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SINKING JOINT CAISSONS AND BUILDING PIERS, WALLS, &c.

APPLICATION FILED MAR. 4, 1911.

1,036,681.

Patented Aug. 27, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

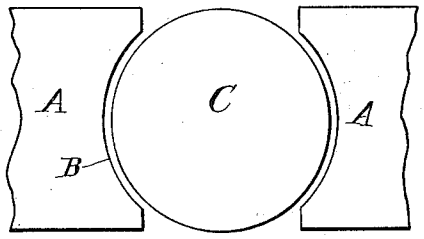


Fig. 2.

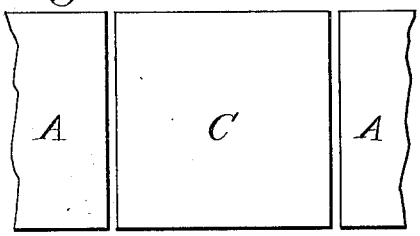


Fig. 3.

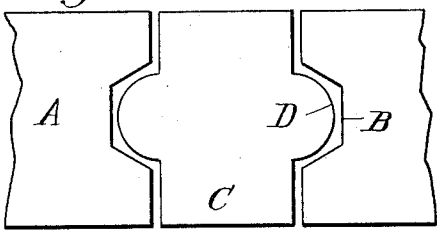


Fig. 4.

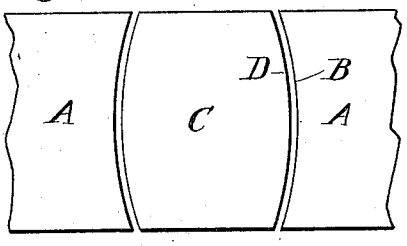


Fig. 5.

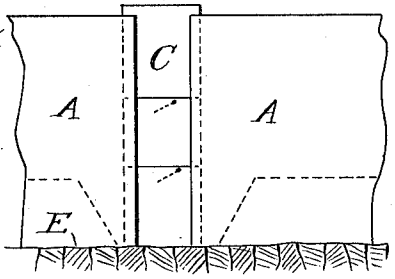


Fig. 7.

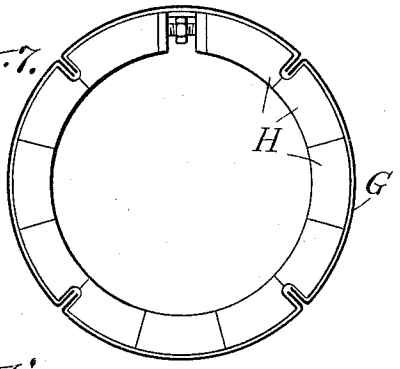
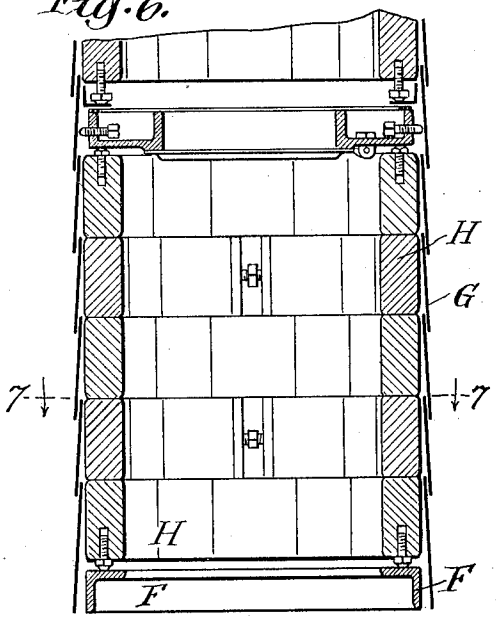


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 8.

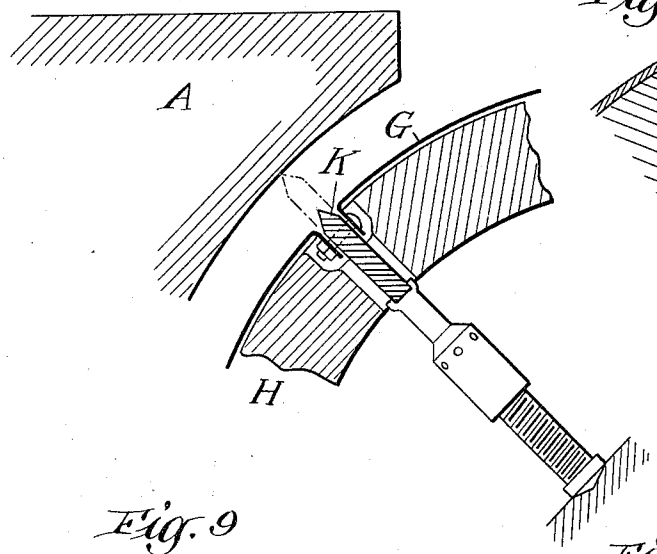


Fig. 12.

