(No Model.)

J. E. SIMPSON, Jr., & A. H. SIMPSON.

DRY DOCK.

No. 347,895. Patented Aug. 24, 1886.

Fig. 1.

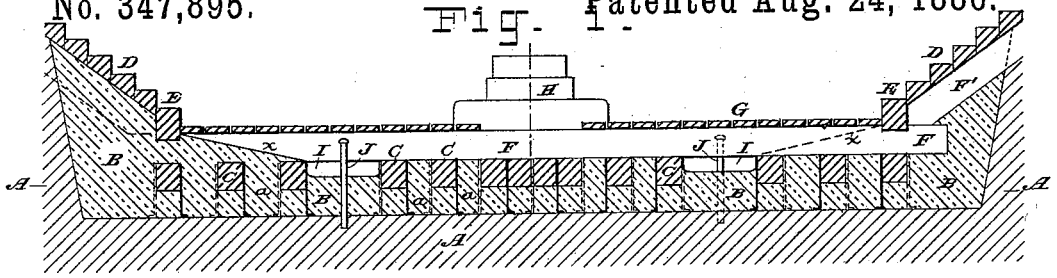

Fig. 2.

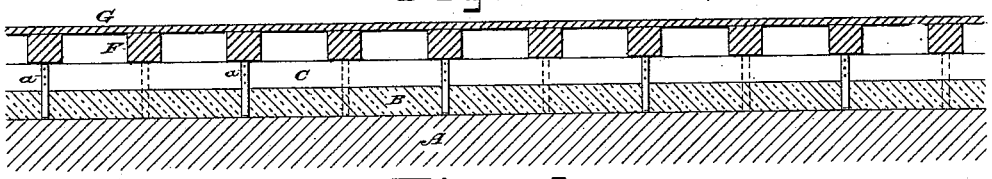

Fig. 3.

