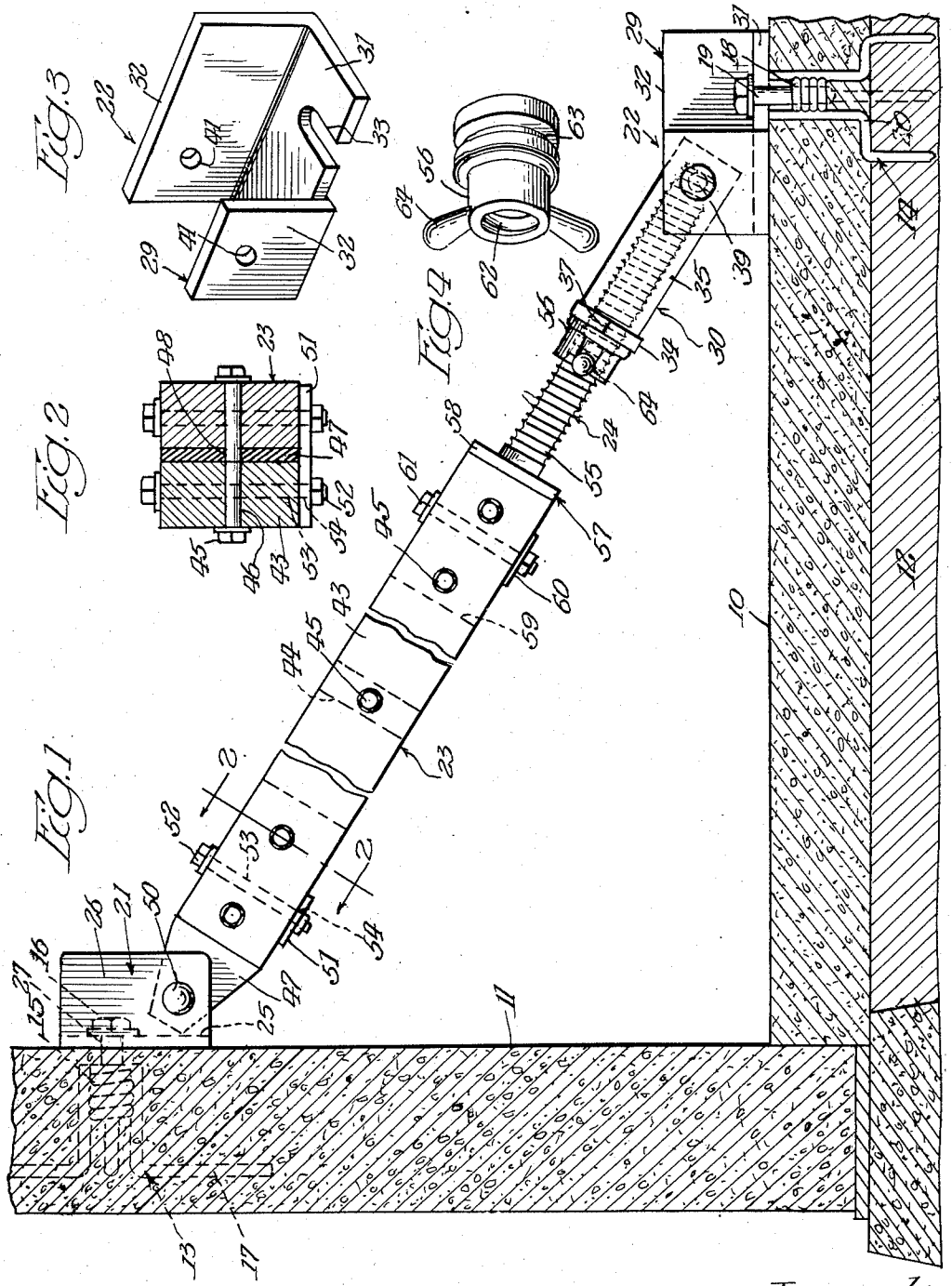
April 29, 1958 B. HILLBERG 2,832,559

ADJUSTABLE BRACE

Filed June 8, 1953 2 Sheets-Sheet 1



Inventor:
Bror Hillberg
By: Fred Gerlach atty.

