Nov. 3, 1970 J. P. ELLIS 3,537,220

MASONRY WALL BRACE

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Fig. 1.

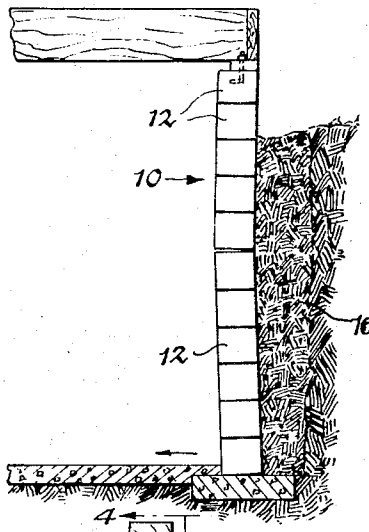


Fig. 2a.

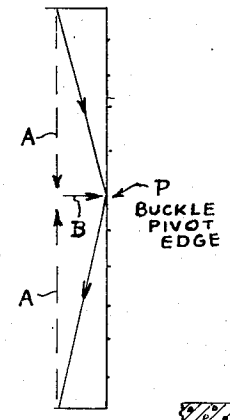
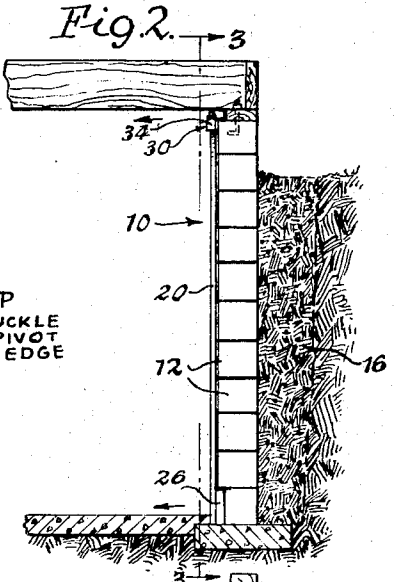


Fig. 2.



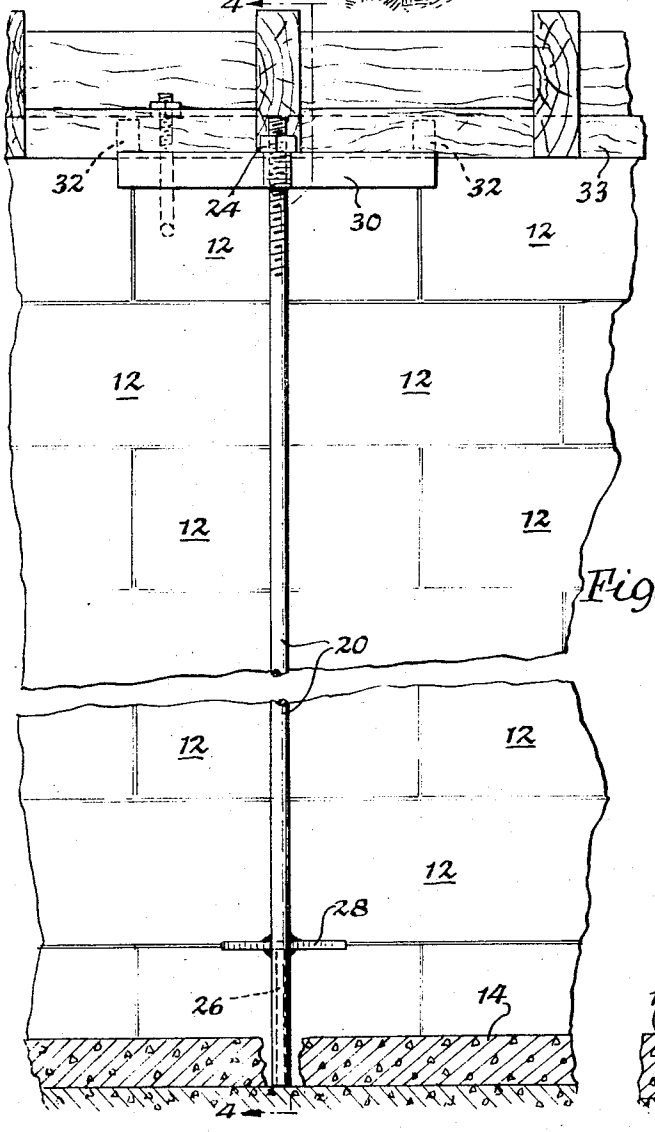
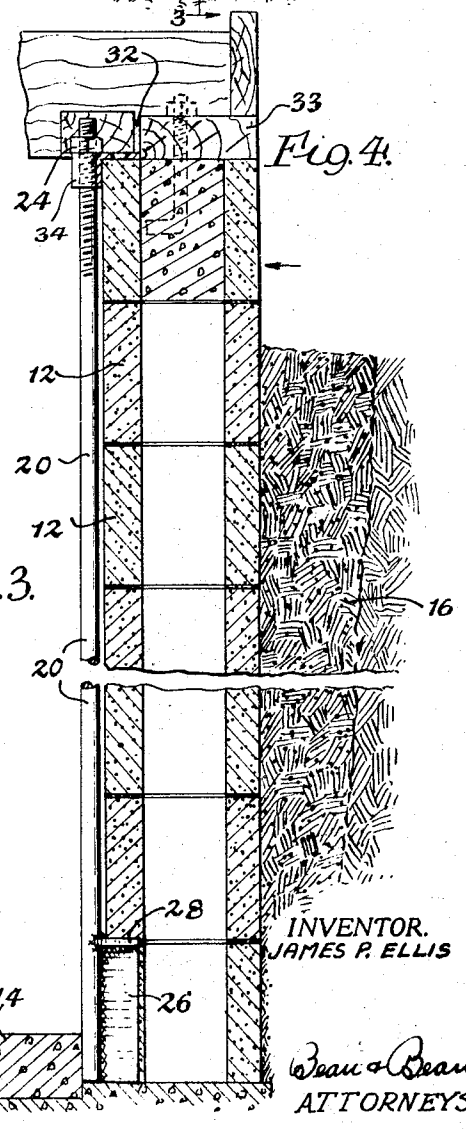


