for panel aligning purposes the holder member 8 may be used without attaching it to the enlargement equipped end of the combined tie and spreader rod R. In this connection it is contemplated that the bracket 9 will first be attached to the form and then the holder member shifted downwards. In connection with downward shift of the holder member the head 24 coacts with the inclined surface 12 to urge the member 8 inwards and thus cause it to clamp the reinforcing beam against the planks.

The clamp which is shown in Figures 5, 6 and 7 constitutes a second or modified form of the invention. It is illustrated in connection with a form F² and a combined tie and spreader rod R¹ and consists of a holder member 25 and a U-shaped bracket 26. The form F² comprises an upstanding pre-formed rectangular panel f⁴ which is adapted to be positioned in edge to edge relation with similar panels and is formed of a plurality of side by side upstanding planks f⁵ and a rectangular frame f⁶. The ends of the planks are nailed or otherwise rigidly connected to the upper and lower parts of the frame. In addition to the planks f⁵ and frame f⁶ the panel f⁴ of the form F² embodies a horizontal reinforcing beam B¹. This beam extends across the central portions of the outer faces of the planks f⁵ and has its ends secured to the central portions of the side parts of the rectangular frame f⁶. The combined tie and spreader rod R¹ is the same as the rod R and is provided at one end thereof with an enlargement r³. Such end of the rod extends through a hole f⁷ in the central portion

of the panel f⁴ and overlies the central portion of the reinforcing beam B¹. As shown in Figure 6 the extremity of the rod R¹ that carries the enlargement r³ extends slightly outwards of the outer surface of the beam B¹. The holder member 25 is exactly like the holder member 8 of the clamp of Figures 1 to 4, inclusive, and functions in the same manner. It has at the upper end thereof a vertically elongated downwardly and inwardly inclined surface 27 for engaging the enlargement r³ with a wedge action in connection with downward shift of the holder member 24. It also has in the upper end thereof a vertically extending transverse slot 28 for slidably receiving the portion of the rod R¹ that is directly inwards of the enlargement r³. The lower end of the holder member 25 embodies a downwardly and inwardly inclined outer surface 29 and is provided with a vertically extending transverse slot 30. The slots 28 and 30 operate similarly to the slots 11 and 13 of the holder member 8 of the clamp of Figures 1 to 4, inclusive. The U-shaped bracket 26 comprises an intermediate part 31, an inner leg 32 and an outer leg 33. It differs from the bracket 9 in that the intermediate part 31 extends vertically and the legs are in alignment with one another. The inner leg 32 extends horizontally in one direction from the intermediate part 31 and is detachably connected to the central portion of the panel f⁴ at a point directly beneath the central portion of the reinforcing beam B¹ by way of a bracket-like fixture 34. Such fixture comprises a horizontally extending part 35 and a depending part 36. The lower end of the depending part fits against the central portion of the panel f⁴ and is securely fastened in place by way of a bolt 37. The central and upper portions of the part 36 are outwardly offset to form a pocket 38 which has open sides and is adapted to receive the inner leg 32 of the bracket 26. The horizontally extending part 35 of the bracket-like fixture 34 projects outwards from the upper end of the depending part 36, as shown in Figures 6 and 7. It underlies the central portion of the reinforcing beam B¹ and is secured thereto by way of a screw 39. When it is desired to attach the bracket 36 to the panel f⁴ of the form F² the inner leg 32 is aligned with one of the open sides of the pocket 38 and then the bracket is shifted horizontally so as to bring the leg 32 into seated relation with the pocket. The outer leg 32 of the bracket 26 projects from the intermediate part 26 in the same direction as the inner leg 32 and is provided with an outwardly extending shank 40 having an enlarged head 41 at its outer end. The shank fits slidably in the slot 30 in the lower end of the holder member 25 and the head 41 coacts with the downwardly and inwardly inclined surface 26 in the same manner that the head 24 of the clamp of Figures 1 to 4, inclusive, coacts with the inclined surface 12 on the holder member 8. When, in connection with use of the clamp of Figures 5 to 7, inclusive, the holder member 25 is driven downwards the surface 27 is brought into wedging relation with the enlargement r³ on the rod R¹ and the surface 29 is brought into wedging relation with the head 41 on the shank 40. The wedging action which results from the surfaces 27 and 29 contacting the enlargement and head causes the holder member to move inwards and brings the reinforcing beam B¹ and the panel f⁴ into connected relation with the enlargement equipped end of the combined tie and spreader rod R¹. When the holder member 25 is in place

the reinforcing beam B¹ is reinforced and it is not subjected to any rolling or rocking tendency due to the clamping pressure to which it is subjected. After use of the clamp the holder member 25 is shifted upwards and the bracket 26 is disconnected from the bracket-like attachment 34 by sliding it laterally or horizontally so as to bring the inner leg 32 out of seated relation with the pocket 38.