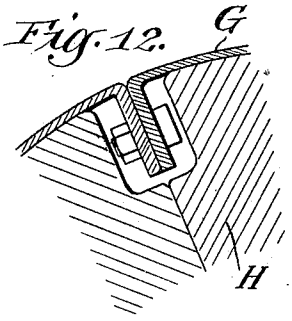


Fig. 9

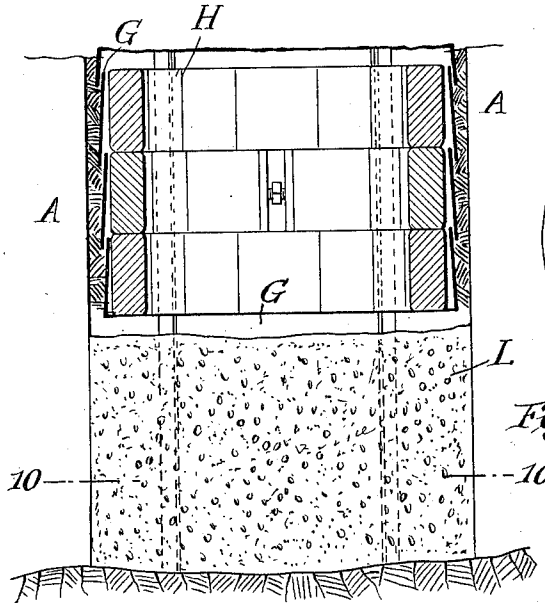


Fig. 10.

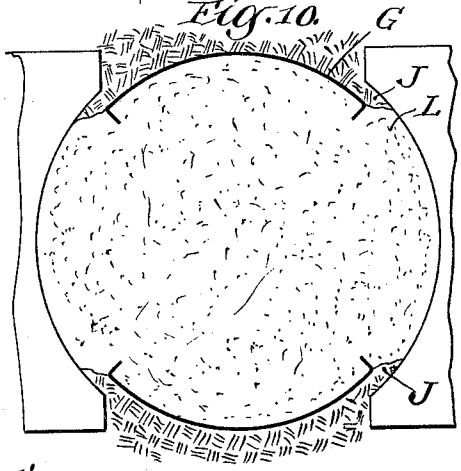
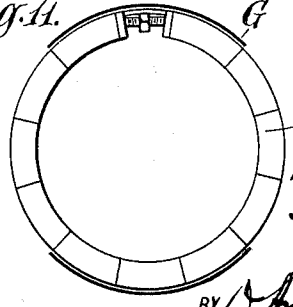


Fig. 11.



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SINKING JOINT-CAISSONS AND BUILDING PIERS, WALLS, &c.

1,036,681. Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed March 4, 1911. Serial No. 612,330.

To all whom it may concern:

Be it known that I, DANIEL E. MORAN, a citizen of the United States, residing at Mendham, county of Morris, and State of New Jersey, have invented new and useful Improvements in Sinking Joint-Caissons and Building Piers, Walls, &c., of which the following is a specification.

In a co-pending application I have described and claimed broadly a cheap and advantageous method of building piers, columns, shafts or the like of concrete or equivalent material.

The present invention is based on a particular application of the aforesaid broad invention to the building or sinking of what I call joint piers or caissons, that is to say piers (or the caissons used in sinking them) which are to engage with an adjacent pier or piers so as to form a substantially continuous wall for keeping water out of an excavation or for other purposes.

The accompanying drawings illustrate embodiments of the invention.

Figures 1, 2, 3 and 4 are diagrammatic plan views of four different arrangements of the adjacent caissons or coffer-dams. Fig. 5 is a side elevation of Fig. 1. Fig. 6 is a vertical section of the joint caisson of Fig. 1. Fig. 7 is a horizontal section on the line 7—7 of Fig. 6. Fig. 8 is a horizontal section of a modification in detail. Fig. 9 is a vertical section similar to Fig. 6 showing the concrete placed in the bottom of the caisson and extending to the adjacent caissons. Fig. 10 is a horizontal section on the line 10—10 of the same. Fig. 11 is a horizontal section of another construction. Fig. 12 is an enlarged detail.