Fig. 3.

Fig. 4.



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Fig. 5.

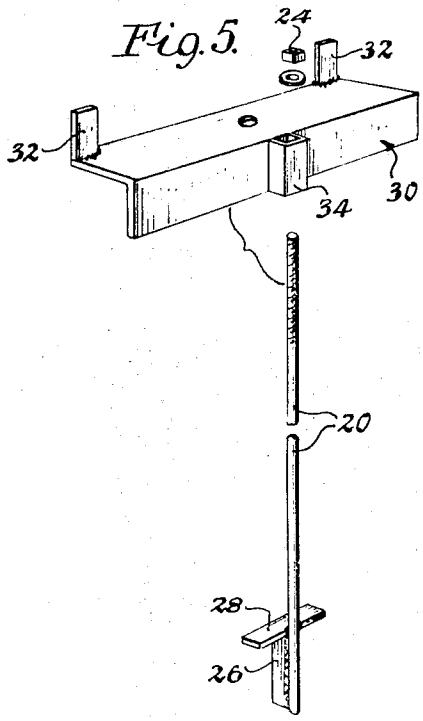
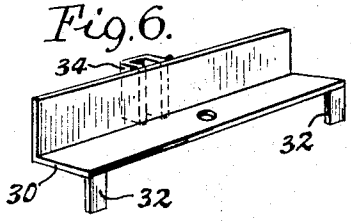


Fig. 6.



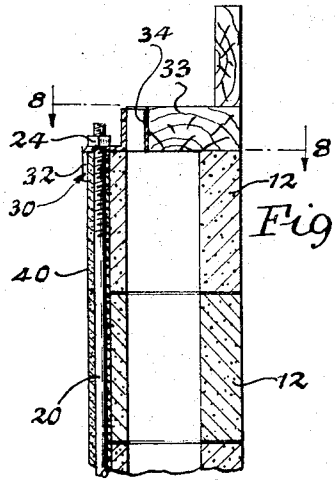
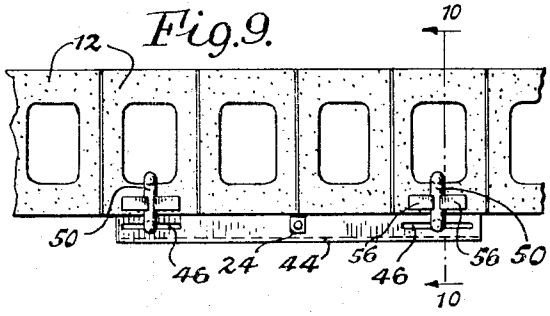


Fig. 7.

Fig. 9.