April 29, 1958 B. HILLBERG 2,832,559

ADJUSTABLE BRACE

Filed June 8, 1953 2 Sheets-Sheet 2

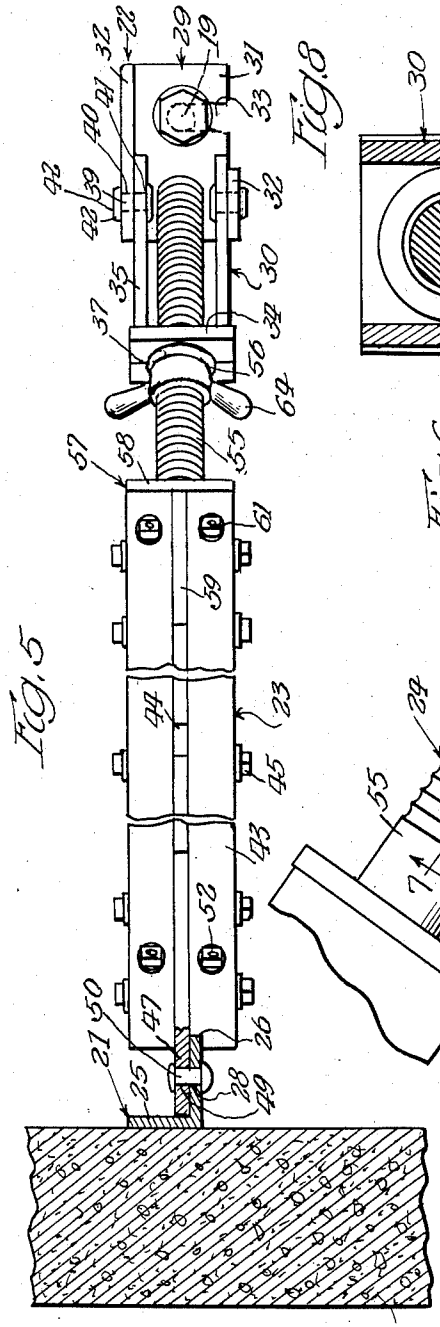


FIG. 5

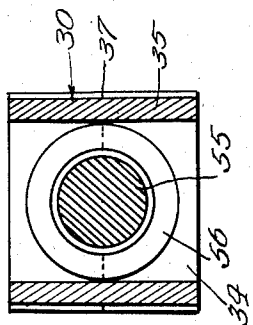


FIG. 8

FIG. 6

FIG. 7

Inventor
Bror Hillberg
By Fred Herlach Atty.

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2,832,559

ADJUSTABLE BRACE

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

Application June 8, 1953, Serial No. 360,033

2 Claims. (Cl. 248—354)

The present invention relates generally to adjustable braces. More particularly the invention relates to that type of brace which is adapted for use in connection with the construction of a concrete building, serves, after a substantially vertical wall slab is placed next to a substantially horizontal floor slab by a crane or like hoisting apparatus, to hold the wall slab in position while it is being fixedly secured in place and comprises an upper bracket having means for detachably securing it to the inner face of the wall slab at a location above the floor slab, a lower bracket having means for detachably securing it to the top surface of the floor slab at a location away from the wall slab, a rigid upwardly inclined strut extending between the brackets and having the upper end thereof pivotally connected to the upper bracket so that it and such bracket are free to tilt relatively to one another in a vertical plane, and an adjustable connection extending between the lower end of the strut and the lower bracket and adapted to shift the strut longitudinally in either direction in order that the wall slab may be tilted outwards or inwards into any desired angular position with respect to the floor slab as a preliminary to securing it in place.

One object of the invention is to provide an adjustable brace which is an improvement upon, and has certain inherent advantages over, previously designed braces including that which is disclosed in, and forms the subject matter of, my copending patent application Serial No. 288,839, filed by me on May 20, 1952 (now Patent No. 2,684,824, dated July 27, 1954), and is characterized by high efficiency and strength, facility of adjustment, simplicity of design and low cost of manufacture.

Another object of the invention is to provide an adjustable brace of the type under consideration in which the lower bracket consists of a fixed U-shaped floor slab engaging part and a tiltable U-shaped part having the outer ends of its side members pivotally connected to the upper ends of the side members of the fixed part so that it is free to swing up and down about a horizontal axis and embodying in its intermediate member a centrally disposed circular hole, and the adjustable connection between the lower end of the strut and the lower bracket, consists of (1) an elongated upwardly inclined externally threaded element which extends through the hole in the intermediate member of the tiltable part of the lower bracket, is disposed in parallel relation with the strut, and has the upper end thereof connected fixedly to the lower end of the strut; and (2) a single nut which is mounted on the element, has an externally disposed groove in which the hole defining portion of the intermediate member of the tiltable part of the lower bracket fits, and is adapted when turned in one direction positively to shift the element and strut upwards so as to effect outward tilting of the wall slab and when turned in the opposite direction positively to shift the element and strut downwards and thus effect inward tilting of the wall slab.

