

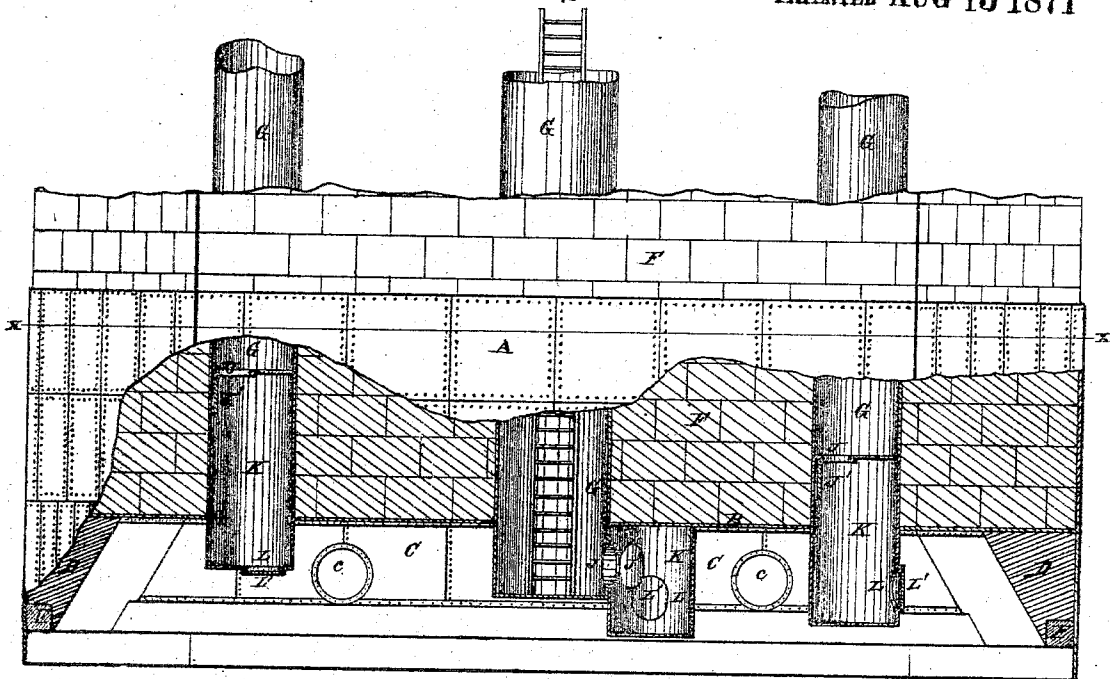
Caissons for Sinking Piers.

J. B. Eads.

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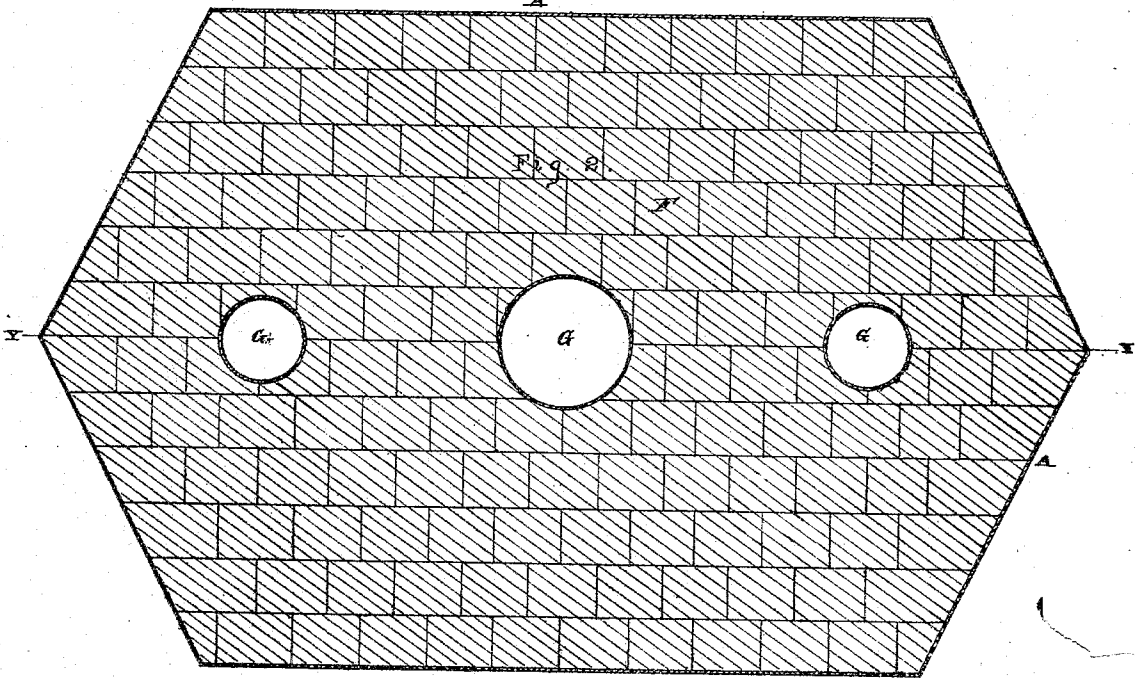
Fig. 1

