May 28, 1940. H. M. KNIGHT 2,202,662

FLOOD PROTECTION MEANS

Filed May 13, 1938 3 Sheets-Sheet 1

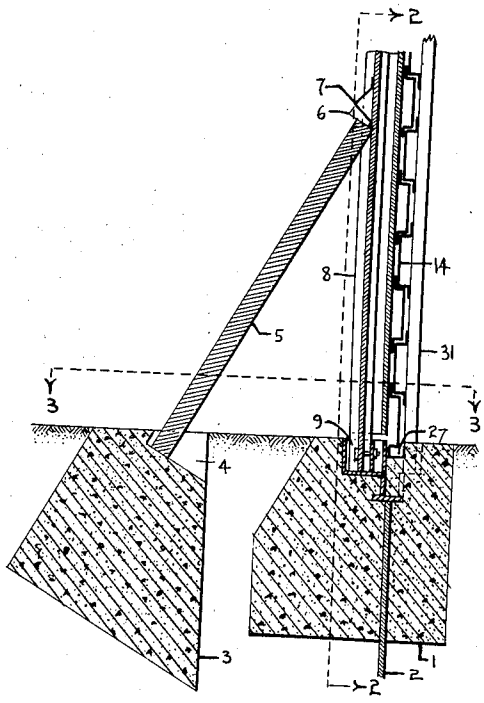



Fig. 1

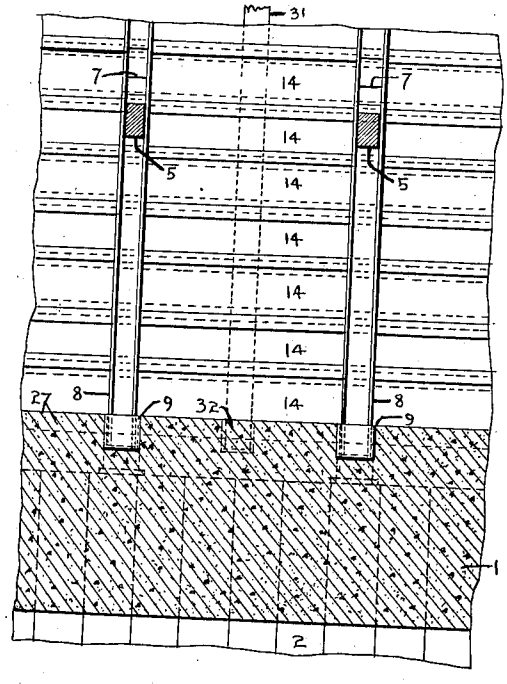



Fig. 2

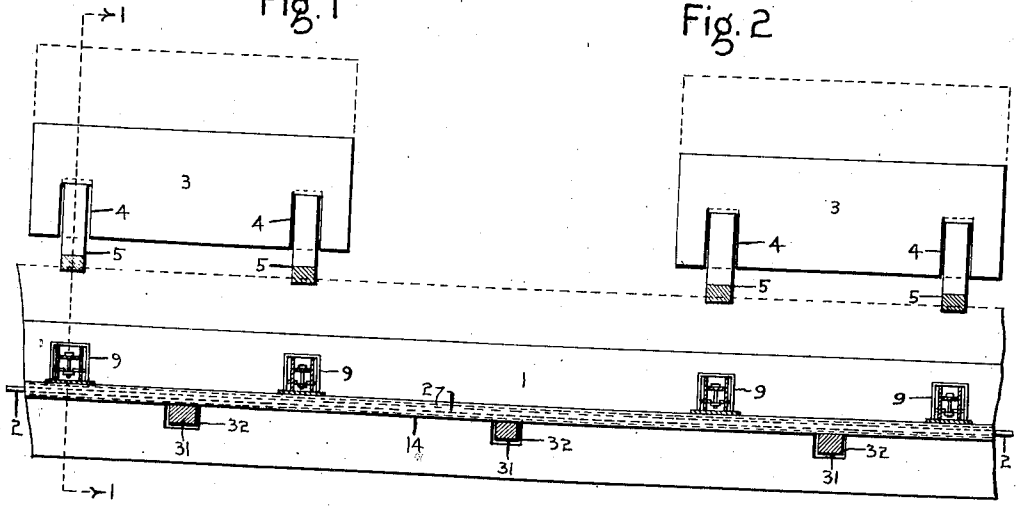



Fig. 3

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FLOOD PROTECTION MEANS

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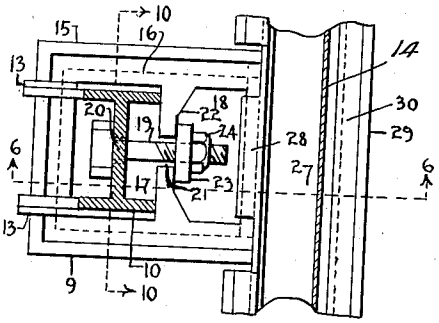


