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CONCRETE REVETMENT.

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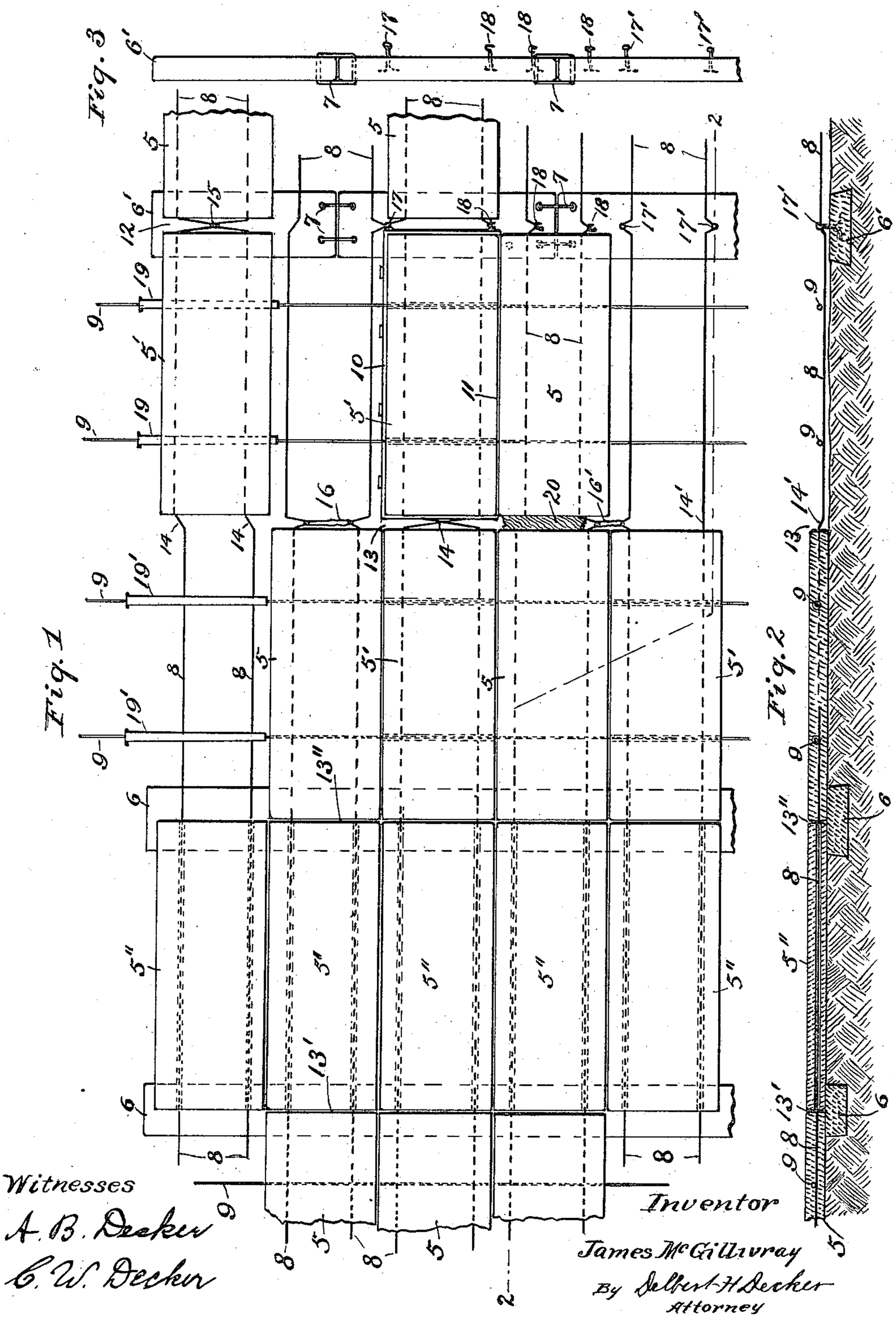
1,154,867.

Patented Sept. 28, 1915.



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UNITED STATES PATENT OFFICE.

