Jan. 20, 1942. A. C. JUHL 2,270,448

ADJUSTABLE TIE FOR CONCRETE FORMS

Filed May 31, 1939 3 Sheets-Sheet 1

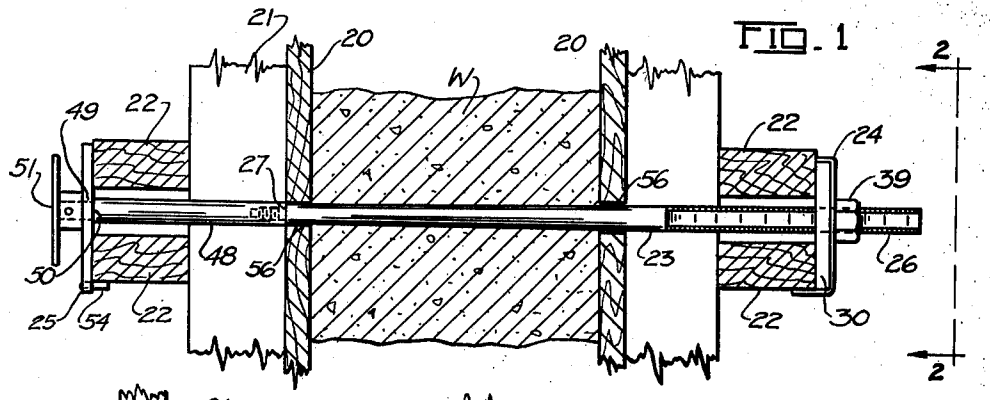

FIG. 1

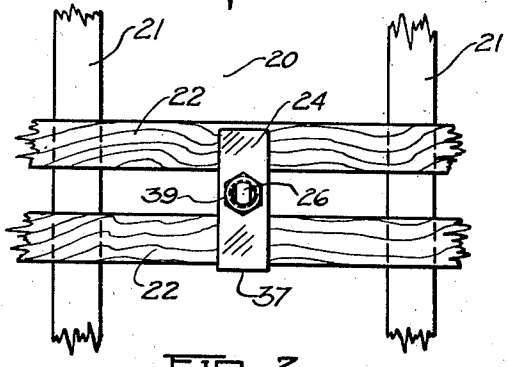

FIG. 2

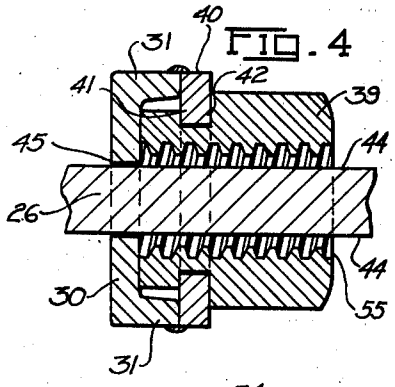

FIG. 4

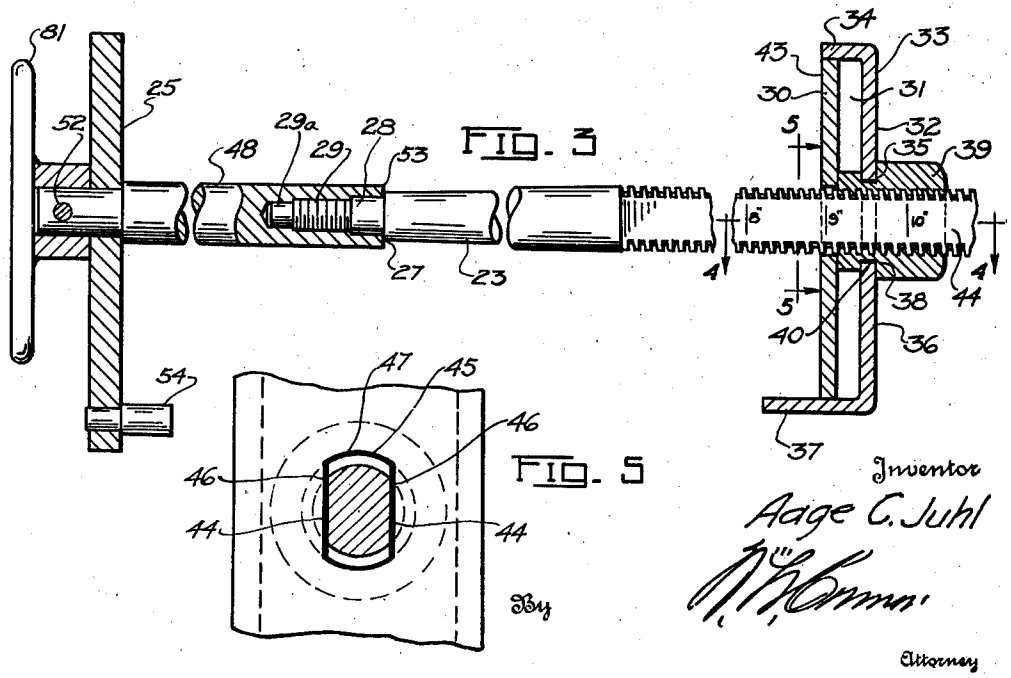

FIG. 3