Fig. 4

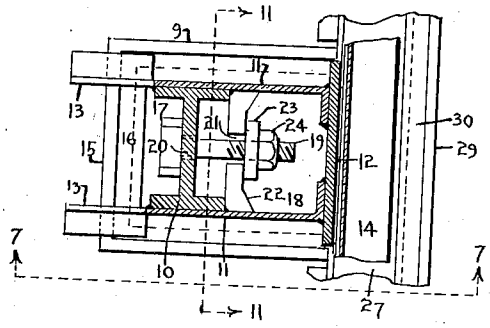


Fig. 5

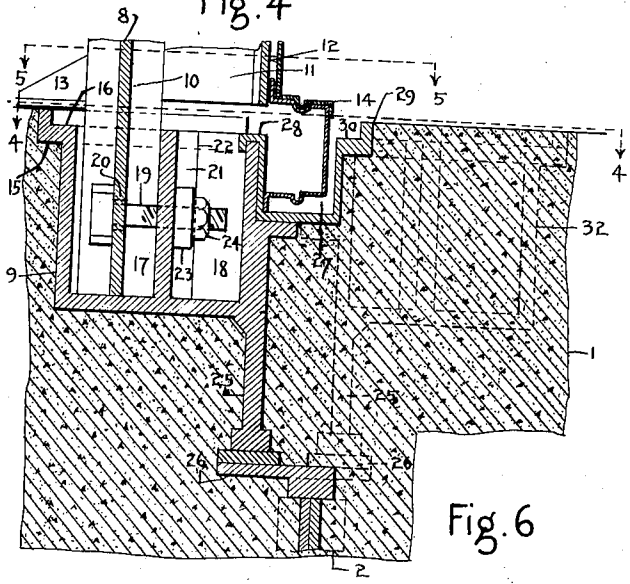


Fig. 6

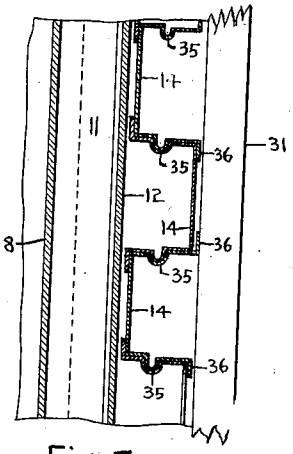


Fig. 7

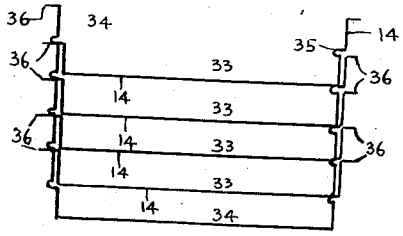


Fig. 8

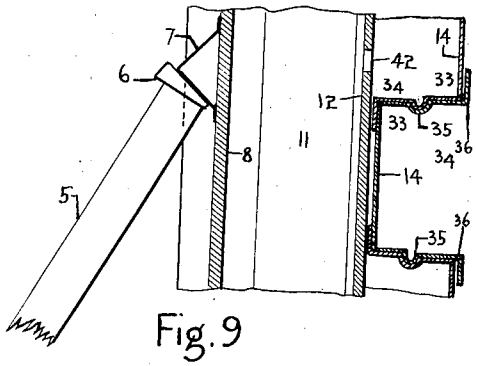


Fig. 9

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FLOOD PROTECTION MEANS

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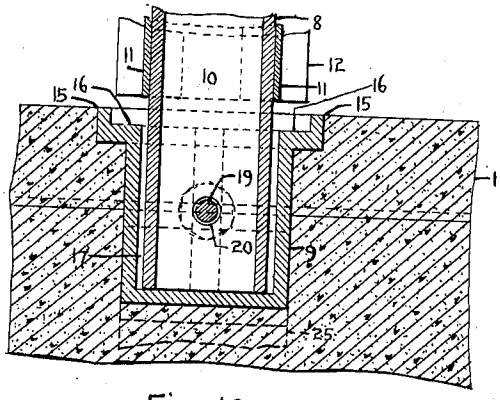