A further object of the invention is to provide an adjustable brace of the last mentioned character in which

the intermediate member of the fixed part of the lower bracket is provided with an opening to receive the shank of a lag screw for fixedly securing such part of the lower bracket to the wall slab, and the pivotal connections between the outer ends of the side members of the tiltable part and the upper ends of the side members of the fixed part of the lower bracket are so arranged with respect to the aforesaid opening for the lag screw that when the strut in connection with use of the brace is at a particular optimum acute angle with respect to the horizontal the imaginary longitudinal center line of the strut and the elongated screw threaded element substantially intersects said lag screw opening to the end that certain hereinafter described results are obtained.

A still further object of the invention is to provide an adjustable brace which is generally of new and improved construction, effectively and efficiently fulfills its intended purpose and involves a simple but novel arrangement of parts.

Other objects of the invention and the various advantages and characteristics of the present adjustable brace 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 of reference denote corresponding parts throughout the several views:

Figure 1 is a fragmentary side elevation showing an adjustable brace embodying the invention in operative relation with a concrete wall slab and a concrete floor slab after placement of the wall slab next to the floor slab by an overhead crane;

Figure 2 is an enlarged transverse section taken on the line 2—2 of Figure 1 and illustrating in detail the construction and design of the straight upwardly inclined strut of the brace;

Figure 3 is a perspective of the fixed U-shaped part of the lower bracket;

Figure 4 is a perspective of the wing nut that forms a part of the adjustable connection between the lower end of the strut and the lower bracket;

Figure 5 is a fragmentary plan view of the brace;

Figure 6 is an enlarged vertical longitudinal section of the lower bracket and the elongated screw threaded element and the nut that constitute the adjustable connection between the lower bracket and the lower end of the strut; and

Figures 7 and 8 are sections taken, respectively, on the lines 7—7 and 8—8 of Figure 6.

The adjustable brace that is illustrated in the drawings constitutes the preferred form or embodiment of the invention. It is adapted for use in connection with a floor slab 10 and a wall slab 11 and serves, as described hereafter more in detail, to hold the wall slab 11 in an upright position next to the floor slab while it is being secured in place in connection with the construction or formation of a concrete building. The floor slab 10 is shown as resting on a fill or foundation 12 at the site where the building is to be erected. It is contemplated that in connection with fabrication of the building a rectangular horizontally extending frame (not shown) will be placed on the fill 12. After the frame is suitably secured or anchored in place concrete in plastic form is poured into the bottom portion of the frame interior in order to form the floor slab 10. After pouring of the concrete for such slab a film or layer of non-adhesive material is applied to the top surface of the concrete. Thereafter concrete is poured into the upper portion of the frame interior in order to form the wall slab 11.

After hardening or setting of the concrete for the two slabs the wall slab is suitably connected to a crane or other hoisting mechanism (not shown) and is first lifted by the aforementioned crane or other hoisting mechanism and then tilted into a substantially vertical position. After the tilting operation the wall slab is manipulated so as to position its bottom marginal portion in abutting relation with one of the side marginal portions of the floor slab, as shown in Figure 1 of the drawings. The wall slab **11** is provided with an anchoring device **13** and the floor slab **10** is provided with an anchoring device **14**. The anchoring device **13** comprises a nut-like member **15** and a lag screw **16** and is located at the upper portion of the wall slab when the latter is in its wall forming position. The nut-like member **15** is in the form of a wire helix. It is embedded in the wall slab directly inwards of the latter's inner surface and embodies a plurality of L-shaped heavy wire legs **17** whereby it is maintained in firmly interlocked relation with the concrete in which it is embedded. The lag screw **16** is arranged so that the threaded shank thereof is in screw threaded relation with the interior of the nut-like member **15** and its head is disposed a small distance away from the inner surface of the wall slab **11**. It is contemplated that the nut-like member **15** of the anchoring device **13** will be embedded in the wall slab at the time the concrete for the latter is poured and that the lag screw **16** will be connected to the nut-like member **17** after the wall slab is manipulated into its upstanding position as hereinbefore described. The anchoring device **14** comprises a nut-like member **18** and a lag screw **19** and is located at the central portion of the floor slab **10** and in substantially the same vertical plane as the anchoring device **13**. The nut-like member **18** is in the form of a wire helix. It is embedded in the floor slab directly beneath the top surface thereof and embodies a plurality of irregularly shaped heavy wire legs **20** whereby it is maintained in firmly interlocked relation with the concrete in which it is embedded. The lag screw **19** is arranged so that the threaded shank thereof is in screw threaded relation with the interior of the nut-like member **18** and its head is disposed a small distance above the top surface of the floor slab **10**. It is contemplated that the nut-like member **18** of the anchoring device **14** will be embedded in the floor slab at the time the concrete for the latter is poured and that the lag screw **19** will be connected to the nut-like member **18** after the wall slab **11** is manipulated into its upstanding position.