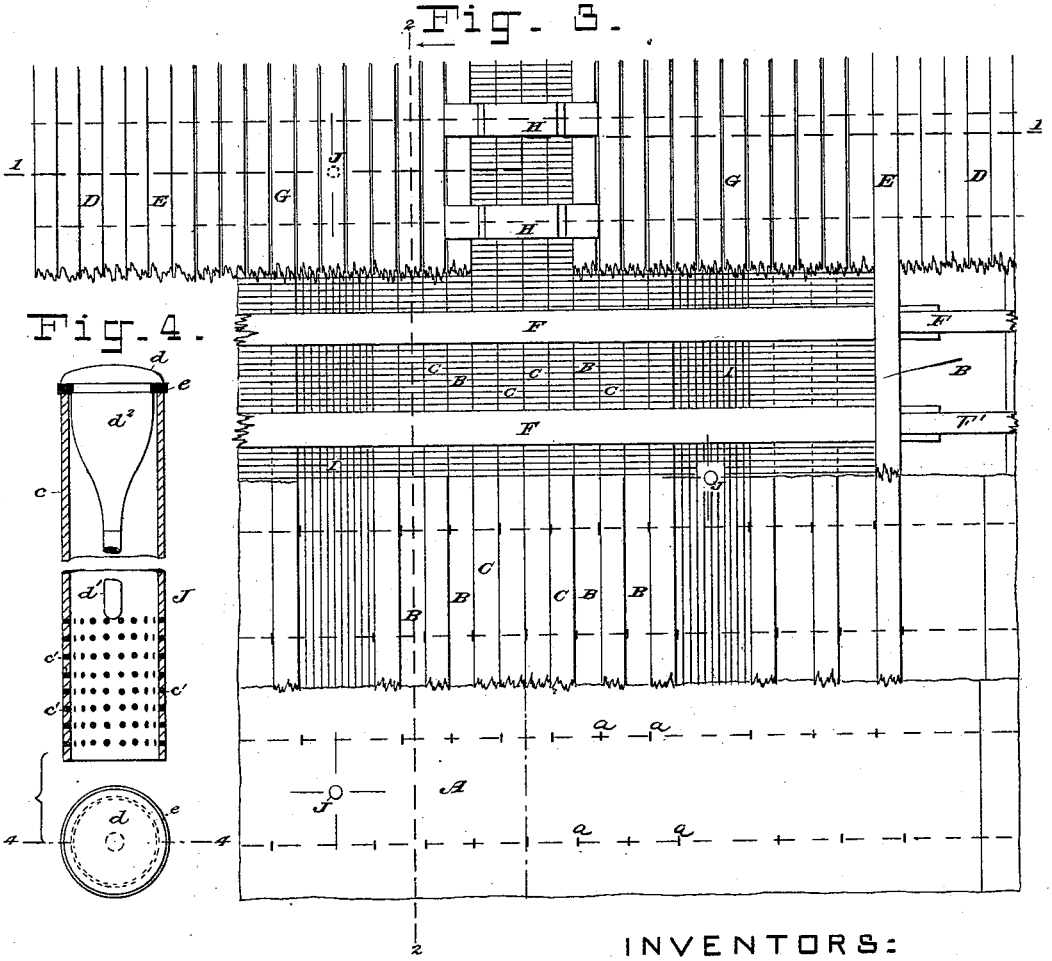

Fig. 4.

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UNITED STATES PATENT OFFICE.

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DRY-DOCK.

SPECIFICATION forming part of Letters Patent No. 347,895, dated August 24, 1886.

Application filed January 27, 1886. Serial No. 189,924. (No model.)

To all whom it may concern:

Be it known that we, JAMES E. SIMPSON, Jr., and ALFRED H. SIMPSON, both citizens of the United States, and residents of Brooklyn, Kings county, New York, have jointly invented certain Improvements in Dry-Docks, of which the following is a specification.

Our invention relates to that class of docks known as "permanent dry-docks," which are located upon the bank or shore of a river or harbor, or within the same. A dry-dock of this general character is shown and described in the Letters Patent of James E. Simpson, No. 204,689, dated June 11, 1878.

Our invention consists in part of a peculiar construction of the bottom and sides of the dock, which construction is especially adapted to docks built in localities where the natural soil is very hard or rocky and not adapted to the driving of foundation-piles, or which does not from its natural solidity and firmness require foundation-piles.

It also consists in part in a device or means for relieving the bottom of the dock of exterior hydrostatic pressure, which in many cases will be so great as to rupture the bottom by bursting it upward. This pressure, as is well understood, arises from water emanating from springs, the tides, and other sources, acting under a head against the under side of the bottom of the dock, which, unless relieved, is apt to rupture the bottom at its weakest points.

Our improvements will be fully described hereinafter and carefully defined in the claims.

In the drawings, which serve to illustrate our invention, Figure 1 is a transverse section of a dry-dock embodying our improvements, the plane of the section being indicated by line 1 1 in Fig. 3. Fig. 2 is a longitudinal section taken in the plane indicated by line 2 2 in Fig. 3, and illustrates the bottom of the dock in section. Fig. 3 is a plan view illustrating the construction of the bottom of the dock. This will be explained hereinafter. Fig. 4 represents in longitudinal vertical section and in plan, on a large scale, the construction of the overflow relief-valve, which will be hereinafter described.

A represents the native soil, which in this case is supposed to be firm or rocky and to require no foundation-piles to support the dock. An excavation is made in this soil of the proper form and dimensions for the dock.

B is a bed of concrete laid on the soil to the proper depth. Before the concrete is laid we place at proper intervals anchors *a a*, usually made from flat bar-iron having flange-like lateral toes or projections formed on their lower ends, their upper ends having holes, so that they may be spiked or otherwise attached to the timbers. When these anchors have been properly placed, we fill around and upon the toes or flanges of these anchors with concrete to the proper depth, and then lay the longitudinal floor-timbers C C between and secure them to the anchors by spiking or other fastening. When the timbers C have been properly placed, the concrete B is filled in between them and rises up to a level with the tops of the timbers. At the sides of the dock, at the points indicated by *x x*, the concrete bed under the altars D D is carried out with an incline from the string-pieces E E, and at these points the timbers C are wholly embedded in and covered by the concrete.

F are cross floor-beams bolted down to the timbers C, and on these are gained the string-pieces E.

On the beams F is laid the floor G, made of planks with open joints or seams. The cross-beams F extend out beyond the string-pieces E, and on them rest the timbers F′, which support the altars D. The timbers F′ abut against the string-pieces E, and are embedded in the concrete. These beams are supported by brace-piles, (not shown,) which are set in the angles of the excavation.

H represents the keel-blocks, constructed in the usual way.

It will readily be seen that by the above construction we anchor the timbers of the floor firmly to the concrete, so that it is practically impossible for any force to raise the timbers C without rupturing the concrete bed, and the floor being strongly secured to these beams it is obvious that it also will be very difficult to rupture. In fact, with this construction the entire bottom of the dock becomes practically one piece.