PATENTED AUG 15 1871



A

Fig. 2.



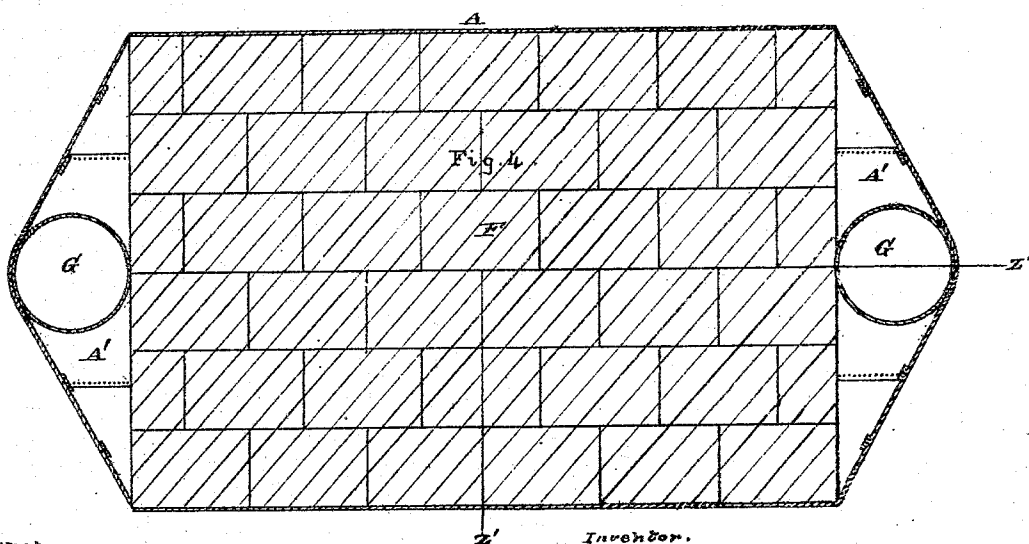
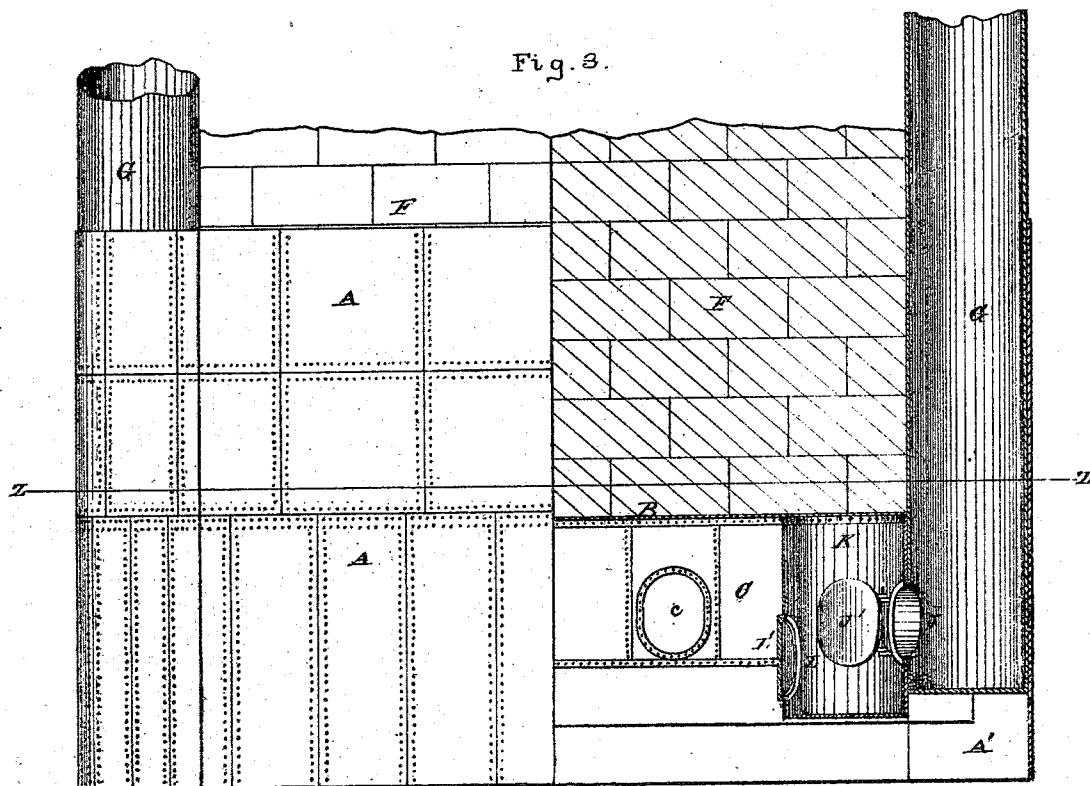
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Caissons for Sinking Piers.