The brace is of unitary character and as its main components or parts comprises an upper wall slab engaging bracket **21**, a lower floor slab engaging bracket **22**, a straight upwardly inclined strut **23** between the two brackets and an adjustable connection **24** between the bracket **22** and the lower end of the strut **23**.

The upper wall slab engaging bracket **21** is formed of steel or other suitable metal and comprises a flat rectangular vertically extending part **25** and a flat rectangular vertically extending part **26** at right angles to the part **25**. The last mentioned part is adapted to fit flatly against the inner surface of the wall slab **11** and has in the upper portion of one side margin thereof a horizontally extending notch **27** for receiving the head-equipped end of the shank of the lag screw **16**. The part **26** of the bracket **21** is connected to, and formed integrally with, the other side margin of the part **25**. It projects away from the wall slab when the bracket **21** is in its operative position and embodies in its lower portion a hole **28**. The latter, as shown in Figure 1, is disposed beneath the notch **27** in the bracket part **25**. In connection with use of the brace after the wall slab is initially manipulated into place by the crane or other hoisting mechanism, the lag screw **16** of the anchoring device **13** is turned so as to shift it outwards to a limited extent with respect to the nut-like member **15**. Thereafter the part **25** of the bracket **21** is placed against the inner surface of the wall slab **11** and is slid laterally until the head-equipped end of the shank of the lag screw **16** is seated in the notch **27**. Thereafter the lag screw **16** is tightened until the bracket **21** is firmly clamped against the inner surface of the wall slab. The anchoring device **13** constitutes means for detachably clamping or securing the bracket **21** against the inner surface of the wall slab.

The lower floor slab engaging bracket **22** consists of a fixed U-shaped part **29** and a tiltable U-shaped part **30**. The part **29** is formed of steel or other suitable metal and consists of a rectangular intermediate member **31** and a pair of upstanding side members **32**. The bottom member **31** is adapted when the bracket **23** is in its operative position to extend at right angles to the wall slab **11** and has in the end portion thereof that is farther from the wall slab a laterally extending notch **33** for receiving the head-equipped end of the lag screw **19** of the anchoring device **14**. In connection with use of the brace the lag screw **19** is loosened to a small extent and then the intermediate member **31** of the fixed part **29** of the bracket **22**, after being placed on the top surface of the floor slab **10**, is manipulated into a position next to the lag screw **19** and is then shifted laterally in order to bring the head-equipped end of the lag screw **19** into seated relation with the notch **33**. Thereafter the lag screw **19** is tightened in order firmly to clamp the intermediate member **31** of the fixed part **29** against the top surface of the floor slab. The anchoring device **14** constitutes means for detachably securing or clamping the fixed part **29** of the lower bracket **22** against the top surface of the floor slab **11**. The upstanding side members **31** of the fixed part **29** have the lower margins thereof formed integrally with the side margins of the intermediate member **31** and have the end margins that are nearer the wall slab arranged so that they are flush with the corresponding end edge of the intermediate member **31**. The side member **32** that is adjacent to the notch **33** is materially shorter than the other side member **32** in order fully to expose the notch. The tiltable U-shaped part **30** of the lower bracket **22** is formed of steel or other suitable metal and consists of a flat intermediate member **34** and a pair of flat laterally spaced side members **35**. The intermediate member **34** is preferably square so far as external configuration is concerned and has in its central portion a hole **36**. It is formed of two side by side pieces and has the abutting edges of its pieces fixedly connected together by welds **37**. The side members **35** of the tiltable part **30** are disposed in parallel relation and have certain opposed ends thereof connected by welds **38** to certain opposed side margins of the intermediate member **34**. Preferably the welds **38** extend at right angles to the welds **37** in order that the side members **35** serve rigidly to connect the two side by side complemental pieces of which the intermediate member **34** is composed. The other or outer ends of the side members **35** fit between the ends of the side members **32** that are nearer to the wall slab **10** and are pivotally connected thereto by way of a pair of coaxial pivot pins **39**. The latter extend horizontally through holes **40** in the side members **32** and holes **41** in the side members **35** and have the ends thereof deformed to provide heads **42** for securing them against axial displacement with respect to the aforementioned holes. The pivot pins **39** serve to support the part **30** of the lower bracket **22** so that it is capable of tilting upwards and downwards in a vertical plane at right angles to the wall slab **10**.

