

J. E. KJILBERG.
SEA WALL OR WHARF CONSTRUCTION.
APPLICATION FILED DEC. 8, 1909.

969,706.

Patented Sept. 6, 1910.

2 SHEETS—SHEET 1.

Fig. 2.

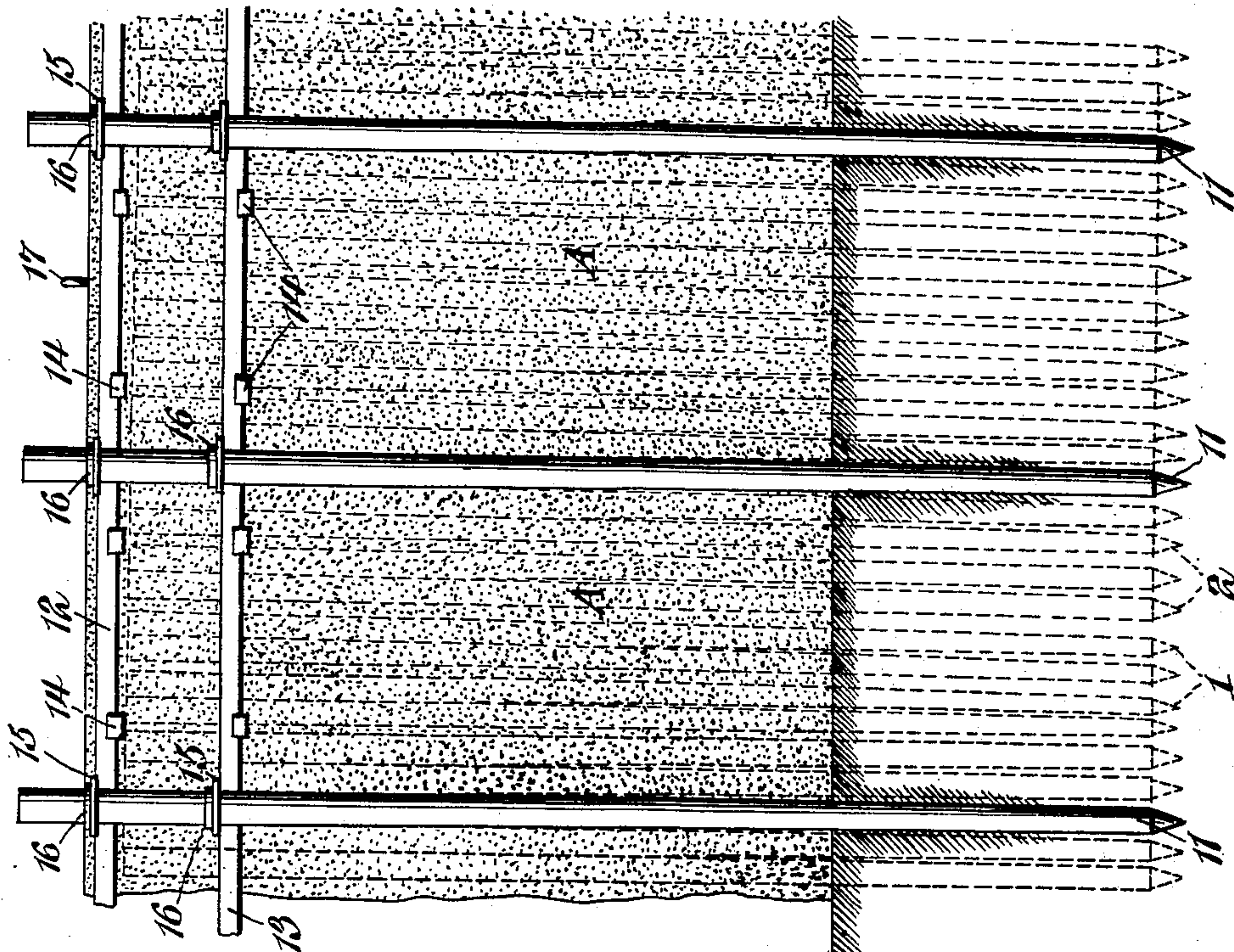
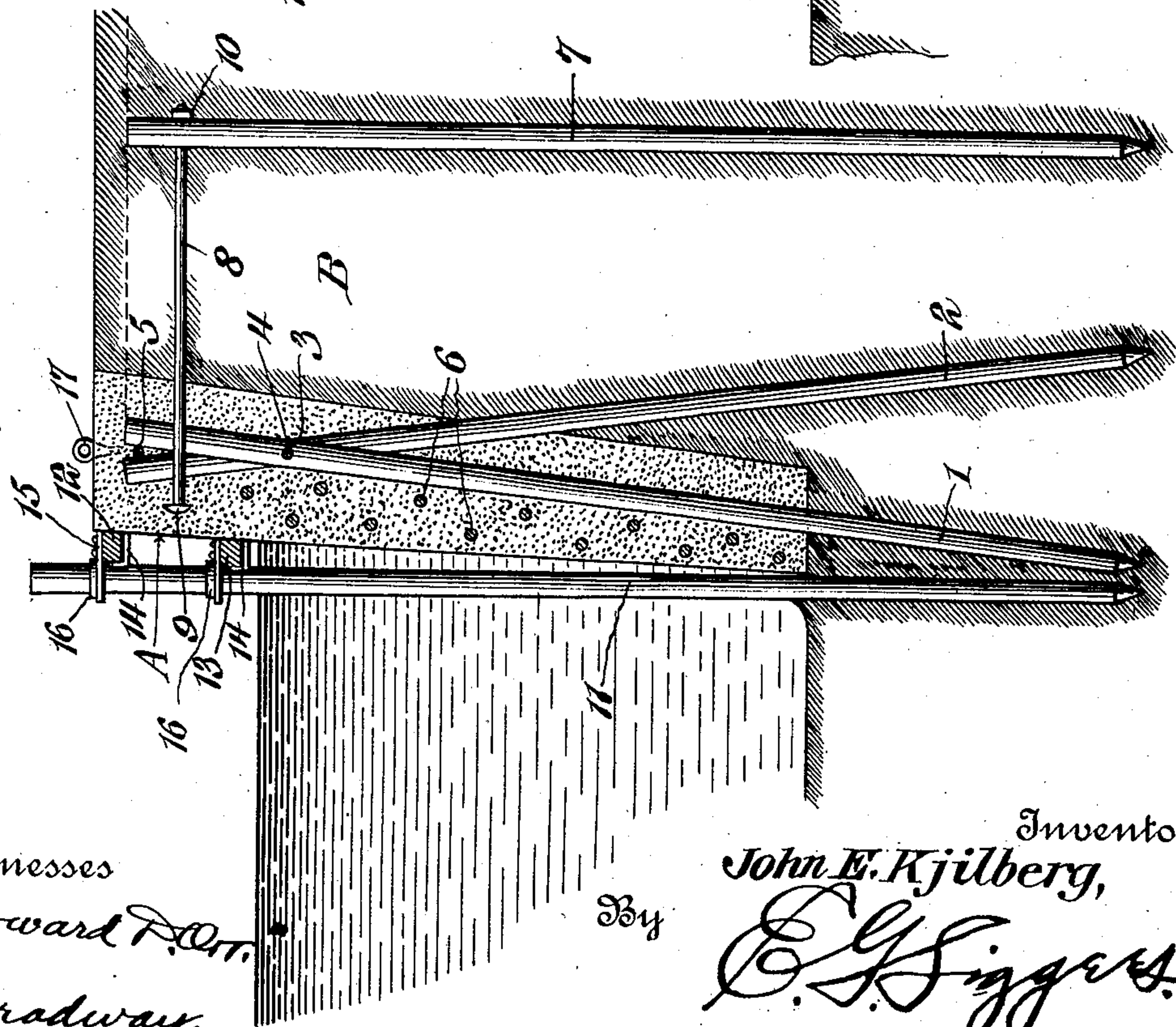


Fig. 1.



