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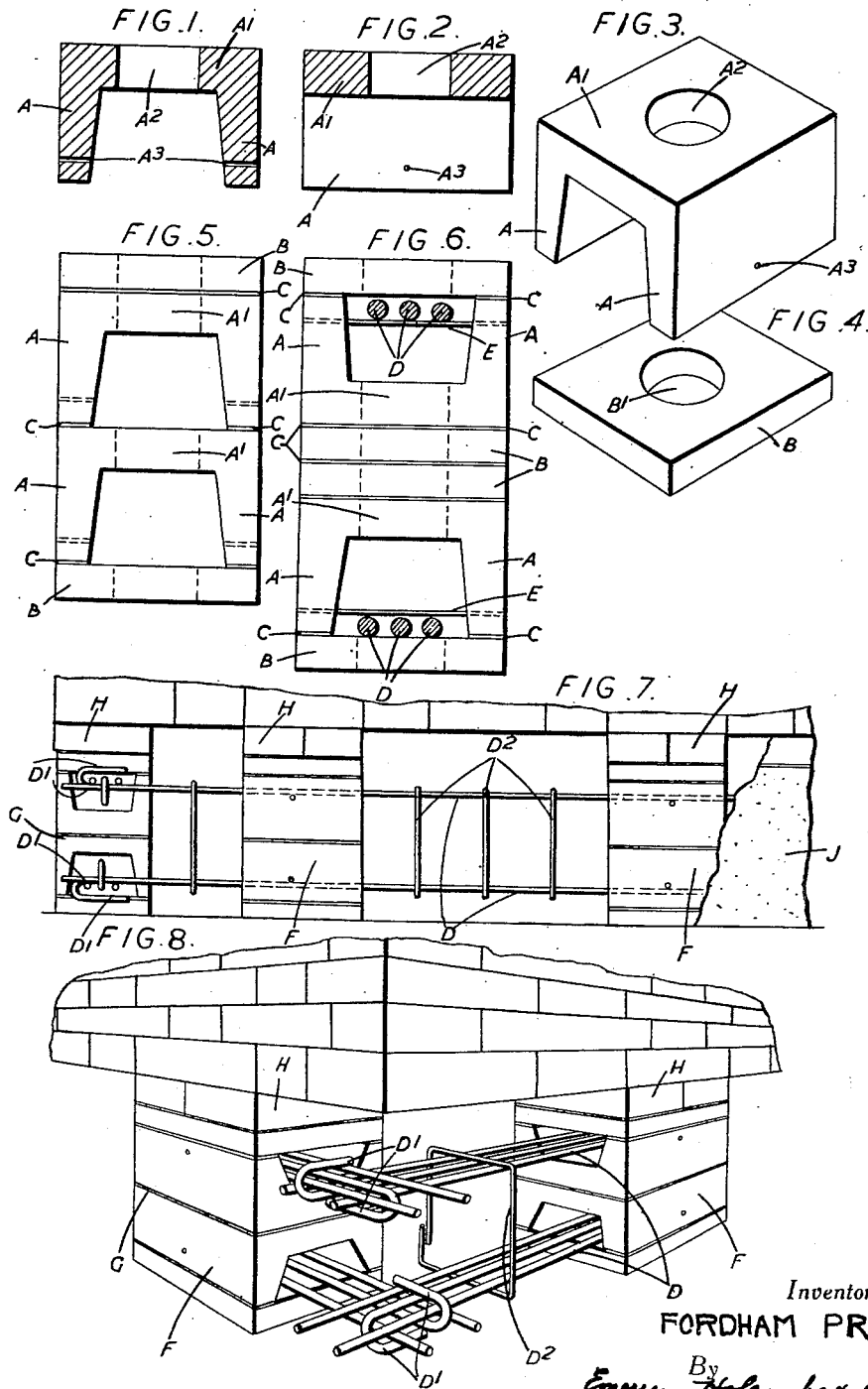
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UNDERPINNING OF BUILDINGS