FIG. 5

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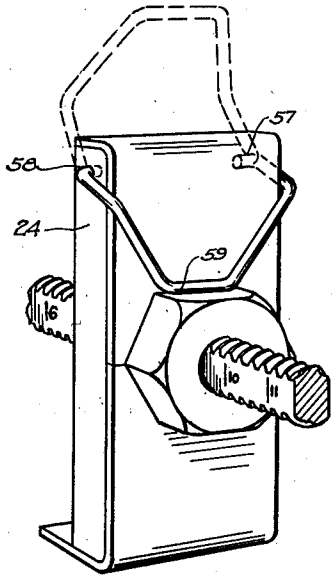
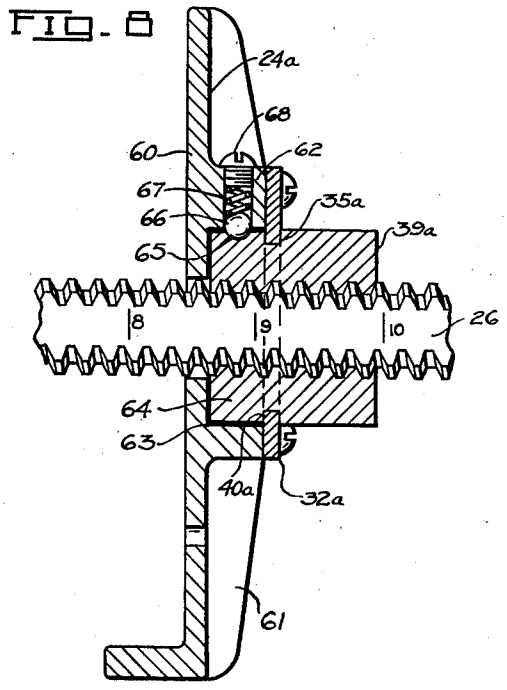


FIG. 6

FIG. 8



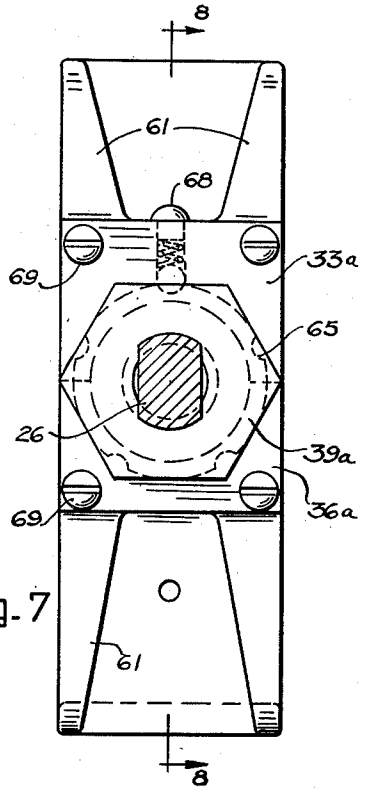


FIG. 7

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ADJUSTABLE TIE FOR CONCRETE FORMS

