This invention relates generally to metal forms utilized in making concrete structures and more particularly to a novel adjustable clamp for aligning aligners in a variably spaced relation to the forms for aligning the forms and for transmitting loads from one form to another. In the use of metal forms for erecting concrete structures, wherein the forms are assembled in a desired form wall structure for receiving concrete, and are then disassembled after the concrete has set, two problems have been encountered which prevent the attainment of the maximum efficiency for this type of concrete forming equipment. The first is concerned with the formation of a curved wall of forms and in maintaining the curvature of the wall after it has been formed. Present day procedure is to cut, and splice if necessary, wood aligners to set or fit the actual curvature of the form setup. This procedure is obviously time consuming and inefficient. Also after the specially cut wood aligners are used they are practically worthless for re-use.

The second problem is concerned with the formation of wall structures which include pilasters. Usually it is necessary to tie the opposed sides of a form structure together to withstand the pressure of the concrete. This is presently accomplished by the use of elongated strips of metal, commonly called spreader ties, secured between the opposed sides. When pilaster arrangements are formed, this usually necessitates the manufacturing and use of spreader ties of odd and unusual lengths.

It is an object of this invention to provide a novel adjustable clamp the use of which obviates the need for specially cut wood aligners and special spreader ties.

Another object of this invention is to provide an adjustable clamp engageable with a concrete form unit and with an ordinary straight aligner to adjustably position and clamp each a spaced relation to the other.

Yet another object of this invention is to provide an adjustable clamp which is readily secured to an aligner and capable upon manipulation to change a group of connected forms from a straight alignment to a curved alignment, and to maintain the curved alignment.

A further object of this invention is the provision of an adjustable aligner clamp connectable between an aligner, subject to thrust from a pilaster form arrangement, and a form in the main form structure adjacent the pilaster, wherein the thrust is transmitted through the aligner and the clamp to one or more conventional spreader ties connecting both sides of the form structure of the principal or main wall.

Another object of this invention is to provide an adjustable aligner clamp which is simple in construction, economical to manufacture, and effective in use.

These objects, and other features and advantages of this invention will become apparent from a consideration of the following description when taken in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective, fragmentary view of a plurality of concrete form units held in a curved alignment by a pair of adjustable aligner clamps of this invention, shown clamped to an ordinary wood aligner, with certain parts broken away for clarity of illustration;

FIG. 2 is an enlarged perspective view of an adjustable aligner clamp;

FIG. 3 is a sectional view taken along the line 3-3 in FIG. 1 and showing the adjustable aligner clamp in side elevation, certain parts broken away and others in section for illustrative purposes;

FIG. 4 is a sectional view taken along the line 4-4 in FIG. 1 and showing the adjustable aligner clamp in plan view, parts broken away for clarity;

FIG. 5 is an enlarged sectional view taken along the line 5-5 in FIG. 2; and

FIG. 6 is a diagrammatic plan view of a pilaster arrangement of the form units, aligner, adjustable aligner clamps, and spreader ties.

In FIG. 1, a plurality of forms 10, 11, and 12 are shown held and maintained in a curved alignment by means of a conventional wooden 2 x 4 aligner 13 secured to the outer ends 14 of the group of forms by commercially available aligner clamps 16, and secured in spaced relation to the forms by a pair of adjustable aligner clamps 17.

The forms 10, 11, and 12 are rectangular in shape and are substantially identical, differing only as to size. Each form includes a flat base plate 18 having straight edges 19, and including a flange 21 integral with each edge 19 and projected laterally therefrom. One or more parallel ribs 20 of substantially identical design also project laterally from the face of each base plate 18 as illustrated.

Each flange 21 is provided with a pair of uniformly spaced rows of openings 22 and 23 whereby adjacent flanges of adjacent forms can be assembled together by a plurality of commercially available plate clamps 24. A row of spaced openings 25 is also provided in each rib 20.