The clamp of Figures 5, 6 and 7 effectively and efficiently fulfills its intended purpose in the same manner as the clamp of Figures 1 to 4, inclusive and is also capable of being produced at a low and reasonable cost. It may be assembled and dismantled with facility and is characterized by the fact that it does not, when in use, tend to tilt, roll or rock the reinforcing beam of the form.

The invention is not to be understood as restricted to the details set forth since these 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 clamp adapted for application to a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably the other face of the beam, having at one end thereof an elongated inclined outer wedging surface and a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and means at the other end of the holder member operative in response to sliding of said member in said one direction additionally to urge the member inwards into clamped relation with the beam.

2. A clamp adapted for application to a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated inclined outer wedging surface and a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a bracket provided means for attachment to the form, and coacting means between the bracket and the other end of the holder member operative in response to sliding of said member in said one direction additionally

to urge the member inwards into clamped relation with the beam.

3. A clamp adapted for application to a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face positioned so that one side thereof is disposed immediately adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated inclined outer wedging surface and a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a bracket adapted to be positioned adjacent the other side of the beam in opposed relation with the projecting end of the rod and embodying means for detachably connecting it to the form, and coacting means between the bracket and the other end of the holder member operative in response to sliding of said member in said one direction additionally to urge the member inwards into clamped relation with the beam.

4. In combination with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, a clamp comprising an elongated holder member extending transversely across, and having its inner face engaging slidably, the outer surface of the beam, embodying at one end thereof an elongated longitudinally extending inclined outer wedging face and in addition a transverse slot extending lengthwise of, and through, said surface and having the projecting end of the rod extending therethrough, and adapted in response to longitudinal sliding thereof in one direction relatively to the beam to have said surface engage the enlargement with a wedge action and coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a bracket detachably connected to the form, and coacting means between the bracket and the other end of the holder member operative in response to longitudinal sliding of the member in said one direction additionally to urge the member inwards into clamped relation with the beam.

5. In combination with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, a clamp comprising an elongated holder member extending transversely across, and having its inner face engaging slidably, the outer face of the beam, embodying at one end thereof an elongated longitudinally extending inclined outer wedging surface and in addition a transverse slot extending lengthwise of, and through, said surface and having the projecting end of the rod extending therethrough, and adapted in response to longitudinal sliding thereof in one

direction relatively to the beam to have said surface engage the enlargement with a wedge action and coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a U-shaped bracket having one leg thereof connected to the form, and arranged so that its other leg is disposed adjacent but inwards of the other end of the holder member, and coacting means between said other leg of the bracket and said other end of the member operative in response to longitudinal sliding of the member in said one direction additionally to urge said member inwards into clamped relation with the beam.

6. A clamp designed for use in connection with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said first mentioned surface engage the enlargement with a wedging action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and means including the second mentioned surface and operative in response to slide of said member in said one direction additionally to urge the member inwards into clamped relation with the beam.

7. A clamp designed for use in connection with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said first mentioned surface engage the enlargement with a wedging action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means for attachment to the form and embodying an element arranged so that when the member is slid in said one direction it engages and coacts with the second mentioned surface in such manner as additionally to urge the members inwards into clamped relation with the beam.

8. A clamp designed for use in connection with a combined tie and spreader rod, having one end

thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated longitudinally extending angularly disposed outer wedging surface and a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated longitudinally extending angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface, and adapted in response to longitudinal sliding movement thereof in one direction relatively to the beam to have said first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means for detachably connecting it to the form and embodying an element arranged so that when the bracket is connected to the form and the holder member is slid longitudinally in said one direction it engages and coacts with the second mentioned surface in such manner as additionally to urge the member inwards into clamped relation with the beam.