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FIG. 9

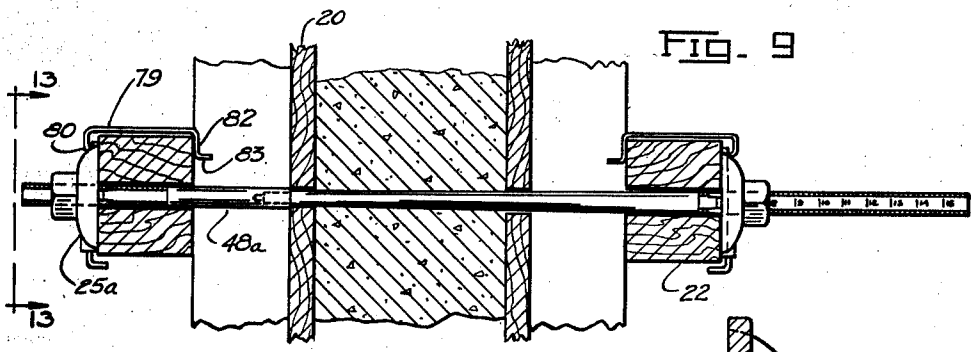


FIG. 12

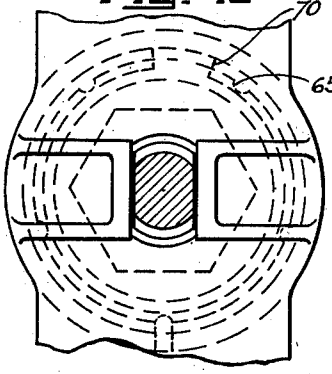


FIG. 11

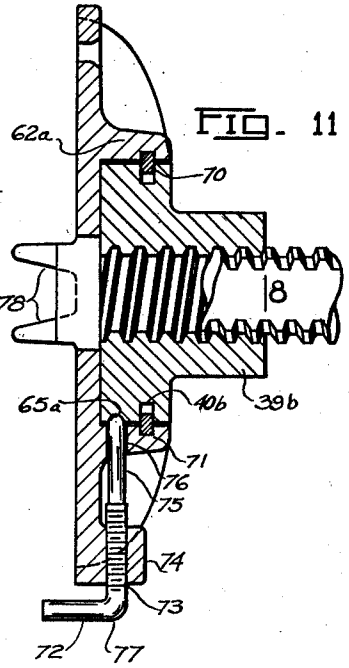


FIG. 13

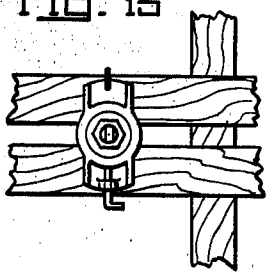
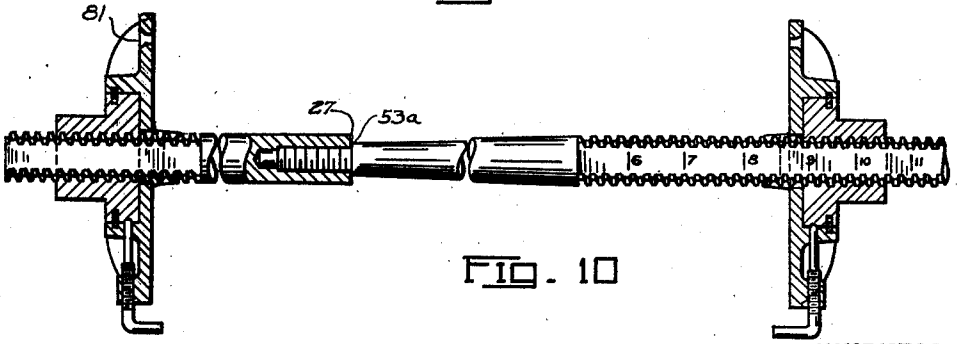


FIG. 14

FIG. 10



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Patented Jan. 20, 1942

2,270,448

UNITED STATES PATENT OFFICE

2,270,448,

ADJUSTABLE TIE FOR CONCRETE FORMS

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Application May 31, 1939, Serial No. 276,590

9 Claims. (Cl. 25—131)

In its broader aspects my invention is directed to the provision of a tie—of the permanent type—for concrete forms, which may be easily and quickly applied to a form and which may be just as easily and quickly removed for further use. In its more limited scope my invention contemplates the embodiment of certain features for making the tie adjustable to forms for walls of different thickness and also means for aiding in its removal from the wall after the concrete has set.

It is a characteristic of my invention that, in addition to providing a tie for holding the form walls against outward lateral displacement, I provide means for holding the form walls against inward lateral displacement, before the cement is poured, thus eliminating necessity for use of internal spacer blocks or spreaders, as required with other forms of ties.

Various means and devices have heretofore been devised for securing the side walls of concrete forms in properly spaced relation, ranging all the way from plain galvanized wire and strips of flat metal—commonly known as band metal—to various types of bolts and more complicated devices.

When wire or strip metal is used it is intended that it remain in, and cannot be removed from, the concrete after it has set sufficiently to permit the forms to be removed, and for this reason is merely passed through the sheathing forming the sides of the form and the ends tied at the outer faces by any suitable means. As such ties merely hold the sheathing against outward displacement, temporary spacer blocks or spreaders must be placed at intervals between the sheathing walls to hold them against inward displacement. In such instances the spacer blocks serve as gauges to properly space the walls, as this cannot be accurately or conveniently done in the placement of the ties. While these are inexpensive types of ties, as far as cost of material is concerned, the method of their placement and the time and labor required adds greatly to their initial cost. Also, the spacer blocks must be removed as the pouring of the concrete progresses. One of the principal objections to the use of ties which are intended to be left in the concrete, such as those just described, where the ends are sheared off at the face of the wall, is that the exposed ends—even though covered with a plaster coating, which, at best, is porous—are subject to oxidization, the result of which may be conveyance of rust and moisture to the interior of the wall, sufficient to damage and discolor it and its finish, as well as to disfigure the outside of the wall with rust stains.