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UNITED STATES PATENT OFFICE.

JAMES B. EADS, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN CAISSONS FOR SINKING PIERS.

Specification forming part of Letters Patent No. 118,118, dated August 15, 1871.

To all whom it may concern:

Be it known that I, JAMES B. EADS, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Caissons for Sinking Piers, of which the following is a specification:

My invention consists, first, in placing the air-lock either partially or wholly within the main air-chamber of the caisson; and secondly, in the use of a water-tight air-shaft to communicate with the air-chamber, whereby the outer skin or caisson inclosing the masonry may be dispensed with.

Figure 1 shows, partly in elevation and partly in longitudinal section, the caisson and lower portion of the pier, the section being taken on the line Y Y, Fig. 2. Fig. 2 is a horizontal section at the line X X, Fig. 1. Fig. 3 shows, half in elevation and half in section, at the line Z' Z', Fig. 4, the caisson and lower portion of the pier, the shafts communicating with the air-lock being placed outside the masonry and the caisson extended at each end beneath the shaft. Fig. 4 is a horizontal section at the line Z Z, Fig. 3.

A is the shell of the caisson, which extends both upward and downward from the horizontal top B of the air-chamber. C are girders running from end of the caisson and attached to the top B and the sides. D are brackets also attached to both top and sides of the air-chamber, imparting rigidity to the structure. The caisson, besides its partial support by the pressure of air beneath it, rests upon the broad bases of the girders C and upon a course of timber, E, which is extended around the inner side of the shell. *c* are apertures in the girder C to allow the passage of the workmen from one compartment of the air-chamber to another. F is the masonry of the pier. G are water-tight shafts whose upper ends are open to the air, and which may be made of metal, wood, or other suitable substance. These shafts extend vertically through or beside the masonry, and their lower ends communicate, by a man-hole, J, with an air-lock, K. The air-lock communicates, by a man-hole, L, with the interior of the main air-chamber. The man-holes J and L have doors J' and L' whose edges are made to fit hermetically with the edges of the man-holes by means of an India-rubber or other packing. In the drawing, the doors J' between the shafts and the locks are shown open and the doors L' between the locks and the air-chamber are shown

closed. The air-locks are generally about five feet in diameter and from seven to twelve feet high. Both doors J' and L' are made to open toward the main air-chamber, so that the extra or plenal pressure of air will always keep one or both of the doors closed.

