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W. H. HEALY.

CYLINDER PIER CONSTRUCTION.

APPLICATION FILED NOV. 6, 1905.

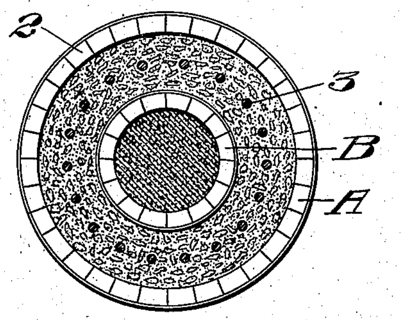

Fig. 1.

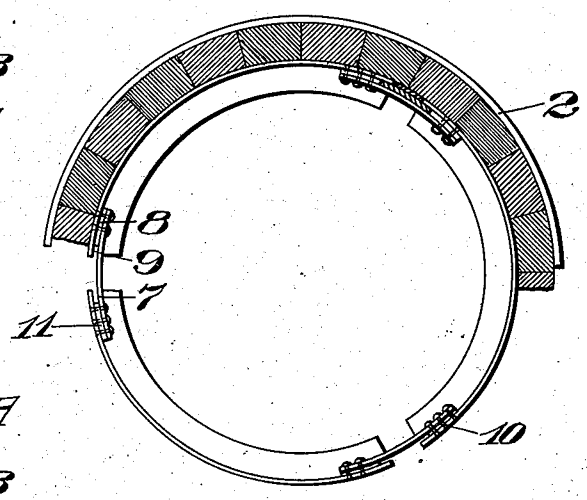

Fig. 3.

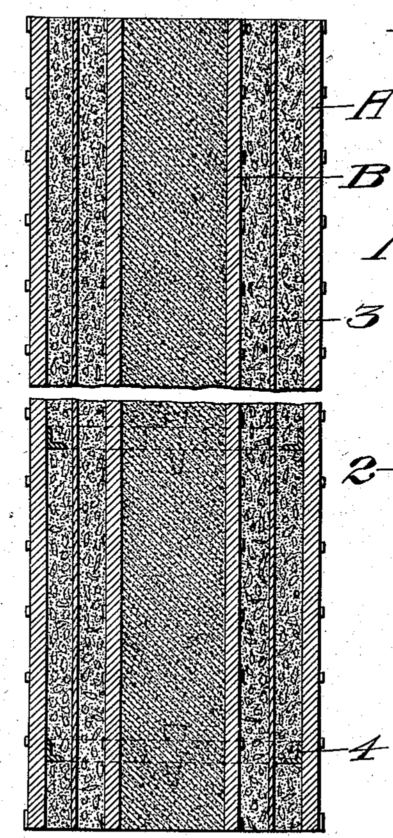

Fig. 2.

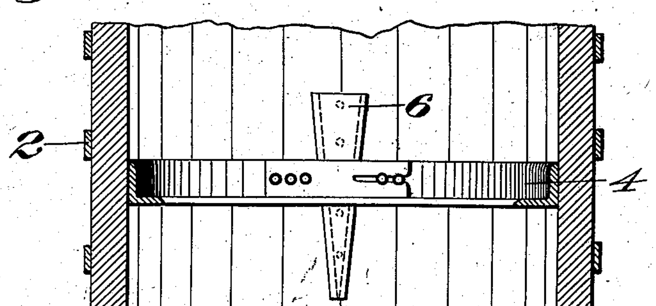

Fig. 4.

Witnesses.
F. Castberg
[illegible]

Inventor.
William H. Healy
By Geo. H. Strong. Atty

UNITED STATES PATENT OFFICE.

WILLIAM H. HEALY, OF SAN FRANCISCO, CALIFORNIA.

CYLINDER-PIER CONSTRUCTION.

No. 814,959. Specification of Letters Patent. Patented March 13, 1906.

Application filed November 6, 1905. Serial No. 285,990.

To all whom it may concern:

Be it known that I, WILLIAM H. HEALY, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Cylinder-Pier Constructions, of which the following is a specification.

My invention relates to the construction of cylinder-piers, such as are used in wharves, bridges, buildings, &c. In certain classes of this construction the piers have two functions—namely, that of carrying direct compression and that of resisting bending—the latter being caused by external radial pressure against the piers, such as tides, currents, and impacts of solid bodies. In constructing cylinder-piers of very great depth and large diameter the cost of material, such as concrete, is an important item. If the piers are small in depth and diameter, they may adequately serve the purpose of carrying direct compression, but they are weak against bending forces. Bending in a body such as a pier causes both tension and compression. If the pier is constructed solid of concrete, it will fail on the tension side of the neutral axis, as concrete is eight to ten times stronger in compression than in tension. Again, in sinking wood-stave cylinders for pier construction it often happens on account of the external pressure due to the head or depth of water and the unsymmetrical beveling of the staves of the cylinder that the structure will collapse when pumped out. This is especially liable to occur with cylinders of six, eight, or more feet in diameter. As it is advisable to have concrete deposited with as little wash as possible, it is either necessary to replace the cylinder by a new one—a source of extra expense—or else devise means to reinforce the interior of the cylinder against collapse. Therefore recognizing the following facts—first, that solid piers of large dimensions are costly; second, that solid piers of small dimensions are weak against bending, and consequently offer very little resistance to the lateral action of tides, currents, and impacts of bodies; third, that the cores of solid piers, which are subjected to bending forces, are of relatively little strength compared to the outer layer, and consequently constitute a waste of material, and, fourth, that cylinders of large diameter are liable to collapse before they are filled with concrete—I propose to build a pier which is, first, economical of cost; second, strong structurally against bending; third, which will have a core of sufficient weight and at a minimum of cost, and, fourth, to provide an expansible reinforce or brace for insertion into the wooden-stave cylinder to prevent its collapsing during the course of construction of the pier.