Each clamp 24 (FIG. 4) is provided with a pair of spaced jaws 27, an actuating handle 28, and a fulcrum arm 26 which is insertable through aligned pairs of openings 22, for example. The aligner clamps 16 are each provided with arms 29 which straddle the aligner 13 and the ends of which are adapted to be inserted through openings 22 or 23 in one or more flanges 21 as illustrated, and includes further cam linkage 31 for clamping the aligner 13 tightly against the adjacent one or more flanges 21.

Referring now particularly to FIGS. 2-5 inclusive, each adjustable aligner clamp 17 comprises an elongated flat bar 32 having a connector 33 at one end for attachment either to a form at a rib 20 or to a pair of adjacent forms at their engaged flanges 21. A clamp device 34 mounted on the bar 32 for longitudinally translating the connector relative thereto clamps the aligner 13 and the ribs 20 together.

Specifically, the connector 33 (FIGS. 2 and 5) includes a pair of parallel plates 36 and 37 spaced on either side of the end 38 of the bar 32 and pivotally connected thereto by a transverse pivot pin 39. As the opening 41 in the bar end 38 is larger than the pin 39, the bar 32 is not only pivotally movable in the same plane as the plates 36 and 37 but is also laterally movable relative thereto. The upward and downward movement of the plates is limited by an insert 40 between the upper edges of the plates 36 and 37, and by an insert 42 between the rear edges 43 and 43' thereof, the insert 42 also providing a measure of support for the bar 32. To adapt the connector 33 for engagement with a rib 20 or one or more flanges 21, the leading edges 44 and 44' (FIG. 5) are flared outwardly from each other, and are provided with transverse edges 46 of substantially the same size as those in the ribs and flanges.

The clamp device 34 includes a hollow housing 47 (FIG. 2) formed with elongated transversely opposed slots 49 (FIG. 2) for receiving the bar 32 therethrough and whereby the bar 32 is adapted to slide back and forth through the housing 47. As the length of the slots
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49 is more than the height of the bar 32, the bar is also movable upwardly and downwardly or longitudinally relative to the housing 47. At one end 51 of the housing 47, an arm 52 extends over and parallel to the upper edge 53 of the bar 32, and toward the connector 33. The lower end of the arm 52 is provided with a cleat 54 the purpose of which will be seen hereinafter.

A stop arm 56 extends from the housing end 51 in an opposite direction relative to the arm 52 at a position adjacent to the bar edge 53. The free end of the stop arm 56 carries a cleat 57 adapted to fit into any one of the serrations 58 formed on a portion of the bar edge 53. To controllably move the bar 32 and the clamp device 34 toward and away from each other, a handle 59 is provided with a threaded rod 61 threadable within an opening 65 formed in the housing 47. The upper end 60 (FIG. 3) of the rod 61 is movable into engagement with the lower edge 62 of the bar 52. A projection 60 (FIG. 3) is provided on the end of the bar 32 opposite the connector end to prevent the clamp device 32 from sliding off.

In use, after the arms 10, 11, and 12 are set up in a clamping relationship by the plate clamps 24, and the aligner 13 is secured in its extended form by the assembly by the straight aligner clamps 16 wherein the aligner 13 is disposed substantially normal to the ribs 20 and flange 21, one or more of the adjustable aligner clamps 17 are set in place. It should be noted here that the forms can be set up in a straight alignment, wherein the clamp 17 is used initially to obtain the desired curved alignment of the forms, or they can be set up where they are already in the desired curved alignment, and wherein the clamp 17 is used to maintain the curved alignment. The flanges 21 can be flexible, relative to their base plate 18, or they can be rigid. For practical purposes, however, even though specified as rigid they will flex slightly relative to their base plates.