The strut **23** is upwardly inclined in the direction of the wall slab **11** when the brace is in its operative position and comprises a pair of coextensive side by side but laterally spaced wooden bars **43**. The latter are maintained in spaced apart relation by way of a series of equidistantly spaced wooden spacer strips **44** between the central portions of the inner or opposed side surfaces of the bars. Horizontally extending nut equipped bolts **45** extend through aligned transverse holes **46** in the bars **43**

and serve to hold the bars in connected relation. In addition to the wooden bars 43 the strut 23 comprises an elongated metallic plate 47. One end portion of this plate fits between the upper ends of the bars 43 and is secured in place by way of the two uppermost bolts 45. The central portions of the shanks of such bolts extend through holes 48 in said one end portion of the plate 47. The other end portion of the plate projects beyond the end surfaces of the bars 43, fits against the lower portion of the part 26 of the wall slab engaging bracket 21 and is provided with a transverse circular hole 49 which is the same in size as, and registers with, the hole 28 in the bracket part 26. A pivot element 50 extends through the holes 28 and 49 and serves so to connect the bracket 21 and the upper end of the strut as to permit the latter to tilt relatively to one another in a vertical plane. Preferably the pivot element 50 is in the form of a rivet in order that it remains permanently in place. The end portion of the plate 47 that is clamped between the upper ends of the wooden bars 43 of the strut has the bottom edge thereof welded to the central portion of a transversely extending metallic strip 51. As shown in Figure 5, the end portions of the strip 51 underlie the upper ends of the bars 43. Two nut equipped bolts 52 extend through holes 53 in the upper ends of the bars 43 and holes 54 in the end portions of the strip 51 and serve to hold said upper ends of the bars and the end portions of the strip in clamped relation.