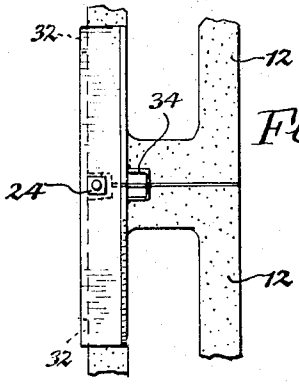


Fig. 8.

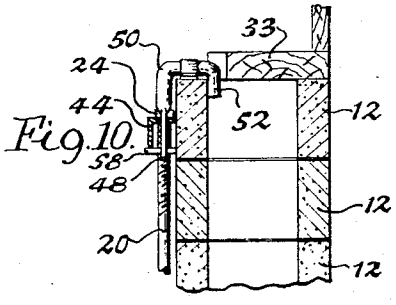


Fig. 10.

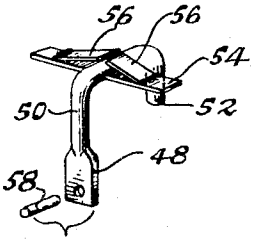


Fig. 11.

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3,537,220

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U.S. Cl. 52—225 5 Claims

ABSTRACT OF THE DISCLOSURE

An improved device adapted to be applied against the inside face of a masonary wall experiencing inwardly bowing forces applied thereagainst; said device comprising a strut member having improved forms of hook means at its opposite ends for hooking said device against a masonry wall to apply compression thereagainst, resulting in force vector components tending to bow the wall outwardly against the forces applied thereto from outside of the wall.

BRIEF SUMMARY OF THE INVENTION

The invention relates to the problems discussed in my prior Pat. No. 3,430,397 which issued Mar. 4, 1969, but distinguishes therefrom in that the present invention is particularly adapted for use in connection with existing brick or tile or concrete block walls; and/or other masonry walls which are subjected to lateral bulging forces. Such forces are typically encountered in cellar walls standing against soft or wet ground; and in masonry wall fabrications which are exposed to strong wind pressures, or the like.

It is a primary object of the present invention to provide a structurally simple and improved brace device for brick or block walls or the like, which may be easily applied thereto (either subsequent to construction or during its construction) and which will effectively brace the wall against lateral bulging and/or collapse.

Another object is to provide an improved brace device as aforesaid which compactly nests against the wall and involves no substantial protuberances into the space outlined by the wall structure, per se.

Other objects and advantages of the invention will be apparent from the following specification and the accompanying drawing, wherein:

THE DRAWING

FIG. 1 is a vertical sectional view of a concrete block type cellar wall or the like, undergoing a typical inbowing collapse due to external dirt-fill pressures thereagainst;

FIG. 2 is a view corresponding to FIG. 1 but showing the wall restoration result of use of a brace device of the present invention;

FIG. 2*a* is a force diagram illustrating the wall restoring forces in action as shown at FIG. 2;

FIG. 3 is a fragmentary front elevational view on enlarged scale; taken as suggested by line 3—3 of FIG. 2;

FIG. 4 is a fragmentary section taken as shown by line 4—4 of FIG. 3;

FIG. 5 is a fragmentary perspective disassembled view of the essential parts of the device of the invention; relatively arranged for one mode of use thereof;

FIG. 6 is a perspective view showing an alternative mode of use of one of the device components;

FIG. 7 is a fragmentary view corresponding to a portion of FIG. 4, but showing the device as employed in a wall surface submerged mode;

FIG. 8 is a fragmentary section taken as suggested by line 8—8 of FIG. 7;

FIG. 9 is a view corresponding to FIG. 8 but showing a modified form of cap member;

FIG. 10 is a fragmentary section taken on line 10—10 of FIG. 9; and

FIG. 11 is a perspective disassembled view of portions of the device of FIG. 10.

DETAILED DESCRIPTION

By way of example, the invention is illustrated and described in detail hereinafter as being applied to a typical cellar concrete block wall construction. The invention may be readily applied either to an existing wall **10** or to such a wall during its construction; the wall **10** in either case being illustrated herein to comprise a fabrication of vertically stacked building blocks **12** of the currently popular "concrete block" type. However, it is to be understood that the "blocks" **12** may alternatively be of brick, or cut stone, tile, or the like; and either "dry"-stacked or cemented together. The cellar floor is illustrated at **14** (FIGS. 3, 4) and the lateral pressure applying earth fill exteriorly of the wall is illustrated at **16**.