JAMES McGILLIVRAY, OF SACRAMENTO, CALIFORNIA.

CONCRETE REVETMENT.

1,154,867. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed January 7, 1915. Serial No. 934.

To all whom it may concern:

Be it known that I, JAMES McGILLIVRAY, a citizen of the United States, residing at Sacramento, in the county of Sacramento and State of California, have invented certain new and useful Improvements in Concrete Revetments, of which the following is a specification.

This invention relates to revetments and particularly to revetments made from concrete.

It contemplates such improvements in this class of inventions as shall make the laying thereof more expeditious and less expensive. These purposes are chiefly accomplished by constructing the concrete slabs *in situ*. Other improvements relating to the reinforcement thereof and to their union in a continuous pliable mattress or revetment are attendant upon this mode of construction.

The invention therefore consists in the construction of parts their association and combination for the purpose specified substantially as hereinafter set forth and claimed.

The accompanying drawing forms a part of this specification and therein—

Figure 1 illustrates in plan a portion of the improved revetment in course of construction; Fig. 2 is a longitudinal section thereof through the broken line 2—2; and Fig. 3 is an edge view of one of the sleepers upon which the units or slabs of the revetment may be laid.

In this invention it is practicable to form the units or slabs of the revetment much larger than heretofore designed since they are formed in place upon the levee or embankment to be protected. If the contour of the levee will permit they may be from 3 to 5 feet wide and from 10 to 15 long and from 3 to 5 inches thick. The size depends on the pliability required in the mattress to prevent rupture of the units and upon the facility in construction of the units.

In the drawings 5, 5′ and 5″ indicate the units or slabs and 6, 6′ the sleepers upon which the ends of the slabs preferably rest. These sleepers may be molded in channels formed in the embankment and extended from the bottom to the top thereof and may be in one continuous strip as indicated at 6 or in several lengths or sections as indicated at 6′ where they are preferably joined together by ties 7. The sections of the sleepers may obviously be made elsewhere and brought to the place of use and there embedded. They are usually laid flush with the surface of the embankment as indicated in Fig. 2 so that the slabs may rest upon said surface throughout.

When the sleepers have been laid then longitudinal reinforcing members 8 consisting of rods or preferably cables are stretched along the levee and anchoring cables 9 are located up and down the bank being anchored at one or both ends in any desired well known manner. The anchoring cables being molded into the slabs serve as reinforcing members as well.

In molding the slabs in place their confines may be determined by any suitable forms of wood or metal. A form for the purpose is typified at 10 with a slab 5′ constructed therein. It is preferable that the side or sides of the form, 11 for example, against an adjacent slab shall be as thin as practicable so that the spaces between the slabs shall be as narrow as possible. The manner of forming these joints is wholly immaterial so long as the slabs constitute distinct units and a pliable mattress is produced.

At the sleepers, or between the ends of adjacent tiers of slabs, whether or not sleepers are used, a sufficient space is left to compensate for longitudinal expansion and contraction of the slabs. These spaces are indicated at 12 and 13 and at the latter no sleeper is used. The expansion joints may be provided at greater intervals than one tier as indicated at the left in Figs. 1 and 2 where no provision is made for expansion at two successive joints 13′ and 13″. The anchoring cables may also be omitted from some of the intermediate tiers as indicated by their absence from the tier of slabs 5″.

Since the slabs are for the most part molded onto the longitudinal reinforcing members 8 and thereby rigidly fixed thereto com-

pensation bends must be provided in said members and preferably without giving them undue slack. Provision for this may be made in various ways which will permit these reinforcing cables to be kept taut. Generally speaking a change in the direction of said cables where they cross the expansion joints will provide sufficient compensation. As indicated at 14 a cable 8 emerging from one slab may pass in an oblique direction to its location in the proximate slab of the adjacent tier. Such obliquity may be in the plane of the slabs or counter thereto as indicated at 14′ in Fig. 2. Such compensation may be effected by means of kinks as indicated at 15 and 16 but in these instances the kinks must be united by interlocking as at 15 or by a link as at 16 in order to make the cables sufficiently taut. The compensating kinks may be united to some other part of the revetment as to the sleepers by passing them around pins 17 and 17′ or hooks 18 secured in the sleepers. As indicated at 16′ and 17 these kinks may also be utilized to tie the longitudinal rows of slabs together at their ends, directly as at 16′ and indirectly as at 17 where both slabs are tied to the same sleeper.