The more expensive types of ties, such as elongated bolts and the like, due to their cost, are not intended to be left in the concrete but are removed as soon as the cement has set sufficiently to warrant removal of the forms. The usual spacer blocks or braces are also generally used with such ties.

The principal objection to the use of the more expensive ties now on the market is, that rods of different lengths must be provided for the construction of walls of different thicknesses. In the case of a contractor, for instance, who is engaged in the business of constructing walls of different thicknesses, he must provide ties for each different thickness of wall he constructs, the most commonly constructed walls being from eight to sixteen inches in thickness. This means that he must have considerable capital invested in ties that he may only use occasionally.

A further objection to the use of the last mentioned ties, is the difficulty of removing them from the concrete after it has set. In most instances, after the end nuts, or other securing means, have been removed and the form boards taken away, they are hammered out. This not only results in damage to the rods but also to the wall. In some cases wrenches and jacks are used to break them loose, both of which also damage the rods and walls.

It is therefore an object of my invention to provide a tie of the permanent type, which may be easily and quickly adjusted to a form and as easily and quickly removed from the concrete after it has set.

It is also an object of my invention to provide a tie embodying adjusting means, whereby a single tie may be used in constructing walls of different thicknesses.

It is a further object of my invention to provide a tie equipped with means whereby it may be easily withdrawn from the concrete after it has set.

It is a further object of my invention to provide a tie which not only embodies adjusting means whereby it may be used in connection with forms for walls of different thicknesses, but which adjusting means also serves as a gauge to laterally space the sides of the form with relation to each other.

And it is also an object to provide a tie which not only holds the sides of the form against lateral outward displacement, but which also holds them against lateral inward displacement, thus

eliminating necessity for use of spacer blocks or spreaders.

The details of my invention will be more fully set forth in the following specification, reference being made therein to the accompanying drawings, in which:

Fig. 1 is a fragmentary transverse sectional view of a concrete wall, with forms in place, showing the manner in which my tie is applied.

Fig. 2 is a side face view taken as indicated by the line 2—2 of Fig. 1;

Fig. 3 is an enlarged view of the tie shown in Fig. 1, details of which are shown partly in section;

Fig. 4 is a sectional view taken as indicated by the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary view taken as indicated by the line 5—5 of Fig. 3;

Fig. 6 is a prospective view of the adjusting or gauge end of the tie, showing one means of latching the adjusting nut;

Fig. 7 is a front face view or elevation of the clamping block shown in Fig. 6, showing a modified form of means for latching the adjusting nut;

Fig. 8 is a vertical sectional view taken as indicated by the line 8—8 in Fig. 7;

Fig. 9 is a view similar to Fig. 1, showing another modified form of my tie;

Fig. 10 is an enlarged, longitudinal sectional view of the tie shown in Fig. 9, the rod being shown in side elevation.

Fig. 11 is a further enlarged vertical sectional view of the clamping block shown at the right hand end of Fig. 10, showing another form of means for latching the adjusting nut.

Fig. 12 is a fragmentary face view taken as indicated by the line 12—12 of Fig. 11.

Fig. 13 is a view taken as indicated by the line 13—13 of Fig. 9; and

Fig. 14 is a view similar to Fig. 1, showing another way in which my adjustable blocks may be used when the tie rod is to be left in the set concrete.

Referring now to the drawings and particularly to Figs. 1 to 5, the numeral 20 designates the parallel, vertical side walls or sheathing of a concrete wall form, 21 the vertical braces or studding and 22 the horizontal bracing or wales. W represents the concrete wall.

In its most simplified form my tie consists of a rod 23, which may be either cylindrical or polygonal, a clamping and adjusting block, generally designated by the numeral 24, and a removable clamping block generally designated by the numeral 25. For convenience of description I will refer to the block 24 as the adjusting block and the block 25 as the securing block, as the latter is intended to be applied after the proper adjustment has been made and the rod 23 is in place, as shown in Fig. 1.

The rod 23 is provided at one end with screw threads 26—preferably of the "Acme" type—extending for a portion of its length, and is reduced at its opposite end to form an annular shoulder 27. The reduced portion 28 is further reduced and externally screw-threaded as at 29. Beyond the screw-threaded portion the end is further reduced as at 29a. That portion of the rod 23 intermediate the screw-threaded portion 26 and the annular shoulder 27, being the portion which is to be surrounded with the concrete, is preferably slightly tapered to facilitate its withdrawal from the concrete after it has set.