As shown generally at **20**, the brace device of the invention may be constructed to comprise a tension rod member formed of steel or the like; carrying at its upper end a nut **24** and adjacent its lower end an inwardly extending T-shaped shoe comprising a vertical plate **26** and a flat cap plate portion **28** both of which are adapted to project into crevices chiseled into the lower portion of the wall **10** (FIGS. 3, 4).

The invention also features use of a novel angle-shaped beam member such as is designated **30** at FIGS. 3–7, which is dimensioned so as to lie flatwise against the upper inner edge of the wall **10**; the angularly disposed sides of the beam **30** operating to stabilize the beam **30** in firmly seated relationship against the top inner edge of the wall. End tab devices **32—32** are welded or otherwise fixed to the beam **30** to extend therefrom upwardly as shown at FIGS. 2–7 to assist in further locking the beam to the wall sill assembly **33** so as to prevent any accidental displacement therefrom.

An open socket portion **34** is welded or otherwise formed on the inner side wall of the beam **30** to receive in sliding relation therethrough the upper end of the rod **20**. Thus, as shown herein, and particularly by reference to FIGS. 3, 4, of the drawing herewith, when the brace device of the invention is applied to a wall structure with the shoe parts **26**, **28** engaged into appropriately chiseled crevices in the lower inner part of the wall, and with the beam **30** locked against the upper inner edge of the wall by means of the nut **24**, the tension adjustment nut **24** may then be actuated to apply to the system any desired degree of tensioning. This tension adjustment may of course be effected simply by applying a wrench to the nut, whereby the tension forces applied by the system are readily regulated to suit the requirements of any situation.

The device is applied against the side of the wall away from the side against which the laterally directed pressures apply (such as from a semi-fluid direct fill or wind loads or the like). By virtue of this arrangement the tension forces exerted by the system of the invention are primarily applied as compression forces acting vertically through the inner surface portion of the wall **10**, as illustrated diagrammatically by force lines A—A of FIG. 2*a*. The line of this force is thereby offset from the pivot edge of the buckling wall, as indicated at P. It is to be understood that whereas only one such "buckle pivot edge" is illustrated at FIG. 1 of the drawing herewith, any other number of such pivot breaks may tend to occur at various elevations in the wall, depending upon the external force conditions. In any case the device of the invention oper-

ates to develop outwardly directed horizontal force components such as are indicated at B, which operate to buck the loading such as would otherwise cause the wall to buckle, for example as illustrated at FIG. 1. The force components B act to prevent the building blocks from rocking one relative to the other upon their innermost edges, which operate as fulcrum surfaces; whereby the wall is forced to reassume or remain in its intended straight and vertically standing attitude as the case may be, as shown at FIG. 2. It will therefore be understood that the forces exerted by the rod **20** operate to relieve the crushing pressures exerted against the pivot edges of the building blocks and/or the mortar therebetween; thereby establishing an overall uniform loading pattern throughout the wall structure.

The sill **33** at the top of the wall and the footing and floor at the bottom of the wall cooperate to hold the top and bottom sections of the wall in place. Thus, the bar **20** actually operates to transmit the external pressure loads into the top sill framework and into the bottom footing and floor; while preventing the external pressures from buckling the wall. Furthermore, it should be noted that whereas the lower courses of the building blocks are under progressively greater vertical loads due to the pyramidal weight load distributions through the upper courses of blocks downwardly; the lowermost blocks are better held against inward displacement, while the device of the invention braces the upper and intermediate courses of blocks against inward buckling and/or shearing. In view of this pyramidal loading pattern, progressively downwardly throughout the structure, the devices of the invention also operate to prevent (or correct) any localized buckling of the structure at different points along the wall.

It is another feature of the invention that when tension is applied to the rod **20**, this tends to bow the rod so as to deflect the bottom edge of the shoe plate **26** downwardly and inwardly; thereby causing the plate **26** to ram into the footer and the rod **20** to bear into the floor slab. This action provides an improved anchorage of the bottom portion of the device to the footing and floor slab, and also causes the shoe plate portion **28** to exert forces outwardly against the wall at that level in opposition to the pressures from externally of the wall. Thus, it will be seen that the device of the invention is adapted to apply to a wall structure a combination of force effects including substantial components tending to bow the wall outwardly at whatever vertical section of the wall forces exist externally of the wall such as would otherwise operate to bow the wall inwardly.