Compensation for transverse expansion and contraction of the slabs is provided for and strain upon the anchoring cables distributed by rigidly fixing alternate slabs to said cables, the cables being permitted to pass freely through the intermediate slabs. The slabs loose upon the anchoring cables are indicated at 5′. In molding these slabs in place tubes represented at 19 are located on the cables within the forms and when the concrete has sufficiently hardened they are pulled from the slab and slid along the cables ready for subsequent use as indicated at 19′.

Where the longitudinal reinforcing members 8 extend through a number of slabs between expansion joints it is also well to provide for their free passage through the slabs of alternate tiers. Such free passage is indicated in slabs 5″ in the tier between joints 13′ and 13″. Provision for this free passage in slabs 5″ may be made as in slabs 5′ above described. The freedom of movement thus provided adds pliability to a mattress of slabs thereby enabling it to settle in conformity with any settling of the surface covered and without breaking slabs or cables.

Where a portion of a revetment is to be constructed under water the slabs must be brought ready-made to the place of use. The structure patented to me on September 29, 1914, No. 1,112,018 is well adapted for the portion under water and with it the present invention can be readily associated since the anchoring cables of said patented structure extend parallel up the bank the same as in the present instance and will serve as anchoring cables and reinforcement for the exposed portion of the revetment to be built *in situ*.

The expansion joints may be filled or left open as desired. When no sleeper is used under said joints it is well to fill them, as indicated at 20, with an asphaltic preparation. Such filling yields to pressure readily and also protects the reinforcement and other metallic parts in the joints. Such filling may obviously be also applied where sleepers are used at the joints.

The invention claimed is—

1. A revetment consisting of upwardly extending tiers of concrete slabs, said tiers being spaced apart to leave expansion joints between them, and reinforcing members passing through said slabs and crossing said joints in directions deviating from those through the slabs, and means for connecting in said joints the parts of the reinforcing members lying between longitudinally adjacent slabs to like parts of such members lying between proximate longitudinally adjacent slabs.

2. A revetment consisting of upwardly extending tiers of concrete slabs, said tiers being spaced apart to leave expansion joints between them, reinforcing members passing through said slabs transversely of said tiers and crossing said joints at an angle to their general direction, and upwardly extending anchoring cables passing through said slabs.

3. A revetment consisting of upwardly extending tiers of concrete slabs joined together by transversely extending reinforcing members and upwardly extending cables traversing the slabs of each tier and being anchored in some slabs while passing freely through others for the purpose specified.

4. In a revetment an upwardly extending tier of horizontally disposed slabs and anchoring cables passing upwardly through said tier, a part of said slabs being rigidly fixed to said cables while said cables pass freely through holes in the intermediate slabs.

5. In a revetment the combination with reinforcing members of concrete slabs having said members molded rigidly thereto and intermediate slabs through which said members pass freely for the purpose specified.

6. A revetment consisting of upwardly extending sleepers and slabs of concrete laid transversely of said sleepers and having their proximate ends located thereon and spaced apart to leave an expansion joint, reinforcing members traversing said slabs and crossing said joint at an angle to their direction through the slabs, and an elastic filling in said joint for the purpose specified.

7. A revetment consisting of upwardly extending sleepers embedded in the surface to be protected, slabs of concrete laid trans-

versely of said sleepers and having their proximate ends located thereon, horizontally extending reinforcing members traversing said slabs successively and upwardly extending anchoring cables also traversing said slabs and being anchored in some of them while passing freely through others.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES McGILLIVRAY.

Witnesses:
CLINTON E. HARBER,
W. GEORGE SPILMAN.