With the rod 61 backed off so that the housing 47 is movable relative to the bar 32, the bar is positioned under the aligner 13 until the flared edges 44 and 44' of its connector 33 straddle a pair of clamped flanges 21 (FIG. 4), for example, at a location wherein a pin 63 is inserted through the aligned openings 46 and 22. Due to the loose connection between the bar 32 and the connector 33, the bar 32 can be set at a position slightly angularly relative to the flanges 21. With the under side 64 (FIG. 3) of the aligner 13 engaging the upper edge 53 of the bar 32, the clamp device 34 is moved toward the aligner 13 until the inner side 66 (FIG. 3) of the housing 47 engages the outer side 67 of the aligner 13, and with the arm 52 poised over the aligner 13.

The rod 61 then threaded toward and into engagement with the lower edge 62 of the bar 32, and with the cleat 57 of the stop arm 56 engaged in a serration 58, continued rotation of the rod 61 acts as a jack screw with respect to the housing 47, and the arm 52 is brought down and into clamping engagement with the aligner 13, the cleat 54 digging into the aligner's upper side 68. To secure an aligner clamp 17 between a rib 29 and the aligner 13, the same procedure is utilized.

Referring now to FIG. 6, a pilaster arrangement is shown in a form structure. One wall 70 of the form structure is straight, while the other wall 71 includes the pilaster that comprises an outer form 72, a pair of parallel side forms 73, and a pair of inside ninety degree corner forms 74, having their flanges 76 clamped to the flanges of a pair of adjacent forms 77 of the wall 71. Conventional spreader ties 78 are extended throughout and secured to the forms 77 and to the opposed wall 70 of the forms. An aligner 79 is placed across the face of the outer form 72 and its outer exposed ends 81 are clamped to the flanges 76 by a pair of adjustable aligner clamps 17. By this arrangement, the force of the concrete against the outer form 72 is transmitted through the aligner 79, the clamps 17, and the flanges 76 and their respective forms to the spreader ties 78.

Although a preferred embodiment of the invention has been disclosed herein, it is not to be so limited as various modifications can be made therein which are within the full scope of the invention as defined in the appended claims.

I claim:

1. An adjustable clamping device for holding a section of a concrete form unit in a desired spaced relation with an aligner member having a portion thereof arranged opposite said section and a portion transversely spaced portions thereof anchored to said section, said section including a laterally projecting rib, said device including an elongated bar adapted to be positioned transversely of said aligner member, with one side of said bar adjacent to one side of said aligner member, adjustable connector means pivotally mounted on one end of said bar and being adapted for securement to the projecting rib, a clamp means mounted on said bar for longitudinal and lateral movement relative thereto to an adjusted position spaced from said section, said clamp means including a first clamp portion engageable with an opposite side of said aligner member and a second clamp portion engageable with said one side of the bar, and means on said clamp device intermediate said clamp portions for moving said first and second clamp portions into clamping engagement, respectively, with said aligner member and said bar, said clamp means anchoring said aligner member and bar member in said adjusted position thereof, whereby said bar member is firmly positioned between the aligner member and the rib of said section.

2. An adjustable clamping device for holding a section of a concrete form unit in a desired spaced relation with an aligner member having a portion thereof arranged opposite said section and other longitudinally spaced portions thereof anchored to said section, said section including a laterally projecting rib, said device including an elongated bar adapted to be positioned transversely of said aligner member, with one side of said bar adjacent to one side of said aligner member, a form connector pivoted at one end to one end of said bar, said connector including a pair of spaced, extending flanges spaced from said pivot connection, said flanges being adapted for securement to the rib of said section, a clamp means mounted on said bar for longitudinal and lateral movement relative thereto to an adjusted position spaced from said section, said clamp means including a first clamp portion engageable with an opposite side of said aligner member and a second clamp portion engageable with said one side of the bar, and means on said clamp device intermediate said two clamp portions for moving said first and second clamp portions into clamping engagement, respectively, with said aligner member and bar, said clamp means anchoring said aligner member and bar member in adjusted position thereof, whereby said bar member is firmly positioned between the aligner member and the rib of said section.

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