9. A clamp designed for use in connection with a combined tie and spreader rod, having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, having at one end thereof an elongated angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface and in addition a transverse slot extending lengthwise of, and through, the second mentioned surface, and adapted in response to sliding movement thereof in one direction relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means for attachment to the form and embodying an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with a head adapted when the bracket is attached to the form and the holder member is slid in said one direction to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

10. A clamp designed for use in connection with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend

transversely across, and have its inner face engage slidably, the outer surface of the beam, having at one end thereof an elongated longitudinally extending angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated longitudinally extending angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface and in addition a transverse slot extending lengthwise of, and through, the second mentioned surface, and adapted in response to longitudinal sliding movement thereof in one direction relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means for detachably connecting it to the form and embodying an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with a head adapted when the bracket is attached to the form and the holder member is slid longitudinally in said one direction to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

11. A clamp designed for use in connection with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, and comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer surface of the beam, having at one end thereof an elongated longitudinally extending angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, having at its other end an elongated longitudinally extending angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface and in addition a transverse slot of greater width than the first mentioned slot and extending lengthwise of, and through, the second mentioned surface, and having the inner end thereof joined to and communicating with the inner end of said first mentioned slot and adapted to have the enlargement inserted therethrough in connection with mounting of the member with respect to said projecting end of the rod, and adapted in response to longitudinal sliding movement thereof in one direction relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means for detachably connecting it to the form and embodying an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with a head adapted when the bracket is attached to the form and the holder member is slid longitudinally in said one direction to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

12. In combination with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, a clamp comprising an elongated holder member extending transversely across, and having its inner face engaging slidably, the outer surface of the beam, embodying at one end thereof an elongated angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, said surface and having the projecting end of the rod extending there- through, embodying at its other end an elongated longitudinally extending angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface and in addition a transverse slot extending lengthwise of, and through, the second mentioned surface, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a U-shaped bracket having one leg thereof connected to the form, arranged so that its other leg is disposed adjacent but inwards of the other end of the holder member, provided on said outer leg thereof with an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with an enlarged head, adapted when the holder member is slid in said one direction to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

13. In combination with a combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a reinforcing beam on its outer face adjacent the projecting end of the rod, a clamp comprising an elongated holder member extending transversely across, and having its inner face engaging slidably, the outer surface of the beam, embodying at one end thereof an elongated longitudinally disposed outer wedging surface and in addition a transverse slot extending lengthwise of, and through, said surface and having the projecting end of the rod extending therethrough, embodying at its other end an elongated longitudinally extending angularly disposed outer wedging surface inclined in the same direction as the first mentioned surface and in addition a transverse slot of greater width than the first mentioned slot and extending lengthwise of, and through, the second mentioned surface, and having the inner end thereof joined to, and communicating with, the inner end of said first mentioned slot and adapted to have the enlargement inserted therethrough in connection with mounting of the member with respect to said projecting end of the rod, and adapted in response to sliding movement thereof in one direction relatively to the beam to have said first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a U-shaped bracket having one leg thereof connected to the form, arranged so that its other leg is disposed adjacent but inwards of the other end of the holder member, provided on said outer

leg thereof with an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with an enlarged head, adapted when the holder member is slid in said one direction to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

14. A clamp designed for use in connection with a horizontally disposed combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a horizontal reinforcing beam on its outer face directly beneath said projecting end of the rod, and comprising an elongated vertically extending holding member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, embodying at its upper end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, embodying at its lower end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot extending lengthwise of, and through, the second mentioned surface, and adapted in response to downward sliding movement thereof relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means whereby it may be attached to the form directly beneath the beam and opposite the projecting end of the rod and embodying an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with an enlarged head adapted when the bracket is in place and the holder member is slid downwards to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

15. A clamp designed for use in connection with a horizontally disposed combined tie and spreader rod having one end thereof anchored and its other end provided with an enlargement at its outer extremity and projecting through and beyond a form with a horizontal reinforcing beam on its outer face directly beneath said projecting end of the rod, and comprising an elongated vertically extending holding member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, embodying at its upper end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, embodying at its lower end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot of greater width than the first mentioned slot, extending lengthwise of, and through, the second mentioned surface, and having its upper end joined to and communicating with the lower end of the first mentioned slot and adapted to have the enlargement inserted therethrough in connection with mounting the member with respect to the rod, and adapted in response to down-

ward sliding movement thereof relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, and a bracket provided with means whereby it may be attached to the form directly beneath the beam and opposite the projecting end of the rod and embodying an outwardly extending shank extending through the second mentioned slot and equipped at its outer end with an enlarged head adapted when the bracket is in place and the holder member is slid downwards to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

16. In combination with an upstanding concrete wall form having a hole therethrough, a combined tie and spreader rod having one end thereof anchored to a second upstanding form in spaced relation with the first mentioned form and its other end provided with an enlargement at its outer extremity and projecting through and beyond the hole in said first mentioned form, and a horizontal reinforcing beam extending across the outer face of said first mentioned form and positioned directly beneath the hole, a clamp comprising an elongated holder member extending vertically across, and having its inner face engaging slidably, the outer face of the beam, embodying at its upper end an elongated inclined outer wedging surface and in addition a transverse slot extending lengthwise of, and through, said surface, and having the projecting end of the rod extending therethrough, and adapted in response to longitudinal sliding thereof in one direction relatively to the beam to have said surface engage said enlargement with a wedge action and coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a bracket connected to the form and arranged to support the beam, and coating means between the bracket and the other end of the holder member operative in response to longitudinal sliding of the member in said one direction additionally to urge the member inwards into clamped relation with the beam.