Referring to the drawings, Fig. 1 shows a pair of caissons or coffer-dams A of any usual or suitable type and between which a joint caisson is to be sunk to prevent the passage of earth and water. The caissons are provided with large circular recesses or key ways B in their ends into which the pier formed by the joint caisson is to extend so as to interlock the several piers. In this case the joint caisson C is made circular.

In the construction shown in Fig. 2 the adjacent piers A are not provided with a keyway and the joint caisson C has no interlocking engagement.

In the case shown in Fig. 3 the adjacent piers A are provided with recesses or keyways B and the joint caisson C is not entirely circular, but is provided with projecting keys D to extend into the recesses B.

In the case shown in Fig. 4 the adjacent piers R are made with their ends on a continuous concave curve forming a keyway B of the full width of the pier and the joint caisson C has its adjacent ends D curved to form engaging keys, its inner and outer faces being flat.

Various other plans may be adopted. Each pier of the wall, for example, may have a right hand end projecting into a keyway in the adjacent left hand end of the next pier, or the joint caissons and the piers formed thereby may be of substantially the same lengths as the other piers. The design of the joint caissons, or of all the caissons, as the case may be, is such as to facilitate the extending of the concrete outward beyond the line of the caisson so as to close the space which is necessarily left as a clearance in sinking the caisson, thus bringing the concrete of one pier into contact and preferably into interlocking engagement with the adjacent face of the next caisson or pier. The problem is simplified as much as possible by the use of main caissons or piers A of the ordinary type, without special construction, leaving only a clear space of about four feet between their ends for the handling of forms, the location of shores, etc.; and subsequently sinking between these main piers caissons of special construction. Whether the joint be made in each caisson or only with special caissons it is an advantage of this invention that the joint is made without the necessity of special work below the cutting edge, the entire caisson being carried down to rock in the ordinary way, or to concrete which has been laterally extended below the cutting edge of adjoining caissons, or to other suitable sub-foundations.

In the case shown in Fig. 5 the main caissons A and the joint caisson C have been shown carried down to rock E. The keyways and keys extend from the cutting edges of the caissons to the surface of the ground. The purpose of the joint caisson is to remove the quicksand or other earth lying between the ends of the other caissons and to provide a filling of concrete extending entirely between the ends of the main caissons. For this purpose, after sinking the joint caisson a removable part of it, adjacent to the end of the main caisson, is

withdrawn and the intervening earth is removed and the caisson filled with concrete which extends through the opening thus provided to make contact with the adjacent main caisson. This operation is performed step by step from the bottom upward. An example of a joint caisson permitting this operation is shown in Figs. 6 and 7, various modifications thereof being illustrated in my co-pending application above referred to. Projecting upward from the angle iron ring F, constituting the cutting edge, is a shell G of sheet metal preferably formed of overlapping rings. Each ring is formed in segments as shown in Fig. 7 with inturned flanges bolted together (Fig. 12). Within the shell is a series of collapsible rings composed of cast iron blocks H forming an internal supporting or reinforcing structure so that the shell G may be made of extremely light metal adapted only to keep out the water, and to be air tight where pneumatic pressure is employed. Each ring of blocks is pressed outward firmly against the shell and in case of necessity fastened thereto so as to be supported independently of the other rings. The caisson having been sunk to the desired depth the lowermost ring of blocks H may be withdrawn, leaving the shell unsupported for so short a distance that there is no danger of its collapsing, after which the body of concrete may be introduced to a height nearly reaching the bottom of the next ring of blocks. This concrete then supports the bottom part of the shell and the process may be repeated step by step upward until the entire caisson is filled. In making a joint caisson the operation is carried still further. After the lowermost ring of blocks H is withdrawn the segments of the shell G adjacent to the ends of the next main caisson are unbolted from the remaining portions of the shell and the earth removed until the end of the adjacent main caisson is reached. The concrete is then introduced so as not only to fill the shell of the joint caisson, but to extend out of the shell and to make direct contact with the adjacent main caisson in the manner shown at L in Figs. 9 and 10. This operation is repeated step by step upward to the desired height, usually to the tops of the caissons or piers.