The adjusting block 24 may be formed in any suitable manner, my preferred, simplified form being that shown in Figs. 1 to 5. This consists of a channel portion 30, having side flanges 31, to which is secured a cover or face plate, generally designated by the numeral 32. The face plate 32 is made in two halves; the upper half 33 being bent over to form a flange 34 and having a central, semi-circular cut-out 35 and the lower half 36 being bent over to form a flange 37 and likewise having a central, semi-circular cut-out 38. When the two halves 33 and 36 are brought together in proper relation, the two semi-circular cut-outs form a circular aperture in the center of the composite plate 32, for a purpose to be hereinafter explained.

An adjusting nut 39 adapted to receive a wrench is mounted on the screw-threaded portion 26 of rod 23 and is provided with an annular channel 40, having sides 41 and 42, adapted to bear against the inside and outside faces, respectively, of the composite plate 32 when the two halves are brought together in proper relation. The cut-outs 35 and 38 of plates 33 and 36, are of such a size that when the two halves are brought together, they will extend into the annular channel 40 of nut 39, as shown in Figs. 3 and 4. In this manner the block 24 is carried along the screw-threaded portion 26 of rod 23 by adjusting nut 39 to ride free and clear of the screw-threads. The plates 33 and 36 may be secured together and to the channel portion 30 in any suitable manner, such as by welding. As shown in Figs. 1 and 3, flange 37 extends beyond the outer face 43 of the portion 30, to engage the bottom surface of the lower wale 22, to hold block 24 and rod 23 against rotation when the tie is in place.

As shown in Figs. 3 and 5 the sides of the screw-threaded end 26 of rod 23 are flattened, as at 44, and the block 24 is held against relative rotation thereon by means of an aperture 45, in the web of the channel portion 30, of the same shape, but slightly larger than the cross-sectional configuration of the rod; that is, the aperture has straight sides 46 and arcuate top and bottom sides 47, as shown in Fig. 5.

The securing block 25 is rotatably mounted on a rod 48. Rod 48 has a reduced end 49, forming an annular shoulder 50, the reduced portion extending through a circular aperture in the block and having a hand grip member 51, non-rotatably fixed thereon by means of a pin 52. Block 25 is thus rotatably secured between shoulder 50 and the inner face of the hub of the hand grip member 51, so the block 25 may rest against the outer faces of the wales during either the attaching or detaching operation. The opposite end of rod 48 is bored to receive the reduced portion 28 of rod 23, counter bored and internally screw-threaded to receive the screw-threaded end 29 and further counter bored to receive the further reduced end 29a. By this means the rod 48 may be properly centered on the screw-threaded end of rod 23, so that binding and stripping of the threads will be avoided. Preferably rod 48 will be of a diameter to provide an annular shoulder 53 when it is on rod 23.

While I have shown the hand grip member 51 non-rotatably secured to the rod 48 by pin 52, it will be readily understood that, should the type of construction require it, a more substantial or greater force resisting connection may be used, such as screw threads supplementing the pin or welding. Also, instead of the hand grip a nut for receiving a wrench may be utilized or a

construction as shown in Fig. 10, which will be later described.

In ordinary practice concrete walls range from eight to sixteen inches in thickness, although thicker walls are often constructed. The sheathing **20** is usually made of 1 inch boards; the vertical bracing or studs **21** are 2" x 4" timbers placed edgewise to the sheathing and the wales are likewise 2" x 4" timbers placed edgewise transversely of the studs **21**. For an eight inch wall the total thickness between the outer faces of the wales is approximately 24⅛ inches and for a sixteen inch wall, 32⅛ inches. Consequently, the length of the tapered portion of the rod **23** between the shoulder **27** and the threaded portion **26** would be approximately 16 inches and the length of the threaded portion **26** would be at least 8 inches, plus the thickness of block **24** and adjusting nut **39**. The length of the tapered portion **23** is such that for any given wall thickness no part of the threaded portion **26** will extend beyond the inner face of the adjacent sheathing. The length of the rod **48**, or the distance between the inner face of block **25** and shoulder **53**, would remain the same for all thicknesses of walls, as it is intended that shoulders **27** and **53** abut at the outer face of the sheathing **20**, as shown in Fig. 1.

The sides of flat surfaces **44** on the screw-threaded end **26** may be provided with numbered gauge marks as shown in Fig. 3, whereby the block **24** may be set for a wall of any desired thickness within the range of its use, say from eight to sixteen inches. The gauge marks **54** are so placed that when the outer face **55** of adjusting nut **39** coincides with any one of them, the adjacent numeral indicates the thickness of the wall for which it is set.