Previous to the introduction of my improvement the air-lock was placed at the upper end of a vertical shaft which was in direct communication with the air-chamber of the caisson, and, as the caisson descended and the masonry was built up, the shaft was increased in height by the addition of sections thereto; for this purpose the air-lock had to be removed from the shaft and the compressed air permitted to escape from the main air-chamber and shaft, the water and mud entering to take the place of the air and rendering the whole interior wet and dirty, the workmen remaining idle while the sectional addition was made to the shaft and the water again forced from the air-chamber. Thus the air-chamber and shaft were continually kept in an unhealthy condition, calculated to injuriously affect the operatives. This shaft constituted an element of danger, as it furnished a chamber for the reception of the whole amount of air contained in the caisson, in case of the latter subsiding rapidly from any cause, such as entering a quicksand; in this case the workmen might not have sufficient warning to enable them to reach the shaft, and their lives would be sacrificed.

My lock, being placed in the air-chamber, leaves no space (as the shaft before mentioned) for the escape of air under extraordinary pressure, and on any rapid subsidence of the caisson the men could not be deprived of air, the air being limited to half the space, exerting double the raising power upon the caisson, and so checking its descent. The position I give to the air-locks enables the communication between the pier-top and the air-chamber to be made by means of shafts whose tops are open to the outer air. The shafts may be built even with the top of the pier during construction, or be kept somewhat in advance thereof, and may be made of wood, metal, or any material found suitable, either wood or metal answering the purpose satisfactorily. By making the shafts water-tight I am enabled to dispense with the outer skin of the caisson inclosing the masonry, the said skin being built only of sufficient height to form a coffer-dam, if any is

needed, at the first setting of the caisson in position. When the water-tight skin of the caisson inclosing the masonry is built up, as the pier descends so as to keep the skin above the water-level, the shafts communicating with the air-locks need not be water-tight; but the construction of this skin involves great expense, and the difficulty is so great of rendering it water-tight against the extreme pressure of the water that any means enabling this skin to be dispensed with is valuable. This end is accomplished by making my shafts water-tight to exclude the water which percolates through the joints of the masonry.

In some cases the piers have insufficient area to admit of shafts being made in the body of the masonry without seriously weakening the structure. In such cases I locate the water-tight air-shafts outside the masonry, as shown in Figs. 3 and 4, the caisson having extensions A' beneath the shafts so as to clear a way for the descent of the said shafts, the said extensions being of any suitable form.

Where the excavation is made in sand or fine gravel (even if some larger stones are found) the sand-pump is found to be the best means for the removal of the main portion of the excavated earth, the stones being stored in bins in the walls of the air-chamber to be used in the concrete filling of the air-chamber. If the excavation is

made through coarse gravel, clay, and larger stones these matters are removed by a dredge which operates in a shaft open at top and bottom and extending from above the water-level to a point below the caisson.

Neither the means for removal of the excavated material nor the pumps for forcing air into the air-chamber are shown, as these provisions are well understood and constitute no part of my present improvement.

I do not claim an air-lock applied at the lower end of a pneumatic pile, as described in a patent granted to F. E. Sickles on the 1st of February, 1870, independently of a caisson for constructing piers.

The following is what I claim as new:

1. In connection or combination with a caisson for sinking piers of masonry or other material, the air-lock K placed at or near the bottom of the air-shaft G and partially or wholly within the air-chamber of said caisson, substantially as herein set forth.

2. The extensions A' of the caissons, substantially as and for the purpose set forth.

In testimony of which invention I hereunto set my hand.

Witnesses:

SAML. KNIGHT,
GEO. C. FABIAN.

JAS. B. EADS.