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C. Bradley.

By

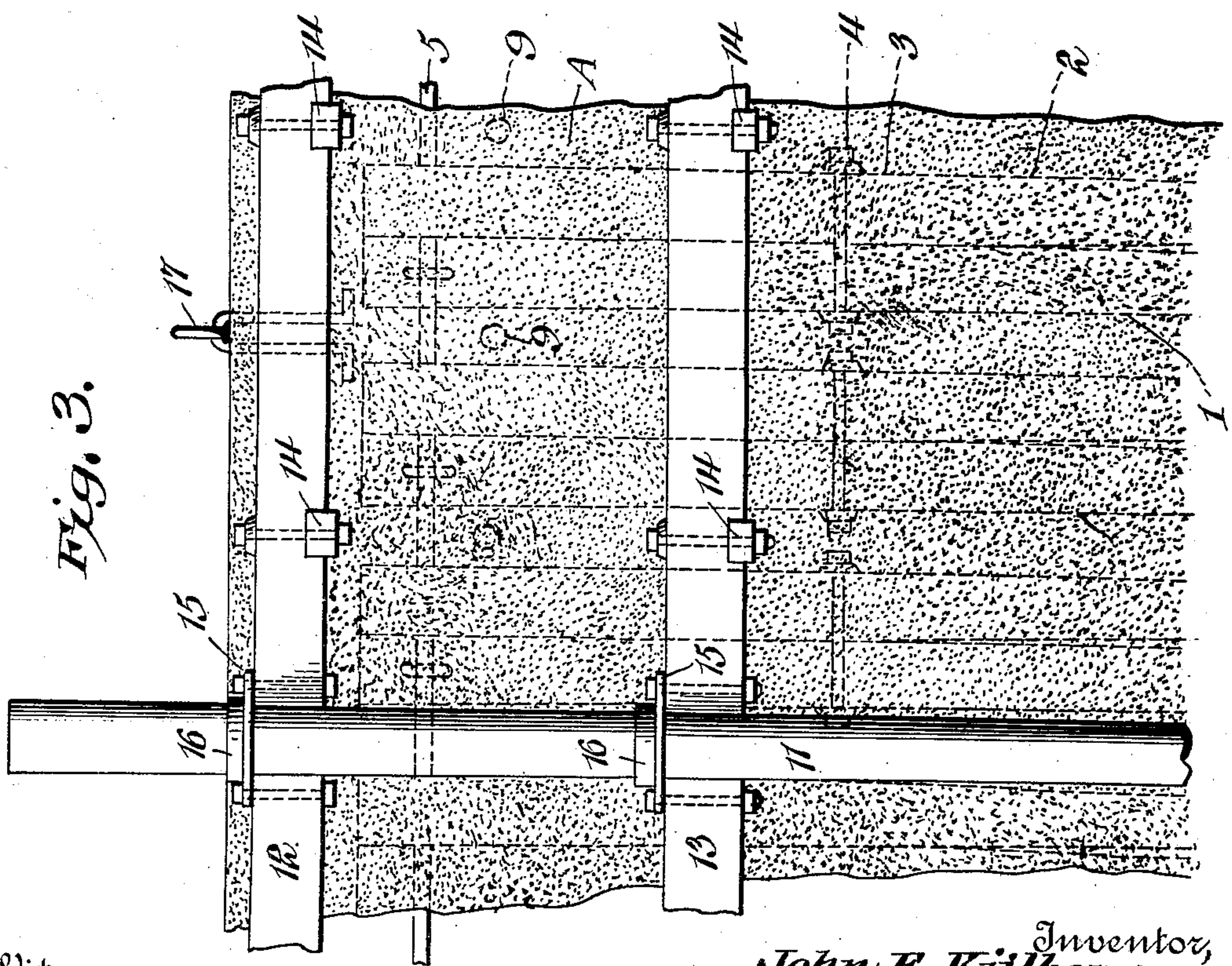
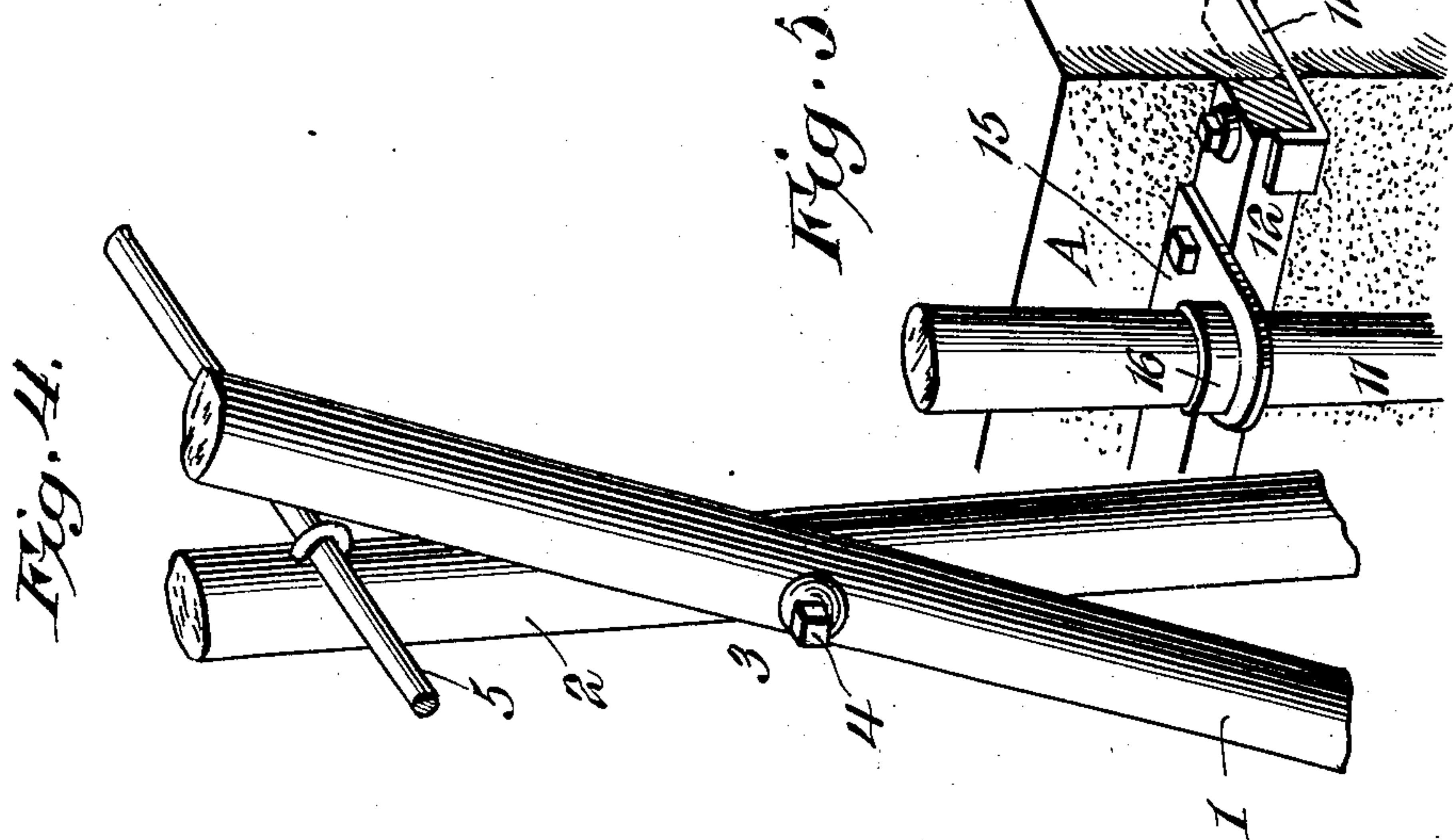
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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SEA-WALL OR WHARF CONSTRUCTION.