After the studs **21**, sheathing **20** and wales **22** are erected, the ties are placed. Holes **56** are bored in the sheathing, centralized with respect to the spaces between the parallel wales, the latter being spaced apart a distance sufficient only to accommodate the rods and receive the blocks **24** and **25**. By rotating the adjusting nut **39** on the screw-threaded end **26**, guided by the markings on the flat surfaces **44**, block **24** is set at the point desired for the thickness of the wall being constructed. This may be done either in the shop or on the job. Rod **23** is then extended through the bores **56** and the block **24** placed against the outer faces of the adjacent wales **22** with flange **37** engaging the bottom face of the lower wale.

When the block **24** is properly set, shoulder **27** on rod **23** will be flush with the outer face of the adjacent sheathing **20** as shown in Fig. 1, with the threaded end **29** extending outwardly therefrom. Rod **48** is then screwed into the threaded end **29** and tightened up until its shoulder **53** abuts against shoulder **27**, at which time plate **25** will abut against the adjacent wales **22**, with the stud **54** engaging the bottom face of the lower wale **22** to hold the plate against rotation. Block **24** being non-rotatably mounted on the threaded end **26** and flange **37** engaging the bottom face of the adjacent lower wale **22**, the rod **23** is held against rotation while rod **48** is being applied. The same is true when rod **48** is being removed.

After the concrete has been poured and allowed to set for a sufficient length of time to permit removal of the forms, the rod **48** is first removed. Inasmuch as the concrete has set around the tapered portion **23**, some considerable force is required to remove it. This is supplied merely by applying a wrench to the adjusting nut **39** and turning it in the direction necessary to withdraw the tapered portion **23** only a short distance through the block **24**, after which it can be easily removed by hand.

With the above described construction and the great force which may be applied, my tie may be easily and quickly removed from the concrete without damage to either the wall or the tie.

While in the structure just described, the frictional resistance between the composite plate **32** and adjusting nut **39**, when the tie is tightened, will ordinarily be sufficient to hold the nut **32** against free rotation on the screw-threaded portion **26**, there may be instances where the vibrations caused by construction operations and pouring the concrete, may jar the adjusting nut loose and cause a loosening up of the tie. To offset this I have devised several forms of means for latching the adjusting nut against jarring loose, one of which is illustrated in Fig. 6. This consists of a wire loop, having inturned ends **57** extending into apertures **58** in the sides of block **24**, whereby it can be swung from the position shown in full lines to that shown in dotted lines and vice versa. It has a flattened portion **59** arranged to engage one of the flat faces of the nut **39** after the tie has been adjusted for a wall of the desired thickness.

Another type of means for latching the adjusting nut against free rotations is shown in Figs. 7 and 8. In this instance I have shown the block **24*a*** to be a casting of suitable metal. This consists of a face or clamping surface **60** provided with side flanges **61** and a central boss **62**. Boss **62** is centrally bored to form a circular seat **63** for the reception of the cylindrical end **64** of the adjusting nut **39*a***. Nut **39*a*** has an annular shoulder **40*a*** formed on its periphery, and a retaining plate, **32*a***, similar to composite plate **32**, is provided to retain the nut **39*a*** in its seat, the plate being provided with a circular aperture **35*a*** to receive the nut, as in the case of composite plate **32**, as shown in Fig. 8. The periphery of the cylindrical portion **64** of nut **39*a*** is provided with a plurality of spaced indents **65**, adapted to be engaged by a ball detent **66**. Detent **66** is yieldingly held in pressural engagement with the periphery of the nut portion **64** by an expansile helical spring **67**, confined between the ball **66** and a cap screw **68**. Any number of the indents may be provided depending upon the fineness of adjustment desired. Plates **33*a*** and **36*a*** may be secured in place by cap screws **69**.

In Figs. 9 to 13, inclusive, I have illustrated another form of block and latching means. The forms of block and nut are similar to those just described, except that I retain the adjusting nut in its seat by an expansile split ring **70**.

The adjusting nut **39*b*** is provided with an annular channel **40*b*** and an opposite channel **71** is cut in the boss **62*a*** into which the split ring **70** may expand. Channel **40*b*** is of sufficient depth to receive the split ring **70** when it is contracted, but channel **71** is only of a depth to receive half the thickness of the ring, as shown in Fig. 11, so as to retain the nut **39*a*** against removal.