Fig. 10

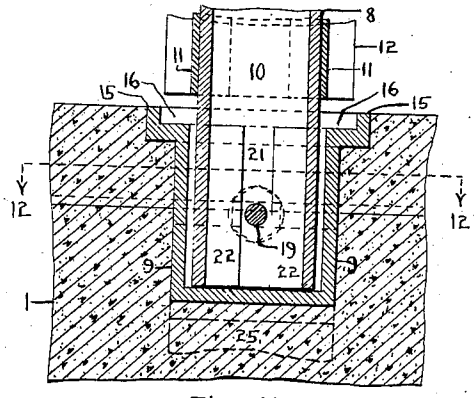


Fig. 11

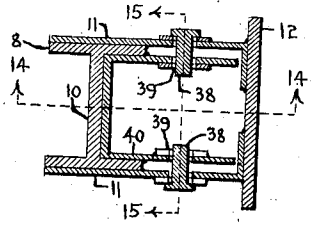


Fig. 13

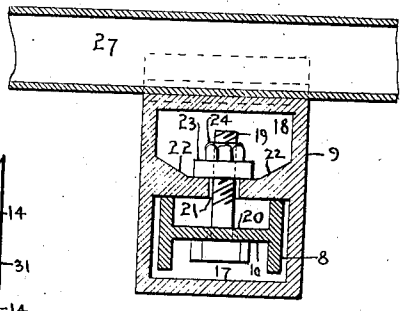


Fig. 12

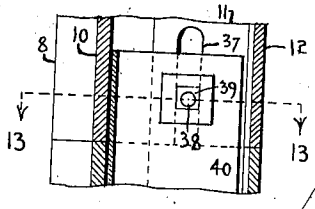


Fig. 14



Fig. 16

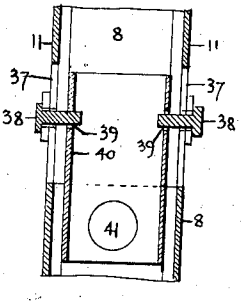


Fig. 15

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# UNITED STATES PATENT OFFICE

2,202,662

## FLOOD PROTECTION MEANS

Herbert M. Knight, Montclair, N. J.

Application May 13, 1938, Serial No. 207,655

9 Claims. (Cl. 61—22)

This invention has reference to means of improvement in the protecting of areas and improvements against damage resulting from high waters incident to flood conditions, and is more particularly related to means which are installed in advance of, or during the period of flood conditions, and removable after the passage of such flood stage.

One of the objects of this invention is a placeable, removable and replaceable flood-barrier, which, when removed, leaves the site previously occupied by such barrier unoccupied and free from any interfering structures or impediments. Another object of the invention is a type of barrier which can be safely extended indefinitely upward as the flood peak rises. A further object of the invention is a flood barrier in which a major element is a stop-plank element of metal. Still another object of the invention is a type of metal stop-plank which can be nested for compact storage when not in use. Still a further object of the invention is a metal stop-plank which employs a crimp as a tightening and fastening means. A further object of the invention is a flood protecting structure using standard structural shapes as parts thereof. Still another object of the invention is a flood protection system in which a sheet-pile core is employed in connection with a placeable and removable stop-plank superstructure. Another object of the invention is a flood protection system in which post-restraining boxes are supported by, and connected to a sheet-pile core. Still a further object of the invention is a flood protection structure in which guide-posts are employed in connection with sustaining-posts. Still further objects of the invention will appear from the specifications and the accompanying plans.

The specifications and the accompanying drawings illustrate the usual and preferred embodiment of the invention, but they are not to be interpreted as illustrating all of the forms in which the invention may be embodied, nor as excluding such forms as are not illustrated.