969,706.

Specification of Letters Patent.

Patented Sept. 6, 1910.

Application filed December 8, 1909. Serial No. 532,068.

To all whom it may concern:

Be it known that I, JOHN E. KJILBERG, a subject of the King of Sweden, residing at Mobile, in the county of Mobile and State of Alabama, have invented a new and useful Sea-Wall or Wharf Construction, of which the following is a specification.

This invention relates to wharves, bulkheads, retaining walls and the like, for use along bodies of water to retain the shore material or embankment from the latter.

The principal object of the invention is the provision of a structure of this character which is of extremely simple construction, inexpensive as to the cost of material and building, and designed to be of permanent character so as to take the place of the common timber constructions which are liable to become destroyed by storms or eaten away by "teredo" or sea-worms.

Another object of the invention is to provide a novel arrangement of reinforcing and supporting piles, together with a wall of concrete or similar material so arranged as to effectively withstand the strains to which the structure is subjected and to be unaffected by the elements.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a vertical transverse section of the wall. Fig. 2 is an elevation of the wall viewed from the water side. Fig. 3 is an enlarged detail view showing the wall in elevation. Fig. 4 is a perspective view of the upper portions of one pair of reinforcing piles for the concrete portion of the wall. Fig. 5 is a detail perspective view of the fastening for the fender pile.

Similar reference characters are employed to designate corresponding parts throughout the views.

Referring to the drawings, A designates the concrete portion of the wall, wharf or the like, which forms a facing for the embankment of earth B, the concrete extending downwardly at least a distance equal to the depth of the water. This concrete section A is reinforced and held in place by piles

1 and 2 which are driven into the earth in such relation to each other as to effectively withstand the downward and lateral pressure of the concrete wall. The piles 1 and 2 are arranged in pairs and are oppositely inclined or battered and so arranged with respect to each other as to cross at the point 3 slightly below their upper ends. The pairs of piles are spaced from each other in a row extending longitudinally of the wall, and the front set of piles 1 of the row pass downwardly through the concrete wall and out of the bottom thereof, while the rear set of piles 2 pass downwardly through the upper portion of the wall and out of the latter at the rear at a point intermediate the top and bottom thereof. The concrete wall can be of any transverse dimension, according to the locality and body of water to be protected. The piles 1 and 2 of each pair are fastened together by bolts 4 or equivalent devices passing through the piles at the point where they cross, and the pairs of piles are secured to a horizontal reinforcing rod or equivalent means 5 which is embedded in the concrete adjacent the top thereof, the said rod being inserted between the upper end of the piles. The concrete wall is further reinforced by spaced longitudinal bars or rods 6, so that the wall is strengthened vertically by the piles and horizontally by the bars. Spaced shoreward a suitable distance from the row of reinforcing piles 1 and 2 is a row of anchor piles 7 which are driven into the embankment and the concrete wall is connected with these piles 7 by rods 8 which have their ends 9 enlarged or otherwise formed to obtain a firm hold in the concrete while the opposite ends pass through the piles 7 and tighten by nuts 10.

Any suitable fender construction may be employed in connection with the concrete wall, and for this fender, piles 11 are driven into the bottom of the waterway close to the water face of the concrete wall, and the upper ends of the piles are secured to wale pieces or horizontal timbers 12 and 13 disposed against the face of the concrete wall and supported on and bolted to L-shaped brackets 14 which are embedded in the concrete and project outwardly therefrom to form seats on which the wale pieces rest. Any suitable means may be employed for fastening the fender piles to the wale pieces,

such for instance, as collar plates 15 bolted to the wale pieces to project laterally therefrom and through the collars 16 of which the fender piles extend. The fender piles 5 may project above the top of the wall or wharf to serve as mooring posts, or mooring rings or equivalent devices 17 may be anchored in the concrete.