Filed Aug. 5, 1947

2 SHEETS—SHEET 1



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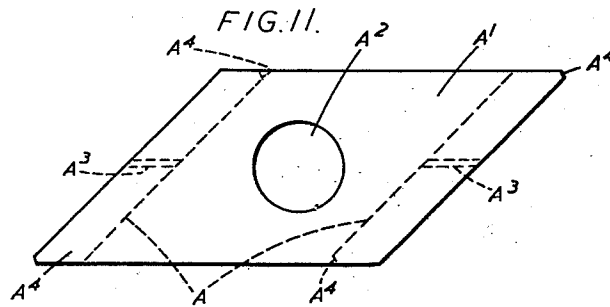
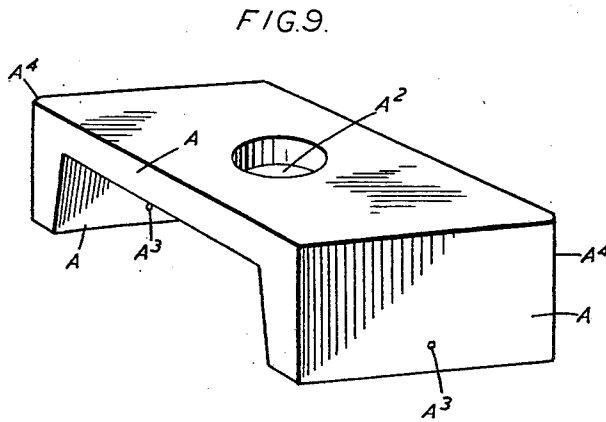
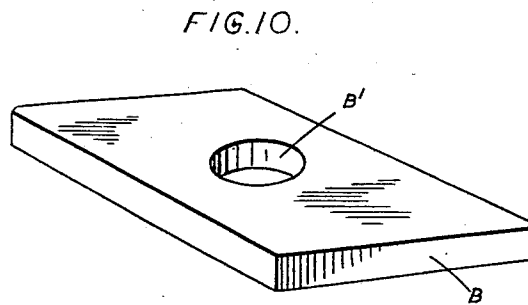
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UNDERPINNING OF BUILDINGS

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7 Claims. (Cl. 61-51)

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This invention relates to the underpinning of buildings, such for example as may be required as the result of the fracture or sinking of parts of the substructure thereof or for other reasons. Hitherto it has been the practice with a building needing underpinning to provide elaborate shoring structures for temporarily holding the remaining parts of the building in place during the repair work, and then completely to remove the parts of the walls or foundations needing replacement and build them afresh, prior to the removal of the temporary shoring structures.

The present invention has for its primary object to provide a new structural element, by means of which an improved method of underpinning can be carried out, whereby the necessity for the usual elaborate temporary shoring structures can in most cases be eliminated altogether.

The structural element according to the invention comprises a channel-section block of adequate thickness through to take a heavy compressive stress, the two side limbs having flat free ends which can engage with a flat surface over an extensive area, whilst the cross limb of the channel provides a flat outer surface parallel to that of the free ends of the side limbs and is bored with a generally central vent hole of substantial size. The element, which is conveniently made of reinforced concrete, may be of substantially rectangular external shape, or alternatively may have its side limbs disposed in staggered relationship, the front and rear faces of the block being parallel to one another but inclined to the parallel side faces thereof.

Such elements are intended to be superimposed on one another to form supporting piers, which may be arranged in various ways.

One form of pier, capable of supporting moderate loads, may comprise a flat base plate and two or more of such channel-section blocks mounted one above another on the base plate, each with its free ends resting on the flat surface beneath it. One or more further flat plates may be inserted between or on top of the blocks, if desired.

An alternative form of pier for heavier loads may comprise a flat base plate, one channel-section block resting with its free ends on the base plate, a second channel-section block inverted on top of the first (with or without an intervening flat plate or plates), and a flat top plate resting on the free ends of such second block.

In use in a preferred underpinning arrange-

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ment such piers are erected at spaced intervals beneath the wall to be supported, the hollow passages formed in the piers by the channel grooves of the blocks all extending in the same direction along the length of the wall to receive metal reinforcing rods which are finally embedded in concrete to complete the underpinning structure.

In the preferred method of underpinning according to the invention the supporting piers serve the double purpose of acting as shoring supports for the building during removal of the damaged parts to be replaced, and of forming an integral part of the final underpinning structure.

A preferred underpinning arrangement according to the invention is illustrated by way of example in the accompanying drawings, in which Figures 1 and 2 are central vertical sections at right angles to one another through a preferred construction of block.

Figure 3 is a perspective view of the block,

Figure 4 is a perspective view of a flat plate used with the block,

Figures 5 and 6 are side views of two alternative forms of supporting pier,

Figures 7 and 8 illustrate the preferred method of underpinning, Figure 8 being an enlarged perspective view showing the arrangement at a corner between two walls,

Figures 9 and 10 are views similar to Figures 3 and 4 of an alternative form of block and flat plate, and

Figure 11 is a plan view of the block of Figure 9.

The block shown in Figures 1-3 is of channel-section comprising two side limbs A A connected by a cross limb A¹ at one end. The two side limbs have flat free ends lying parallel to the outer surface of the cross limb, the whole block being externally of rectangular shape. The cross limb A¹ is centrally bored with a vent hole A² of substantial size passing through from the flat outer surface into the channel. The limbs are of adequate thickness throughout to take a heavy compressive stress. The two side limbs are bored with aligned small holes A³, through which a pin can be threaded to support reinforcing rods.