17. In combination with an upstanding concrete wall form having a hole therethrough, a combined tie and spreader rod having one end thereof anchored to a second upstanding form in spaced relation with the first mentioned form and its other end provided with an enlargement at its outer extremity and projecting through and beyond the hole in said first mentioned form, and a horizontal reinforcing beam extending across the outer face of said first mentioned form and positioned directly beneath the hole, a clamp comprising an elongated holder member extending vertically across, and having its inner face engaging slidably, the outer face of the beam, embodying at its upper end an elongated inclined outer wedging surface and in addition a transverse slot extending lengthwise of, and through, said surface, and having the projecting end of the rod extending therethrough, and adapted in response to longitudinal sliding thereof in one direction relatively to the beam to have said surface engage said enlargement with a wedge action and coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a U-shaped bracket disposed under the beam beneath the projecting end of the rod embodying a horizontal intermediate part in supporting relation with the beam, a depending

inner leg connected to the adjacent portion of the outer face of the first mentioned form and an outer depending leg disposed inwards of the outer face of said beam, and coacting means between the outer leg of the bracket and the lower end of the holder member operative in response to longitudinal sliding of the member in said one direction additionally to urge the member inwards into clamped relation with the beam.

18. In combination with an upstanding concrete wall form having a hole therethrough, a combined tie and spreader rod having one end thereof anchored to a second upstanding form in spaced relation with the first mentioned form and its other end provided with an enlargement at its outer extremity and projecting through and beyond the hole in said first mentioned form, and a horizontal reinforcing beam extending across the outer face of said first mentioned form and positioned directly beneath the hole, a clamp comprising an elongated vertically extending holding member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam, embodying at its upper end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot extending lengthwise of, and through, the surface and shaped slidably to receive the projecting end of the rod, embodying at its lower end an elongated longitudinally extending outer wedging surface inclined downwards and inwards and in addition a transverse slot extending lengthwise of, and through the second mentioned surface, and adapted in response to downward sliding movement thereof relatively to the beam to have the first mentioned surface engage the enlargement with a wedge action and to coact therewith in such manner as to urge the member inwards into clamped relation with the beam, a U-shaped bracket disposed under and in supporting relation with the beam and having one leg thereof connected to the form and its other leg positioned adjacent but inwards of the lower end of the holder member, and an outwardly extending shank on said other leg of the bracket extending through the second mentioned slot and equipped at its outer end with a head adapted when the

holder member is slid downwards to engage and coact with the second mentioned surface in such manner as additionally to urge the member into clamped relation with the beam.

19. A clamp designed for use in connection with a form with a reinforcing beam on its outer face, comprising an elongated holder member designed to extend transversely across, and have its inner face engage slidably, the outer face of the beam and having at one end thereof an elongated longitudinally extending angularly disposed outer wedging surface and in addition a transverse slot extending lengthwise of and through said surface, and a bracket provided with means for detachably connecting it to the form and embodying an outwardly extending shank extending through the slot and equipped at its outer end with a head adapted when the bracket is attached to the form and the holder member is slid lengthwise in one direction to engage and coact with the surface in such manner as to urge the member inwards and cause it to clamp the beam against the form.

20. In combination with an upstanding concrete wall form with a horizontal reinforcing beam extending across the outer face thereof, a clamp comprising an elongated holder member extending vertically across, and having its inner face engaging slidably, the outer face of the beam and having at its lower end an elongated longitudinally extending outer wedging surface and in addition a transverse slot extending lengthwise of, and through the surface, a U-shaped bracket disposed under, and in supporting relation with, the beam, having one leg thereof connected to the form and its other leg positioned adjacent but inwards of the lower end of the holder member, and an outwardly extending shank on said other end of the bracket extending through the slot and equipped at its outer end with a head adapted when the holder member is slid longitudinally in one direction relatively to the beam to engage and coact with the surface in such manner as to urge the member inwards and cause it to clamp the beam against the form.

BROR HILLBERG.