10 A wall constructed in this manner is light as compared with other concrete walls and possesses great strength owing to the large number of piles and their peculiar arrangement. Furthermore, the wall is of a permanent character since the piles are protected from destructive elements.

15 From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the construction which I now consider to be the best embodiment thereof, I desire to have it understood that the construction shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

30 Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In a structure of the class described, a wall of concrete or the like, and a row of 35 vertically disposed reinforcing and supporting elements partially embedded in the wall and driven into the foundation of the wall, said elements comprising connected piles arranged in crossed relation.

40 2. In a structure of the class described, a wall, means for supporting the wall consisting of a plurality of pairs of piles arranged side by side with their upper ends embedded in the wall and their lower ends 45 projecting out of the latter and driven into the earth, the piles of each pair crossing each other at a point below their upper ends and the point of crossing being located in the wall.

50 3. In a structure of the class described, a wall, means for supporting the wall consisting of a plurality of pairs of piles arranged side by side with their upper ends embedded in the wall and their lower ends 55 projecting out of the latter and driven into the earth, the piles of each pair crossing each other at a point below their upper ends and the point of crossing being located in the wall, and means for securing each pair 60 of piles rigidly together.

4. In a structure of the class described, a wall, means for supporting the wall consisting of a plurality of pairs of piles arranged side by side with their upper ends embedded 65 in the wall and their lower ends projecting

out of the latter and driven into the earth, the piles of each pair crossing each other at a point below their upper ends and the point of crossing being located in the wall, and means for securing a plurality of pairs 70 of piles together and to form a horizontal reinforce for the wall.

5. In a structure of the class described, a wall, means for supporting the wall consisting of a plurality of pairs of piles arranged 75 side by side with their upper ends embedded in the wall and their lower ends projecting out of the latter and driven into the earth, the piles of each pair crossing each other at a point below their upper ends and the 80 point of crossing being located in the wall, means for securing each pair of piles rigidly together, and means for securing a plurality of pairs of piles together and to form a horizontal reinforce for the wall. 85

6. In a structure of the class described, a wall of concrete or the like, separate series of piles having their upper ends embedded in the wall, the lower ends of one series passing out of the bottom of the wall and of the 90 other series passing out of the side of the wall to be anchored in the earth under the wall, the said series of piles being disposed in angular relation to each other and adjacent piles of both series crossing each other 95 near the top of the wall.

7. In a structure of the class described, a concrete wall, separate series of piles having their upper portions embedded in the wall in crossed relation and their lower portions 100 projecting downwardly out of the same at divergent inclinations, a row of driven piles spaced shoreward from the wall, and means for connecting the wall with the last-mentioned piles above the points of intersection 105 of the first-mentioned piles.

8. In a structure of the class described, a wall formed with concrete or the like, a plurality of supporting and reinforcing elements each consisting of a pair of connected 110 piles having their upper ends embedded in the wall in crossed relation and their lower ends projecting outwardly therefrom in divergent relation, fender piles secured to the outer face of the wall, and reinforcing elements embedded in the wall and extending 115 transversely to the piles.

9. In a structure of the class described, a wall formed with concrete or the like, a plurality of supporting and reinforcing elements each consisting of a pair of connected 120 piles having their upper ends embedded in the wall in crossed relation and their lower ends projecting outwardly in divergent relation, anchor piles spaced from the wall, and tie bars anchored in the wall between adjacent supporting and reinforcing elements 125 above the points of intersection of the same and extending from the wall and connected with the anchor piles. 130

10. In a structure of the class described,
the combination of a concrete wall, brackets
embedded therein, wale strips secured to
said brackets, collar plates secured to said
5 wale strips, and fender piles inserted
through and supported by said collar plates.

In testimony that I claim the foregoing as

my own, I have hereto affixed my signature
in the presence of two witnesses.

JOHN EMIL KJILBERG.

Witnesses:

N. A. HUTCHINS,

J. S. PÊHLSTROM.