Figure 4 shows a flat plate B, of a size approximately the same as that of the flat outer surface of the cross-limb A¹ of the block, the plate being bored with a central vent hole B¹ similar to the vent hole A² in the cross-limb of the block. One or more of such plates are used with the blocks to form the supporting piers.

Figure 5 shows a supporting pier, suitable for taking moderate loads. This pier has two

(or more) of the blocks of Figures 1-3 mounted on top of one another, with the free ends of the side limbs A of the upper block resting on the outer surface of the cross-limb A¹ of the lower block. One of the flat plates B of Figure 4 is used as a base-plate for the free ends of the side limbs A of the lower block to rest on, and one or more others are placed on top of the upper block, as may be necessary to suit the height required. A further flat plate or plates may be interposed between the blocks, if desired. The blocks and plates are mortared together in the well-known bricklaying manner, as indicated at C.

Figure 6 shows an alternative, and preferred, form of pier for heavier loads. This arrangement differs from that of Figure 5 in that the upper of the two channel-section blocks is inverted so that the free ends of its side limbs A point upwards. This figure also shows, by way of example, two of the flat plates B of Figure 4 interposed between the two blocks.

Figure 6 serves also to show how the reinforcing rods fit through the blocks. In the example illustrated three rods D are shown passing through the upper block and three more rods D through the lower block. The rods D through the upper block are supported by a pin E passing through the holes A³ in its side limbs and a similar pin E in the lower block serves to hold the lower rods D down.

The piers shown in Figures 5 and 6 are suitable for supporting, say, a nine-inch wall, but for thicker walls, each pier may consist of two (or more) sets of blocks side by side, the flat plates in this case extending over the double set of blocks, each plate being bored with two (or more) vent holes, one for each set of blocks.

The preferred method of underpinning according to the invention will now be described with reference to Figure 7. First of all a series of small portions at spaced intervals of the damaged substructure to be rebuilt are exposed and are removed one at a time, the amount removed being only sufficient to accommodate one supporting pier. Such pier is thereupon erected and completed, if necessary with one or more courses of bricks above the pier, so as to take its appropriate part of the load of the remainder of the building. The other exposed small portions of the substructure are then removed and replaced by supporting piers, until the set of piers is completed. This set of spaced piers constitutes a complete shoring structure for supporting the building during exposure and removal of the remainder of the substructure to be replaced. It should be mentioned that the piers are preferably built on the foundation of the original wall, since this will usually be stronger than the surrounding ground, but obviously the builder must be guided by his knowledge of the cause of the original damage in any particular instance.

Figure 7 illustrates a corner of a building in process of underpinning and shows a row of piers F F in front view along one wall and a side view of the end of the row of piers G along the other wall. These piers are of the kind shown in Figure 6, but without any flat plates between the upper and lower blocks. One course of bricks is indicated at H on the top of each pier. The piers in each row are arranged with the channel grooves in the blocks all facing in the same direction along the length of the wall to be supported.

When all the piers have been built to support the building, and the intervening parts of the substructure removed, the metal reinforcing rods D are threaded through the hollow passages in the piers along the lengths of the walls, some of the rods having hooked ends D¹ to interlink with other rods, as indicated more clearly in the enlarged view of Figure 8, at the corners of the building and, if necessary, also at intermediate points in the walls. Metal loops, indicated at D², may be placed around the reinforcing rods D at intervals between the piers, to strengthen the reinforcement still further.

The necessary framing for receiving the concrete is then set up, and it will often be convenient for the frame on the inner side to be built of brick to remain permanently in place, the outer frame usually being of wood, afterwards removed. The appropriate concrete mixture is then filled into the troughs so formed, and is pressed into the hollow passages in the piers from both sides. The vent holes A² B¹ in the cross-limbs of the blocks and the plates forming the piers serve to ensure that the passages become wholly filled without air pockets. The concrete is allowed to set, and the wood framing is removed, such brickwork above the concrete substructure as may be necessary being re-erected to complete the underpinning. The piers F F G, which in their original hollow state formed the necessary shoring support for the building, are thus finally embedded in the concrete as an integral part of the final replaced substructure. Although the front faces of the blocks in the piers may form part of the final outer surface, it will usually be preferable for the framing to be slightly spaced therefrom, so that the concrete is formed in front of the blocks as well, in order to give a continuous surface of concrete in the finished structure, as indicated at J.

It will be appreciated that this method of underpinning will usually render unnecessary the erection of elaborate shoring structures to hold the building in place during the work, and even when additional temporary shoring is necessary, such shoring can be of a much simpler nature than has hitherto been required.