Instead of the spring pressed detent as shown in Fig. 8 I have provided a manually operable screw **72**, adapted to cooperate with a plurality of peripheral indents, **65*a***. Screw **72** has an intermediate screw-threaded portion **73** by which it is mounted in an internally screw-threaded

boss 74. An extended end 75 extends through a smooth bore 76 in the boss 62a and is rounded to engage in indents 65a. It is not, however, essential, that indents 65a be provided, as the end 75 engaging the periphery of the portion 62a will be sufficient to normally retain it against rotation. The lower end 77 is bent to form a handle portion by which the screw is rotated. As in the case of the detent shown in Fig. 8, any number of the indents 65a may be provided to give the desired fineness of adjustment. The screw threads 73 are such that a one quarter turn of the handle portion 77 will move the end 75 into and out of engagement with the indents 65a. Thus after the block has been placed at the desired point on the rod, and the rod inserted in the form, the handle 77 is turned to the position shown in Fig. 11, locking the nut in place and providing a means for engaging the lower wale, to hold the rod against turning, as shown in Fig. 9.

The adjusting block shown in Figs. 9 to 13, inclusive, may be provided on its inner face with outwardly extending flanges 78, arranged to engage the adjacent faces of the wales 22, to also hold the rod against rotation when the tie is in place.

While I have shown the screw 72 to be a desirable feature in my combination, this element may be eliminated, if desired, as under all ordinary working conditions the frictional resistance between nut 39b, ring 70 and the block will be sufficient to hold nut 39b against free rotation after the tie is in place in the form.

A convenient means for holding the sides of the form against inward displacement may be provided as shown in Fig. 9. This may consist of a yoke 79 formed of suitable material, such as heavy steel wire, bent to provide an inturned end 80 adapted to extend into an aperture 81 adjacent the top of the block. The opposite end is bent downwardly, as at 82, and then outwardly, as at 83; the portion 82 providing a yielding or spring grip and the portion 83 providing a hand grip portion. The yoke 79 is easily and quickly applied and as easily removed.

It is to be noted that in Figs. 9 and 10, I have shown the blocks at both ends of the tie to be adjustably mounted on their respective rods.

This arrangement is particularly efficacious where it is desired to use the clamps in the construction of a wall of more than usual thickness. For instance, if a group of clamps as shown in Fig. 9 are made for use in the construction of walls of from 8 to 16 inches in thickness and it is desired to use them in the construction of a 20 inch wall, the additional thickness may be compensated for by the adjustable extensibility of the securing block 25a shown at the left in Fig. 9. In such case the block 25a, being adjustably mounted on the screw-threads 26a may be extended so the shoulders 27 and 53a would meet at a point between the sheathings 20

In Fig. 14 I have shown how a pair of the blocks 25a as shown at the left in Fig. 9, may be used in cases where the intermediate tie portion is intended to remain in the concrete. An intermediate round steel rod, about ⅜ of an inch in diameter, may be screw-threaded at each end to receive the internally screw-threaded ends of the adjusting and securing rods 48a. After the concrete has set the adjustable ends are removed and the holes formed thereby closed by cementing.

In the use of my improved tie, the block 24 may be set on the screw-threaded end 26 of the rod 23 either in the shop or just before being placed in the forms. Ordinarily the most convenient way will be to adjust block 24 to its proper position of the screw-threaded end 26 just before it is placed in the form, using the gauge marks on the flattened side 44, to set it to the desired thickness of wall Prior to this adjustment the sheathing 20, studs 21 and wales 22 are in place, the latter being positioned for proper spacing of the ties. The holes 56 are then bored and the rod 23 inserted, from the right in Fig. 1. Rod 48 is then applied and screwed up until the shoulder 53 abuts shoulder 27. Should the sheathings at this time be spaced too far apart they will be drawn together and properly spaced by attaching rod 48, and should they be too close together they will be properly spaced by the blocks 24 and 25 and shoulder 27, when the concrete is poured.

When securing blocks, as shown at left in Fig. 9 and in Fig. 14, are used, they may be removed in the manner hereinbefore described in connection with Fig. 1.

It is to be noted that the use of the screw-threads on the rods will not be objectionable from the standpoint of concrete spilling over the side of the form into them, as the wales sufficiently protect them during pouring of the concrete to admit of no interference in moving the blocks along the threads in effecting removal of the rods after the concrete has set.

While I have shown and described the preferred specific embodiment of my invention, together with the several preferred modifications thereof, I nevertheless reserve the right to make such other changes and modifications in structure as will come within the scope of the claims appended hereto.

Having described my invention, I claim:

1. In the concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod, the opposite end of the rod being screw-threaded to receive a second rod.

2. In a concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage the form to hold the block against rotation relative to the form, the opposite

end of the rod being screw-threaded to receive a second rod.