Figs. 7 and 10 are for the case of a circular joint caisson and show the removal of a quadrant of the shell. The length removed, however, may be greater or less according to the circumstances. Each of the sheet iron rings constituting the shell corresponds in height to one, or to an exact number of rings of the reinforcing blocks H so that the same height of reinforcing rings and shell may be removed for each operation. In order to facilitate the removal of portions of the shell as described it is advantageous to make the rings of sheet metal slightly conical and overlapping in the manner indicated in Fig. 6. Under ordinary conditions the removal of a part of the shell would involve danger of the falling in of the outside material. In the case of a joint caisson lying close to the end of another caisson there is only a small amount of material liable to fall in, and this material has to be removed in any case. The inflow of material from the sides of the opening, say at J, Fig. 10, will generally be prevented by the narrowness of the space and by the retention of the adjacent portion of the shell G of the joint caisson.

In especially bad soil the outward flow of air or the inward flow of material from the sides of the removed plates may be guarded against by stock ramming in the space J or by various mechanical devices such for example as the packing strip K, Fig. 8, arranged to be pushed outward against the face of the adjacent main caisson A. Such a strip may be movable independently of the shell and carried, for example, in slots in the cast iron blocks, or it may be fastened to the parts of the shell G so as to carry with it the part of the shell which has not been removed. The strip can be made in short lengths corresponding to the heights of the supporting rings or of the shell rings, or it can be in longer lengths. The chief function of the shell is to keep out water, and to hold air in the case of pneumatic work. Where open excavation is practicable and where the conditions of the earth permit the shell may be omitted in whole or in part. For example, in passing through dry earth or impervious clay the entire circumference of the shell may be omitted. Or the conditions may permit the omission of the shell over a part of the circumference adjacent to the main caisson, as in Fig. 11. In such case it is only necessary to remove the interior rings and excavate the earth out to the face of the main caisson, whereupon the concrete can be laid as in Fig. 10. The cast iron rings not only serve to maintain the form of the excavation by supporting the pressure of the earth and to permit excavation through them, but they serve by their weight and stiffness to sink the caisson. The two functions of weight and vertical stiffness may be separately provided for, using a removable structure of comparatively light weight and sinking it by means of superposed weights, jacks or the like. Various other modifications may be made, as explained more fully in my co-pending application above referred to.

What I claim is—

1. An apparatus for connecting two adjacent piers, said apparatus comprising a shell adapted to be sunk between piers and

having on each of the two sides adjacent to said piers a removable portion extending clear to the top of the structure.

2. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a shell having a removable portion on the side toward the adjacent pier, and comprising also a removable internal stiffening structure.

3. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a shell having a removable portion on the side toward the adjacent pier, and comprising also an internal stiffening structure consisting of collapsible and removable rings.

4. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a shell having separately removable portions located one above another and on the side toward the adjacent pier and adapted to be removed in upward succession to permit the extension of the filling material to the adjacent pier in corresponding upward succession.

5. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a shell having separately removable portions located one above another and on the side toward the adjacent pier and adapted to be removed in upward succession to permit the extension of the filling material to the adjacent pier in corresponding upward succession, and comprising also a removable internal stiffening structure.

6. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a shell having separately removable portions located one above another and on the side toward the adjacent pier and adapted to be removed in upward succession to permit the extension of the filling material to the adjacent pier in corresponding upward succession, and comprising also an internal stiffening structure consisting of collapsible rings removable in upward succession.

7. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a structure having a removable portion on the side toward the adjacent pier, and means for preventing the inflow of the outside material at the side of the opening to be formed by the removal of said portion.

8. An apparatus for forming a pier in contact with an adjacent pier, said apparatus comprising a structure having a removable portion on the side toward the adjacent pier, and a strip adapted to be set in place from the inside of the caisson for preventing the inflow of outside material at the side of the opening to be formed by the removal of said portion.

9. The method of building a pier in contact with an adjacent pier which consists in sinking a suitable structure adapted to maintain the form of the excavation, removing at least a side portion of said structure toward the adjacent pier removing the earth out to said adjacent pier and introducing concrete extending out to the adjacent pier.

10. The method of building a pier in contact with an adjacent pier which consists in sinking a suitable structure adapted to maintain the form of the excavation, simultaneously sinking a shell around said structure, removing said structure and a side portion of said shell toward the adjacent pier, removing the earth out to said adjacent pier and introducing concrete in place of said structure and extending out to the adjacent pier.

11. The method of building a pier in contact with an adjacent pier which consists in sinking a suitable structure adapted to maintain the form of the excavation, simultaneously sinking a shell around said structure, removing said structure in successive sections from the bottom upward and simultaneously removing side portions of said shell toward the adjacent pier, removing the earth outward to the adjacent pier and introducing concrete in successive sections in place of the sections of said structure removed and extending out to the adjacent pier.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

DANIEL E. MORAN.

Witnesses:
W. W. CORLETT,
D. ANTHONY USINA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."