The adjustable connection 24 of the brace comprises an elongated externally threaded element 55 and a nut 56. The element 55 is preferably in the form of a metallic tube and is connected to the lower end of the strut 23 by a metallic plate structure 57. It is disposed in parallel relation with the strut and extends loosely through the hole 36 in the intermediate member 34 of the tiltable part 30 of the lower bracket 22. The metallic plate structure 57 is of unitary character and consists of a transversely extending plate 58, a longitudinally extending plate 59 and a transversely extending plate 60. The transversely extending plate 58 is welded to the upper end of the externally threaded element 55 and abuts directly against the lower end surfaces of the wooden bars 43. The longitudinally extending plate 59 fits between the lower ends of the bars 43 and has the lower end portion thereof welded to the central portion of the transversely extending plate 57. The two lowermost bolts 45 extend through holes in the longitudinally extending plate 59 and serve to hold the plate structure 57 in connected relation with the lower ends of the wooden bars 43. The transversely extending plate 60 underlies the lower ends of the bars 43 and has its central portion welded to the central portion of the lower edge of the longitudinally extending plate 59. Nut equipped bolts 61 extend through holes in the lower ends of the bars 43 and holes in the end portions of the transversely extending plate 61 and coact with the two lowermost bolts 45 fixedly to connect the plate structure 57 to the lower end of the strut 31. The nut 55 is formed of steel or other suitable metal and is mounted rotatably on the externally threaded element 55. It has an internal screw thread 62 in mating relation with the external thread of the element 55 and embodies an externally disposed annular groove 63 in which loosely fits the hole defining portion of the intermediate member 34 of the tiltable part 30 of the lower bracket 22. The groove defining portion of the nut and the hole defining portion of the intermediate member 34 are approximately the same in thickness and coact to form a connection whereby the nut 56 is held against axial displacement with respect to the tiltable part 30 on the lower bracket 22 while at the same time it is permitted to rotate freely relatively to said tiltable part. When the nut 56 is turned in one direction it operates positively to slide the element 55 and the strut 23 upwards and away from the lower bracket 22 and when the nut is turned in the opposite direction it operates positively to shift the element and strut downwards in the direction of the lower bracket 22. The nut is provided at its upper end with a pair of integral outwardly extending diametrically opposite handles 64 whereby the nut may be manually turned in one direction or the other in order to effect longitudinal adjustment of the brace as a whole. In assembling the brace the complemental pieces that constitute the intermediate member 34 of the tiltable part 30 of the lower bracket are shifted together with the nut therebetween and then the welds 37 are formed between the abutting edges of the pieces in order to effect mounting of the nut with respect to the intermediate member 34. Thereafter the side members 35 of the tiltable bracket part 30 are welded to the intermediate member 34 and are then connected pivotally to the upstanding side members 32 of the bracket part 29 by mounting in place the pivot pins 39. In practice it has been found that the brace functions to best advantage and may be most readily manipulated when in connection with use thereof the strut 23 extends at an angle of approximately 30° with respect to the horizontal as shown in Figures 1 and 6. The pivot pins are so arranged with respect to the lag screw receiving notch 33 that when the strut is positioned at such acute angle the imaginary longitudinal center line of the externally threaded element 55 and the strut 23 substantially intersects the notch. As a result of this the force (tension or compression) to which the fixed U-shaped part 29 of the lower bracket 22 is subjected when in connection with use of the brace the strut is at its aforementioned optimum acute angle with respect to the horizontal is applied directly to the head of the lag screw 19 and hence is so neutralized that it does not exert or apply such tilting moment to the fixed U-shaped part 29 as to cause it to fracture the lag screw and thus become dislodged from its proper anchored position on the floor slab 10.

When, after manipulation of the wall slab 11 into the position shown in Figure 1 of the drawings, it is desired to use the brace the bracket 21 is connected to the anchoring device 13 and the bracket 22 is connected to the anchoring device 14 as heretofore described. As soon as the lag screws 16 and 19 are tightened the brace holds the wall slab 11 in fixed relation with the floor slab 10. If it is desired, as a preliminary to permanently securing the wall slab in place, to tilt the wall slab outwards, the nut 56 is turned so as to feed the element 55 away from the lower bracket 22. Such turning movement on the part of the nut 56 results in the strut 23 sliding upwards and effecting outward tilting of the wall slab. As soon as the wall slab is tilted outwards to the desired extent turning of the nut 56 is stopped in order positively but releasably to lock the strut in place. In the event it is desired to tilt or swing the wall slab inwards the nut 56 is reversely turned. Such turning movement on the part of the nut 56 results in the strut 23 sliding downwards and effecting inward tilting of the wall slab. As soon as the wall slab is tilted inwards to the desired extent rotation on the part of the nut 56 is stopped so that it serves securely but releasably to lock the strut against further longitudinal displacement or movement. In connection with sliding movement of the strut by turning of the nut 56 the pivot element 50 permits the upper end of the strut to tilt relatively to the wall slab engaging bracket 21 and the tiltable part 30 of the bracket 22 permits the lower end of the strut to tilt vertically relatively to the floor slab.

The herein described adjustable brace effectively and efficiently fulfills its intended purpose and, due to its particular construction, may be fabricated or produced at a comparatively low cost. It is both strong and durable and may be adjusted with facility due to the specific construction and design of the adjustable connection 24 consisting of the elongated externally threaded element 55 and the single nut 56.