FIGS. 6, 7, 8, illustrate a a modification of the invention wherein the beam member to which the upper end of the tension rod **20** is applied is constructed to include a hole through which the rod **20** slide-fits while lying in a groove cut into the inner face of the wall **10**. The inner surface of the wall may then be plastered or the like as indicated at **40**, so as to cover the rod **20** and provide a smooth interior wall surface.

FIGS. 9, 10, 11, illustrates still another modification of the invention wherein a beam member as shown at **44** is provided with a centrally located hole through which the tension rod **20** slide fits for holding connection with its nut **24**. Adjacen its opposite ends the beam **44** is slotted as indicated at **46—46** to receive in slide-fitted relation therein the end blade portions **48** of a pair of U-shaped hooks **50—50**; the opposite ends **52—52** of the hooks being bent to extend down into the building block interiors so as to firmly anchor the device against any accidental dislodgements.

To re-enforce the top edge of the building block upon which the device is anchored, the hooks **50** are each provided with pressure pads **54** (FIGS. 10, 11), and to permit the device to easily "float" into optimum pressure bearing relation against the top surface of the building block, the pressure pads are not welded or in anywise rigidly fixed to the top portions of the hook members. The pads

54 are simply assembled on the hooks by means of spring fingers **56—56** which are rigidly fixed at their outer ends to the pressure plates and extend therefrom in the manner of leaf springs into bearing relation at their free ends against the top section of the hook. Thus, the pressure pad is freely rotatable upon the upper horizontal section of the hook **50**, whereby when the device is applied upon a building wall, the pressure pad **54** easily "floats" into flat bearing relation against the top of the block surface, regardless of any dimensional irregularities therein and/or other parts comprising the device of the invention.

As indicated at **58** a lock pin is provided with each hook member **50** so that after the shank portion **48** of the hook is slip-fitted through the slot **46** of the beam member **44**, the pin **58** may then be slip-fitted through a suitably apertured portion of the hook blade **48** at a position just below the bottom flange of the beam member. Thus, the hook devices is firmly locked to the beam member and tension forces transmitted therethrough upon rotation of the nut **24** transmit through the hooks **50** and down against the top portion of the building wall in uniformly applied pressure relation against all portions of the beam member. Also, the rod **20** will of course be free to rotate relative to the beam so as to accommodate any "twisting" adjustments such as may be required between the upper and lower ends of the device because of wall irregularities or the like.

I claim:

1. A wall brace unit adapted to be mounted against one side of a building masonry wall,

said unit including a tension member having at one end a shoe device for hooking engagement into the lower portion of a masonry wall, and having at its other end a screw threaded rod portion,

a beam member adapted to span the inner top edge portion only of a course of blocks along the top of the wall, said beam member being of right-angle sectional form and having an apertured portion adapted for slide-fitting accommodation of said threaded rod portion,

a threaded nut engaging said rod portion whereby to maintain said beam member in positionally adjustable assembled relation on said tension member,

said shoe device being T-shaped and comprising, in combination, a vertically standing plate portion edgewise fixed to and extending rearwardly from the bottom end portion of said tension member and a horizontally disposed cap plate portion fixed to the top end of said vertically standing plate portion,

whereby said shoe device may be set into complementing vertically and horizontally grooved portions of the lowermost course of blocks comprising the building wall so as to anchor the lower end of said tension member to the inner bottom portion of the wall and to its footing, while said tension member is disposed to lie vertically along the inner surface of the building wall with said beam disposed to lie upon the upper inner edge portion of the wall, whereby said nut may be turned to apply between said shoe device and said beam member compression forces acting vertically through the inner surface portions of the intervening wall blocks in opposition to forces from externally of the wall tending to bulge the wall inwardly while fulcruming adjacent blocks to relatively pivot upon their outer edge portions.

2. A wall brace unit as set forth in claim **1**, wherein said tension member comprises a steel rod.

3. A wall brace unit as set forth in claim **1**, wherein said beam member apertured portion is so provided that said beam member may be alternatively employed in different attitudes relative to said tension member.

4. A wall brace unit as set forth in claim **1**, wherein said beam member carries hook means adapted to overhang the top inner edge portion only of a building block wall.

5. A wall brace unit as set forth in claim 4, wherein said hook means carry pressure pad devices in freely pivotable relation thereon.

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ALFRED C. PERHAM, Primary Examiner

U.S. Cl. X.R.

52—227, 293, 698