3. In a concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod; the opposite end of said rod being externally screw-threaded, that portion of the rod between said screw-threaded ends being tapered smaller towards the last mentioned screw-threaded end; and clamping means for said last mentioned end.

4. In a concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage the form to hold the block against rotation relative to the form; latching means cooperative between said block and nut whereby the nut is held against rotation relative to the block; the opposite end of said rod being externally screw-threaded, that portion of the rod between said screw-threaded ends being tapered smaller towards the last mentioned screw-threaded end; and clamping means for said last mentioned end.

5. In a concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod; a U-shaped form engaging yoke pivotally mounted at one end on one end of the block to swing in a plane parallel to the axis of the rod, said yoke being constructed and arranged to yieldingly engage over a wale-piece of a form; the opposite end of said rod being externally screw-threaded, that portion of the rod between said screw-threaded ends being tapered smaller towards the last mentioned screw-threaded end; and clamping means for said last mentioned end.

6. In a concrete form tie, the combination of: a tie rod externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, said block comprising a face plate adapted to engage the form, the adjacent end of the nut engaging the rear surface of said face plate; an annular channel in the nut and means cooperating between the clamping block and nut whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, there being cooperative surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage the form to hold the block against rotation relative to the form; latching means cooperative between said block and nut whereby the nut is held against rotation relative to the block; a U-shaped form engaging yoke pivotally mounted at one end on one end of the block to swing in a plane parallel to the axis of the rod, said yoke being constructed and arranged to yieldingly engage over a wale-piece of a form; the opposite end of said rod being externally screw-threaded, that portion of the rod between said screw-threaded ends being tapered smaller towards the last mentioned screw-threaded end; and clamping means for said last mentioned end.

7. In a concrete form tie, the combination of: a tie rod formed of two detachably connected parts, one part being externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, the inner end of the nut bearing against the adjacent face of the block, there being complementary surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage a form to hold the block against rotation relative to the form; the opposite end of said rod being reduced to form an annular shoulder and being externally screw-threaded on said reduced portion, that portion of the rod between said screw-threaded ends being tapered smaller towards the reduced end and being of a length to extend through the wall for which it is adapted; the other portion of the rod being bored and internally screw-threaded to receive the externally screw-threaded reduced end of the first mentioned part and being of a larger diameter than the shoulder on the reduced end of the first mentioned part to form an annular shoulder therearound when the two parts are screwed together; a clamping block rotatably mounted adjacent the outer end of the second mentioned part, means to hold said block against longitudinal displacement thereon, there being means associated with said second mentioned part for rotating it.

8. In a concrete form tie, the combination of: a tie rod formed of two detachably connected parts, one part being externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, the inner end of the nut bearing against the adjacent face of the block, there being complementary surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage a form to hold the

block against rotation relative to the form, the opposite end of said rod being reduced to form an annular shoulder and being externally screw-threaded on said reduced portion, that portion of the rod between said screw-threaded ends being tapered smaller towards the reduced end and being of a length to extend through the wall for which it is adapted; the other portion of the rod being bored and internally screw-threaded to receive the externally screw-threaded reduced end of the first mentioned part; and a clamping block on said last mentioned part.

9. In a concrete form tie, the combination of: a tie rod formed of two detachably connected parts, one part being externally screw-threaded at one end for a portion of its length; a nut on said screw-threaded end; a clamping block carried by said nut to ride free and clear of the threads, whereby the block may be adjusted to different positions on the rod and held against longitudinal movement thereon, the inner end of the nut bearing against the adjacent face of the block, there being complementary surfaces on said rod and block whereby the block is held against rotation relative to the rod; means on the block adapted to engage a form to hold the block against rotation relative to the form, the opposite end of said rod being reduced to form an annular shoulder and being externally screw-threaded on said reduced portion, that portion of the rod between said screw-threaded ends being tapered smaller towards the reduced end and being of a length to extend through the wall for which it is adapted; the other portion of the rod being bored and internally screw-threaded to receive the externally screw-threaded reduced end of the first mentioned part and being of a larger diameter than the shoulder on the reduced end of the first mentioned part to form an annular shoulder therearound when the two parts are screwed together; a clamping block rotatably mounted adjacent the outer end of the second mentioned part, means to hold said block against longitudinal displacement thereon, there being means associated with said second mentioned part for rotating it; and a U-shaped form engaging yoke pivotally mounted at one end on one end of each of said blocks to swing in a plane parallel to the axis of the rod, said yoke being constructed and arranged to yieldingly engage over a wale-piece of a form, whereby the form walls are held in fixed spaced relation.

AAGE C. JUHL.