I I are kennels or channels formed in the

concrete, and extending longitudinally of the dock. These are designed to lead or drain the water into a pumping-well. (Not shown.) The inclines *x* lead the water from the sides directly into these channels, which latter are arranged between two of the parallel longitudinal timbers C, as clearly shown.

As we have hereinbefore stated, the external hydrostatic pressure on the bottom of a dock is sometimes enormous, and granite bottoms with inverted arches have been resorted to to resist the strain. A bottom constructed in this manner is exceedingly expensive, and, besides, it is only partially effective. In our construction we do not seek to resist this pressure altogether, but to relieve it, and this we accomplish by planting or setting in the bottom of the dock, at suitable intervals, tubes arranged with their axes vertical or slightly inclined, which tubes extend down into the soil below the concrete. These tubes have apertures at their lower ends, being usually perforated at the sides. The water under head is free to enter these tubes, pass up through them, and overflow their tops into the channels I, whence it passes off to the well and is pumped out. In order that, when the dock is flooded, the water may not flow out through these tubes and saturate the soil under the bottom of the dock, we provide each of these tubes with a valve or cover, preferably self-closing, and which is easily raised by a pressure from below.

In Fig. 4 we have illustrated the form of overflow-valve we prefer to employ. J represents the overflow tube and valve as a whole. *c* represents the tube, usually cylindrical, and provided with perforations *c' c'* at the end, driven or placed into the soil below the concrete. *d* is the valve or cap which closes the open upper end of the tube *c*. This valve has a slender stem, *d'*, which has a bulbous heavy spindle-like portion, d^2, next the valve *d*. The object of the stem is to prevent the valve from falling off the upper overflow end of the tube when lifted by the incoming water, and the bulbus portion of the stem serves as a weight and guide to bring the valve back properly to its seat. *e* is a packing-ring, usually of rubber, shrunk on the stem just below the valve. This packing-ring serves to make the joint water-tight when the valve is closed. In the upper view, Fig. 4, the valve and its stem are in elevation, and both the tube and valve-stem are broken across to economize space. The tube may be of any length, its length being governed somewhat by the conditions and surrounding circumstances. We usually set these overflow-valves in the channels I, and their positions are indicated by the letters J J in Figs. 1 and 3.

We do not wish to limit ourselves to the precise construction of the overflow-valve herein shown, as any valve-controlled inlet in the bottom adapted to relieve the bottom from external hydrostatic pressure would serve. Enough should be employed to produce the desired result, and the number will depend on circumstances.

Having thus described our invention, we claim—

1. The bottom of a dry-dock, composed of the concrete bed laid on the soil or natural bottom, and the timbers C embedded in and resting on said concrete, and provided with anchors *a a*, secured to the said timbers and having flanges or toes which take into the concrete, substantially as described.

2. A bottom for a dry-dock, composed of the longitudinal timbers C, laid with intervening spaces, and having anchors *a a*, constructed substantially as shown and extending downward from said timbers, and the concrete B, arranged, as shown, between and under said timbers and embedding the anchors, substantially as set forth.

3. As a means for relieving the bottom of a dry-dock from external hydrostatic pressure, said bottom provided with tubes which extend down through it to the natural soil below, and said tubes provided with valves to prevent the outflow of water through said tubes, substantially as described.

4. The combination, to form an overflow-valve for the bottom of a dry-dock, of the tube *c*, open to receive water at its lower end, and the valve *d*, provided with a stem, *d'*, having a weighted bulbous portion, d^2, near the valve, and a suitable packing, *e*, all constructed and arranged as set forth.

5. The combination, in a dry-dock, of the concrete bed B, laid upon the natural soil, the longitudinal timbers C, embedded in the said concrete and provided with anchors *a a*, which extend down into the concrete, the cross-beams F, secured to said timbers C, and the planking G, laid with open joints and secured to said beams F, substantially as herein set forth.

6. The combination, with the longitudinal timbers C, the cross-beams F, the string-pieces E, the inclined timbers F', and the altars D, all constructed and arranged substantially as set forth, of the concrete bed B, filled into the angle of the excavation and up to the level of the upper faces of the timbers C and F', substantially as herein set forth.

7. The concrete filling B of the bottom and sides of the dock, formed with sloping or inclined surfaces at *x x*, as shown, and having longitudinal channels I I formed in its upper surface, substantially as and for the purposes set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

JAMES E. SIMPSON, JR.
ALFRED H. SIMPSON.

Witnesses:
RICHARD S. BOSTWICK,
WILLIAM T. KING.