I illustrate my invention by the accompanying drawings, in which Fig. 1 is a cross-section of the flood-protection system on the line 1—1, of Fig. 3; Fig. 2 is an elevation of the back of such a system on the line 2—2, of Fig. 1; Fig. 3 is a horizontal top view of such a system on the line 3—3, of Fig. 1; Fig. 4 is a horizontal top view of the post-restraining box, used in such a system, on the line 4—4, of Fig. 6; Fig. 5 is a horizontal cross-section of the sustaining-post employed, on the line 5—5, of Fig. 6; Fig. 6 is a vertical cross-section of the restraining-box and its appurtenant parts, on the line 6—6, of Fig. 4; Fig. 7 is a vertical cross-section, showing sustaining posts and stop-planks, on the line 7—7, of Fig. 5; Fig. 8 is a view of the stop-planks, nested as in storage; Fig. 9 is a cross-section at the top of a brace, showing sustaining-posts, stop-planks and brace in position; Fig. 10 is a vertical cross-section of a restraining-box and sustaining-post, on the line 10—10, of Fig. 4; Fig. 11 is a vertical cross-section of such box and post, on the line 11—11, of Fig. 5; Fig. 12 is a horizontal cross-section of a restraining-box and sustaining-post, on the line 12—12, of Fig. 11; Fig. 13 is a horizontal cross-section of a sustaining post at a splicing point, on the line 13—13, of Fig. 14; Fig. 14 is a vertical cross-section of a post at a splicing point, on the line 14—14, of Fig. 13; Fig. 15 is a vertical cross-section of a post at a splicing point, on the line 15—15, of Fig. 13, and Fig. 16 is a vertical cross-section of the flood-protection system, showing a sustaining-post in multiple extended length at a splicing point.

Referring to the accompanying drawings, in which similar numbers refer to similar parts: 1 is a base-block; 2 is a line of sheet-piling; 3 is a buttress-block, having chases 4, therein. Braces 5 abut against said block and a wedge 6 tightens the same. Skew-backs 7 are a part of sustaining-posts 8, which are housed in restraining-boxes 9. An I-beam 10, cheek-plates 11 and face-plates 12, are essential parts of said posts, while a foot-plate 13 acts as a back support to said post at said base-block. Stop-planks 14 rest against said face-plates. The restraining-boxes have flanges 15 and ledges 16 and compartments 17 and 18, a bolt 19 passing through a hole 20 in the said posts, and also through a slot 21 in a partition 22, a washer 23 and a nut 24 being on said bolt. Legs 25 and feet 26 support said box on said sheet-piling. A slot 27 is adapted to receive said stop-planks, while hooks 28 engage said restraining-box, and flanges 29 and ledges 30 constitute parts of said slot. Guide-posts 31 are inserted in boxes 32. Metal stop-planks have a reduced section portion 33 and a larger section portion 34, while crimps 35 and flanges 36 are portions of such metal stop-planks. Sustaining-posts have slots 37 which engage pins 38, inserted through holes 39 in splice-plates 40. Apertures 41 are in said splice-plates, and hoisting apertures 42 are in said face-plate.

The usual method followed in protecting areas liable to sudden or periodic inundation by freshets, or other causes of exceptionally high water,

is the partial, or entire surrounding of such areas by a bank of earth, known as a levee, or by a thick, high concrete wall, both requiring a long time, and a large expenditure of money in their installation. Such constructions occupy a large area of valuable land, particularly in the case of levees, rendering unavailable such occupied land for business or commercial purposes, and making it, and often the more valuable realty of the locality, exempt from, and non-productive of, revenue or taxes. While their benefit and use is usually only temporary, and may often occur only once or at most, a few times over a period of years, they are permanent, so far as their effect upon the development and productivity of the community is concerned, permanently withdrawing the occupied territory from profitable use.

This invention overcomes these serious drawbacks, furnishing a quick and immediate means of staying the effect of flood waters, offering a structure of adequate strength therefor, and at the same time leaving the site unencumbered after the passage of the flood. By its means a flood can be followed in its rise until the peak is attained, be that peak high, or medium or low, only so much of the structure being employed as is necessary to control and limit the spread of the rising water, and upon the subsidence of the flood waters all of the superstructure, above the ground surface is removed, hauled to an adjacent point of storage, where it is held until another occasion for its use arises, either after a shorter or longer period of non-use. In the meantime, and while the stream surface elevation is normal, or near normal, the area occupied by the flood protection means, is free from any and all encumbrance above the surface, and the normal activities of business and commerce can proceed unimpeded and uninterrupted.