Having reference to the accompanying drawings, Figure 2 is a longitudinal section of my improved pier construction. Fig. 1 is a top end view of same. Fig. 3 is a section of a fragment of the pier, showing the application of my expansible reinforce. Fig. 4 is a detail showing a portion of the reinforce with a wedge for expanding the same.

A and B represent two concentric spaced wood-stave cylinders of suitable length and diameter, the staves of each cylinder being surrounded and held in firm cylindrical form by suitable means, as the hoops or bands 2. The relative sizes of the cylinders depend on the size of the pier to be constructed, and they are proportioned to provide the necessary strength and produce the best mechanical results. In an eight-foot pier the inner cylinder is approximately four feet in diameter.

The two cylinders are driven simultaneously, and the annular space between the cylinders is then excavated and pumped out. Metal rods or twisted-wire cables 3, which are as long as the cylinders, are now inserted between the peripheries of the two cylinders, and the intercylinder space is filled and packed with concrete to the height desired. If the material inside of the inner cylinder is not suitable as a core, the space within the inner cylinder is also excavated and filled in with sand, rock, or some suitable cheap material to the requisite height.

The use of the two concentric wooden cylinders enables me to produce a concrete tubular pier of maximum strength and at a minimum cost, since the volume of concrete actually used is arranged to best advantage relative to the axis of the pier to resist bending, while the cheap loose sand core employed in the inner cylinder gives sufficient weight to the pier and is sufficiently compact to sustain its due proportion of direct compression and to support the inside of the inner cylinder against collapse.

If during the construction of the pier the outer cylinder shows a tendency to collapse for any reason, I may insert one or more ex-

pansible reinforces or braces, each in the form of an annulus 4, composed of a series of conjoined angle-iron segments. The arcs of these segments correspond to the curve of the inside of the cylinder in which the brace is to be used, and the combined length of the segments is a little less than the circumference of the inside of said cylinder to provide for the necessary expansion and contraction of the braces. The adjacent ends of the several segments are beveled convergently downward, and the segments are so connected as to provide suitable keyways or pockets for the wedges 6. As herein shown, each segment has riveted to it, adjacent to one end, a plate 7, spaced from the body of the segment by a filler or spacing plate 8 to form a groove 9 for one edge of the wedge to move in. The opposite end of the plate 7 is slotted, and bolts or rivets 10, carried by the adjacent end of the succeeding segment and passing through a spacing-plate 11 similar to plate 8, engage in the slot and are headed, so as to hold the segments together ring fashion. The wedge 6 is preferably made of two metal plates riveted together, with the edges of the larger plate adapted to engage in the grooves 9, formed at the opposed ends of two segments. In case the cylinder shows signs of weakness before the concrete has been packed in place to its full depth one or more of these reinforces may be quickly inserted, and by driving home the wedges the cylinder will be made to assume its original shape, allowing the work to go on. The reinforces may be left embedded in the concrete or they may be removed successively as the level of the concrete approaches them.

While I have spoken of using metal rods or wire cables 3 to provide nesessary longitudinal internal braces for the concrete body, I may use expanded metal or other material suitable for the purpose, and it is possible that various other modifications in my invention may be made without departing from the principle thereof, and I do not wish to be considered as limiting myself to my specific construction beyond a reasonable interpretation of my claims.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An improved pier construction, comprising two concentric wooden-stave cylinders, a concrete filling between the cylinders, and a filling of sand or like substantially permanently loose material in the inner cylinder.

2. An improved pier construction, comprising a concrete tubular structure, and an inner core of substantially permanently loose sand, rock, or such like material.

3. A concrete tubular pier having metal supports embedded in the concrete and running lengthwise of the pier, and a sand or like core of permanently loose material.

4. A concrete pier construction, comprising inner and outer wooden-stave cylinders, a concrete filling between the cylinders, twisted-wire cables embedded in the concrete, and a filling of sand or the like in the interior cylinder.

5. The combination with a cylinder, of an internal brace therefor comprising a series of conjoined movable segments, and wedges operable between the segments to expand the brace.

6. The combination with a cylinder, of an internal brace therefor comprising a series of conjoined movable angle-segments having keyways provided at their adjacent ends, and wedges fitting said keyways.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM H. HEALY.

Witnesses:
CHAS. C. HORTON,
M. E. BROWN.