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. As a new article of manufacture, an adjustable brace adapted, after an upstanding wall slab is placed next to a substantially horizontal floor slab in connection with the construction of a concrete building, to hold the wall slab in position while it is being secured in place and comprising: an upper bracket provided with means for detachably securing it to the inner surface of the wall slab at a location above the floor slab; a lower bracket adapted to be positioned over the floor slab at a location away from the wall slab and embodying a fixed U-shaped part consisting of an intermediate member and a pair of laterally spaced upstanding side members, provided with means for detachably securing its intermediate part to the top surface of the floor slab and adapted when properly secured in place by said means to have the side members thereof extend at right angles to the wall slab, and a tiltable upwardly inclined normally inverted U-shaped part consisting of a rectangular intermediate member in the form of two flat elongated side by side metallic pieces with the abutting side margins connected together by longitudinally extending welds and a pair of separately formed laterally spaced metallic side members with certain ends thereof in abutting relation with the end margins of the two-piece intermediate member and connected fixedly thereto by longitudinally extending welds at right angles to the first mentioned welds, provided in its intermediate member with a circular hole one-half of which is formed in the abutting side margin of one of the two pieces and the other half of which is formed in the abutting side margin of the other piece, and having the other ends of the side members thereof positioned in lapped and parallel relation with the side members of the fixed part and pivotally connected thereto so that it is free to swing about a horizontal axis towards and away from the wall slab; a rigid upwardly inclined strut extending between the two brackets and having the upper end thereof pivotally connected to the upper bracket so that it and said upper bracket are free to tilt relatively to one another in a vertical plane; and an adjustable connection extending between the lower bracket and the lower end of the strut and embodying an elongated upwardly inclined externally threaded element extending loosely through the aforesaid hole into the space between the side members of said tiltable part, disposed in parallel relation with the strut, and having the upper end thereof connected fixedly to the lower end of said strut, and a single one-piece nut mounted rotatably on the element, provided with an external annular groove of substantially the same thickness as the intermediate member of said tiltable part, having the portion thereof that defines said groove in interlocked and closely fitting relation with, but rotatable relatively to, the hole defining portion of the intermediate member of said tiltable part, and adapted when turned in one direction positively to shift the element and strut longitudinally in one direction with respect to the lower bracket and when turned in the opposite direction positively to shift said element and strut longitudinally in the opposite direction with respect to the lower bracket.

2. As a new article of manufacture, an adjustable brace adapted, after an upstanding wall slab is placed next to a substantially horizontal floor slab in connection with the construction of a concrete building, to hold the wall slab in position while it is being secured in place and comprising: an upper bracket provided with means for detachably securing it to the inner surface of the wall slab at a location above the floor slab; a lower bracket adapted to be positioned over the floor slab at a location away from the wall slab and embodying a fixed horizontally elongated U-shaped part consisting of a flat intermediate member and a pair of laterally spaced upstanding side members, adapted when properly positioned to have its side members extend at right angles to the wall slab, and provided in the end portion of the intermediate member that is farther from the wall slab with an opening for receiving a lag screw for detachably securing said intermediate member to the top surface of the floor slab, and a tiltable upwardly inclined U-shaped part consisting of an intermediate member and a pair of laterally spaced side members with certain ends thereof fixedly connected to the last mentioned intermediate member, provided in the central portion of its intermediate member with a circular hole, and having the other ends of the side members thereof positioned in lapped and parallel relation with the side members of the fixed part and pivotally connected to the end portions of the last mentioned side members that are nearer the wall slab by horizontal pins so that it is free to swing about a horizontal axis towards and away from the wall slab; a rigid upwardly inclined strut extending between the two brackets and having the upper end thereof pivotally connected to the upper bracket so that it and said upper bracket are free to tilt relatively to one another in a vertical plane, and an adjustable connection extending between the lower bracket and the lower end of the strut and embodying an elongated upwardly inclined externally threaded element extending loosely through the aforesaid hole into the space between the side members of the tiltable part, disposed in parallel relation with the strut, and having the upper end thereof connected fixedly to the lower end of said strut, and a single nut mounted rotatably on the element, provided with an external annular groove of substantially the same thickness as the intermediate member of said tiltable part, having the portion thereof that defines said groove in interlocked and close fitting relation with, but rotatable relatively to, the hole defining portion of the intermediate member of said tiltable part, and adapted when turned in one direction positively to shift the element and strut longitudinally in one direction with respect to the lower bracket and when turned in the opposite direction positively to shift said element and strut longitudinally in the opposite direction with respect to the lower bracket, said strut being adapted when in connection with use of the brace the upper and lower brackets are connected to their respective slabs at certain locations to assume an optimum working position wherein it extends at approximately an angle of 30° with respect to the horizontal, said horizontal pins being so positioned with respect to the lag screw receiving opening in the intermediate member of the fixed part of the lower bracket that when the strut is in its aforesaid optimum working position the imaginary longitudinal center line of the element and strut substantially intersects said opening.

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