The system of flood protection consists essentially of a base-block 1 of masonry, usually concrete, which said base-block is super-imposed upon and about a line of sheet-piling 2. In rocky soils, such sheet-pile core may not be necessary, but in situations where the soil is liable to erosion under heavy heads or from rapid flows, such a sheet-pile core is both desirable and requisite. This sheet-pile core, which is usually, although not necessarily, of metal, has been driven at, or near, the perimeter of the area to be protected. A buttress-block 3 is located adjacent to and back of the base-block, relative to the stream to be guarded against, the top of both of said blocks being at, or slightly below the ground surface, thereby removing them from interference with passage or use over the area beneath which they are located. These buttress blocks have chases 4 in their top surfaces, such chases being adapted to receive the lower end of braces 5, one end of which rests upon and within the aforesaid chase, while the other end engages, either directly, or through a wedge 6, a skew-back 7, which said skew-back is immovably fastened to the sustaining-post 8. This sustaining-post is vertical, its lower end being housed in the restraining-box 9. The sustaining post consists essentially of an I-beam member 10, having cheek-plates 11 extending therefrom and connected to a face-plate 12. These three elements, I-beam, cheek-plates and face-plate are so riveted, welded or otherwise fastened together, as these elements act as a beam, transmitting the pressures from the stop-planks through the braces to the buttress-blocks. A foot-plate 13 is also rigidly connected to the sustaining-post, and rests upon the base-block, acting as a back support to said post, and at the same time transferring a portion of the stresses incident to the high water to the base-block. Stop-planks 14 abut against the face-plate and are positioned between said face-plate and guide-posts 31.

The restraining-box 9 consists essentially of a cubical casting surrounded on five sides or faces, the upper face only being open said face having flanges 15 providing a ledge 16 on which a cover may be laid when the system is not in service. The box is divided into two compartments, compartment 17, into which the sustaining-post is thrust and housed, and compartment 18, which contains the fastening and holding means, through which the sustaining-post is fastened to the base-block. A bolt 19 passes through a hole 20 in the web of the I-beam 10, and through a slot 21 in the partition 22, said bolt being provided with a washer 23, which engages said partition, being forced into contact therewith by means of the nut 24. A leg 25 extends downwardly from said box 9, having a foot 26 thereon, which engages with, and may be fastened to, the sheet-piling 2.

A longitudinal slot 27 is an open trough, usually, but not necessarily, of metal, adapted to receive the bottom stop-plank, said slot having a hook 28 adapted to engage the said box, and also being provided with a flange 29 and a ledge 30 for the placing of a cover, at times when the system is not in service.

The stop-planks, which may be of metal, lumber or other satisfactory material, are superficially in contact with the said faceplates 12, the lower plank being inserted in the said slot 27, upper planks being superimposed upon the lower planks as the flood stage rises. Guide-posts 31, which are usually of timber, are positioned along the outer, or front, face of the stop-planks, being upon opposite faces of said stop-planks, relative to said sustaining posts, and staggered along the longitudinal axis of said protection, with reference to said sustaining-posts, said guide-posts being inserted in boxes 32 positioned to receive them in said base-block.

If the stop-planks are of metal they are preferably of trough form, having a bottom portion 33 of smaller area than the upper portion 34, the size and formation of said bottom portion being such that the said bottom portion can be inserted through the open end of the trough, thereby consolidating and condensing the stacked planks, and occupying a very small space while out of use and service, during such storage. These planks have crimps 35 along their sides, such crimps serving as a rest for superimposed planks while in storage. At the same time they aid in the positioning of the planks, the shape, size and location of the crimps being such, that when in position of service the crimp of the superimposed plank, registers with, and is housed within the crimp of the under plank. Great tightness results, preventing the leaking of water through the joints between the planks, by reason of this locking together of the juxtaposed planks by means of the said crimps. Flanges 36 extend along the edges of the planks, which flanges are an additional tightening and waterproofing means, resulting from the pressure of the water against the planks and the said flanges.

In order to meet varying heights of flood, and to reduce the size and weight of the several members, provision is made for extending the sustaining-posts upwardly to keep the stop-plank struc-

ture in advance of the rising water. For this purpose the foot of the superimposed post has a slot 37 adapted to slide upon and to be held by a headed-pin 38 which has been inserted through a hole 39 in a splice-plate 40, which is immovably fastened to the I-beam. Apertures 41 in the said splice-plate permit of more securely fastening the splice-plate and the I-beam, by means of welding. The face-plate 12 has holes 42 therein, through which a pin or hook may be introduced for use with a hoisting means, making the handling and placing of the sustaining-posts much easier and quicker

The structure hereinbefore described is strong and adequate for the service required. All upper major stresses are carried through skew-backs and braces to the buttress-blocks, which are deeply and firmly imbedded in the soil. The sheet-piling prevents any leaking or boiling through, or beneath the structure, and, with the base-block, resists the inward pressure from the water at or near the base of the structure. No material is employed that is liable to be destroyed by flood or fire, and the parts, and their form and size admit of ready assembling and rapid removal, the buttress-block and the base-block, with its boxes and slot, being the only portions left in position during low or normal water heights.