It is not essential to the invention that the finished underpinning structure should be at or below ground level, and, if desired, the structure may be formed, in the manner above described, at a height in a wall well above ground level, the lower part of the wall then acting as the foundation on which the supporting piers are built prior to concreting. Part of such foundation may be cut away after the underpinning structure has been completed, if desired, for example to form a doorway, the structure then constituting the lintel to the door. Again, an underpinning structure, built at an appropriate height in a wall may be used to constitute an anchorage for tie rods for example for holding two opposite outside walls of a building together.

Figures 9-11 show a modified form of the block and flat plate of Figures 1-4, wherein the side limbs A of the block are disposed in staggered relationship, so that the outer surface of the cross-limb A¹ is of oblique parallelogram shape. This arrangement has the advantage of ensuring more reliably against air pockets in the concreting, but at the expense of some slight reduction of strength for the same thickness of concrete in the limbs of the block. The greater the degree of staggering of the side limbs, the greater the safeguard

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against air pockets, but the greater also the reduction in strength, and generally it is preferable for the front end of one side limb to be more or less on a level with the rear end of the other side limb. The sharp edges of the block may be rounded or bevelled off, if desired, as indicated at A⁴. The plate B has the same parallelogram shape as the top surface of the block. In other respects the block and plate are similar to those above described.

It will be appreciated that the foregoing arrangement has been described by way of example only and may be modified in various ways within the scope of the invention. Thus it is not essential to the invention that the blocks should be made of reinforced concrete and other materials may be used, if desired, such as steel or other metal or plastics, having the necessary strength to provide the requisite shoring support prior to embedding in the final concrete substructure. Again it is not essential that the flat plates used with the blocks should be of the same size as the blocks, and they may be smaller or larger, if preferred.

What I claim as my invention and desire to secure by Letters Patent is:

1. A method of underpinning buildings, according to which spaced small portions of a damaged substructure to be replaced are first removed, supporting piers having substantially horizontal passages running in the direction of the wall are then erected in the openings thus formed to act as shoring supports for the building, the remaining portions of the damaged substructure are then removed, metal reinforcing rods are then threaded through the hollow passages in the supporting piers, and the openings from which the remaining portions of the substructure were removed, the individual rods extending into at least a plurality of the piers, and the whole is then embedded in concrete to form the final beam-like underpinning structure, the supporting piers which originally acted as shoring supports during removal of the remaining portions of the damaged substructure thus forming an integral part of the final underpinning structure.

2. A method of underpinning buildings as claimed in claim 1, according to which each supporting pier is built up mainly of superimposed channel-section blocks, the channels of which form hollow passages for the reinforcing rods, each such block having two side limbs with flat coplanar free ends and a cross limb with a flat outer surface parallel to that of the free ends of the side limbs, such cross limb being bored with a generally central vent hole to afford a venting connection between the hollow passages in the pier.

3. A method of underpinning buildings as claimed in claim 2, according to which each supporting pier is built up of a flat base plate, and a plurality of the channel section blocks mount-

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ed one above another on the base plate, the free ends of the side limbs of each block resting on the flat surface beneath it.

4. A method of underpinning buildings as claimed in claim 3, according to which at least one flat plate is inserted between consecutive blocks in the pier, such plate being bored with a vent hole registering with the vent hole in the cross-limb of the block beneath it.

5. A method of underpinning buildings as claimed in claim 1, according to which each supporting pier is built up of a flat base plate, a channel-section block having two side limbs with flat coplanar free ends which rest on the base plate and a cross-limb with a flat outer surface parallel to that of the free ends of the side limbs such cross-limb being bored with a generally central vent hole, a second similar channel-section block inverted on top of the first with its vent hole registering with that of the first block and with its channel extending in a direction parallel both to that of the first block and to that of the building wall to be underpinned, and a flat top plate resting on the free ends of the side limbs of the second block, the vent holes thus affording a venting connection between the channels which form the hollow passages for the reinforcing rods.

6. A method of underpinning buildings as claimed in claim 5, according to which at least one flat plate is inserted between the two blocks, such plate being bored with a vent hole registering with those in the cross limbs of the blocks.

7. A method of underpinning buildings comprising the steps of removing spaced portions of the substructure thereof, erecting channeled supporting piers in the openings thus formed, removing the remaining portions of the original substructure, threading reinforcing rods through the channels in the supporting piers and the remaining open spaces, and filling the remaining open spaces resulting from removal of the original substructure, including the remainder of the channels in the piers, with concrete.

FORDHAM PRYKE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
563,130	Breuchard	June 30, 1896
1,592,476	Torrecelli	July 13, 1926
1,600,895	Larry	Sept. 21, 1926
1,662,727	Wait	Mar. 13, 1928
2,298,184	Von Rosenberg	Oct. 6, 1942
2,320,690	Willis	June 1, 1943

FOREIGN PATENTS

Number	Country	Date
775,499	France	1934