What I claim:

1. Flood protection means comprising in combination with a sheet-pile cut-off wall, a base block enclosing the top of said wall, said block having a slot in its upper side extending longitudinally of the wall and said base block having boxes at spaced intervals to each other longitudinally of the wall and disposed next to the slot, posts having their lower ends socketed in said boxes, stop-planks in and above said slot and adjacent said posts, buttress blocks adjacent to the base block and each opposite a box in the base block, and a brace from each said buttress block to the post adjacent thereto.

2. Flood protection means comprising in combination a base block having a slot in its upper side extending longitudinally thereof and of material other than the material of said base block, said base block having post sockets alternately on opposite sides of said slot, sustaining posts in said sockets on one side of the slot and guide posts in said sockets on the other side of the slot, stop-planks longitudinally disposed with respect to said base block and extending between the sustaining posts and the guide posts and with the lower said stop-plank inserted in said slot, buttress blocks adjacent to the base block and each opposite a sustaining post on the opposite side thereof from said slot, and braces engaging said sustaining posts and corresponding buttress blocks.

3. Flood protection means comprising in combination a base block having a plurality of upwardly opening boxes therein spaced from each other longitudinally of the block, sustaining posts socketed in said boxes and projecting upwardly from said blocks, trough-shaped stop-planks supported by said base block and in contact with said sustaining posts, buttress blocks adjacent to the base block and each opposite a box in the base block, and a brace from each said buttress block to the post adjacent thereto.

4. In a structure of the class described, a plurality of stop-planks, said stop-planks being trough-shaped in transverse section with the bottom of the trough disposed vertically and the two sides thereof disposed horizontally, said sides having crimps therein, said crimps of adjacent planks registering when assembled in said structure so that the vertically disposed bottoms of alternate stop-planks are in vertical alinement with each other.

5. In a structure of the class described, a plurality of stop-planks, said stop-planks being trough-shaped in transverse section with the bottom of the trough disposed vertically and the two sides thereof disposed horizontally, the edges of said sides remote from said vertically disposed bottoms having flanges along said edges.

6. In a structure of the class described, a plurality of stop-planks, said stop-planks each being trough-shaped in transverse section and having a vertically disposed bottom and two horizontally disposed sides, said sides having longitudinal edges remote from said bottom, and a flange along each of said edges, said flanges of adjacent stop-planks each overlapping the vertically disposed bottom of an adjacent plank when assembled in said structure with the said vertically disposed bottoms of alternate stop-planks in vertical alinement with each other.

7. In a structure of the class described, a plurality of stop-planks, said stop-planks each being trough-shaped in transverse section and having a vertically disposed bottom and two horizontally disposed sides, said sides having crimps therein and having longitudinal edges remote from said bottom, a flange along each of said edges, said crimps of adjacent planks registering, and said flanges of one stop-plank overlapping upon vertically disposed bottoms of adjacent stop-planks when said planks are assembled in said structure so that the said vertically disposed bottoms of alternate stop-planks are in vertical alinement.

8. Flood protection means comprising in combination a base block having a plurality of upwardly opening boxes therein spaced from each other longitudinally of the block, sustaining posts socketed in said boxes and projecting upwardly from said block, trough-shaped stop-planks wherein the bottoms of the troughs are vertically disposed and the sides of the troughs are horizontally disposed and said stop planks are juxtaposed to each other one above the next and providing crimps juxtaposed to and adapted to engage crimps of adjacent planks, said stop-planks each having flanges disposed in vertical planes with the flanges of one plank overlapping the vertically disposed trough bottom of the next adjacent planks, buttress blocks adjacent to the base block and each opposite a box in the base block, and a brace from each said buttress block to the post adjacent thereto.

9. In a structure of the class described, a plurality of stop-planks, said stop-planks being trough shaped in transverse section and having a bottom and two sides, said sides having crimps therein, said crimps projecting inwardly into the trough on one of said sides and outwardly from the trough on the opposite side of said plank.

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