(No Model.) 2 Sheets—Sheet 1.

B. M. KASH.

BRIDGE CONSTRUCTION.

No. 510,264. Patented Dec. 5, 1893.

Fig. 4.

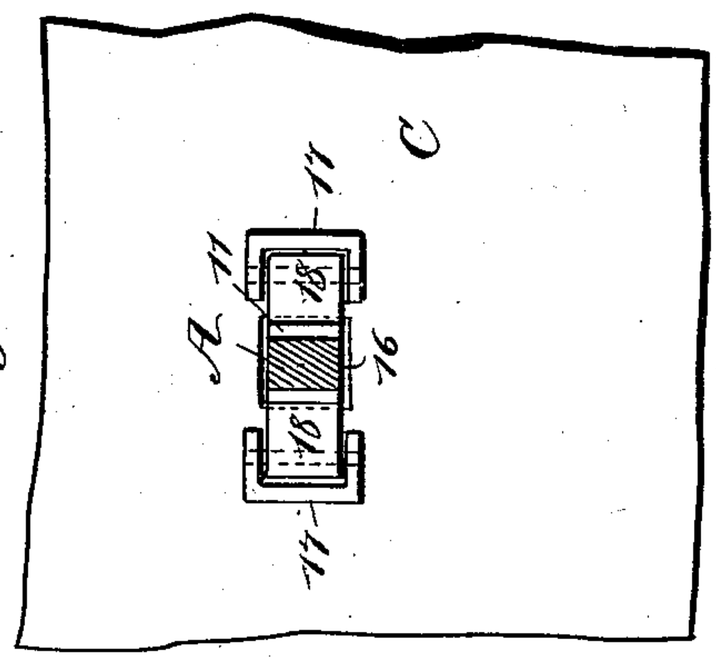
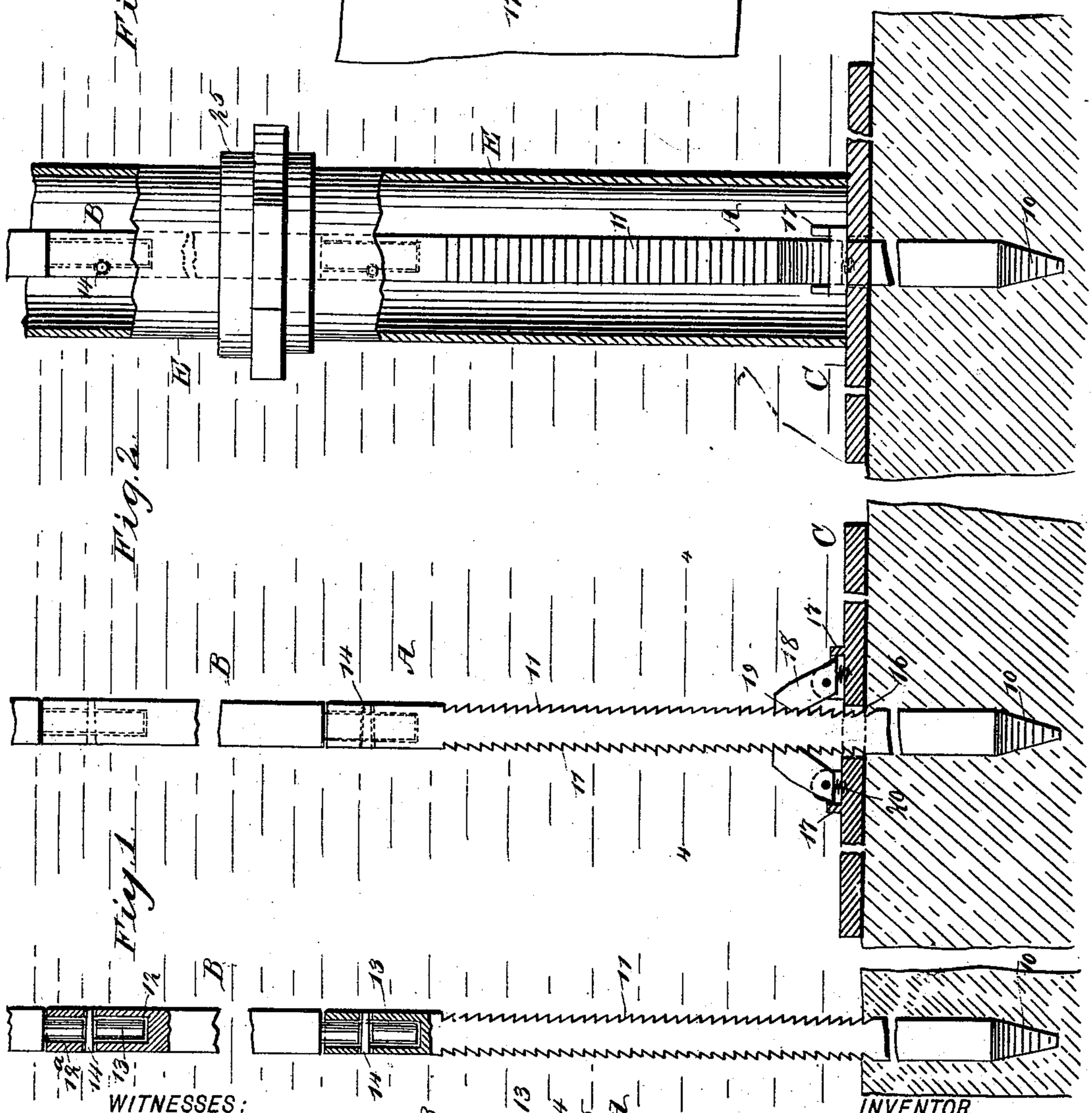


Fig. 3.



WITNESSES:

O. F. McArdle

C. Sedgewick

INVENTOR

B. M. Kash

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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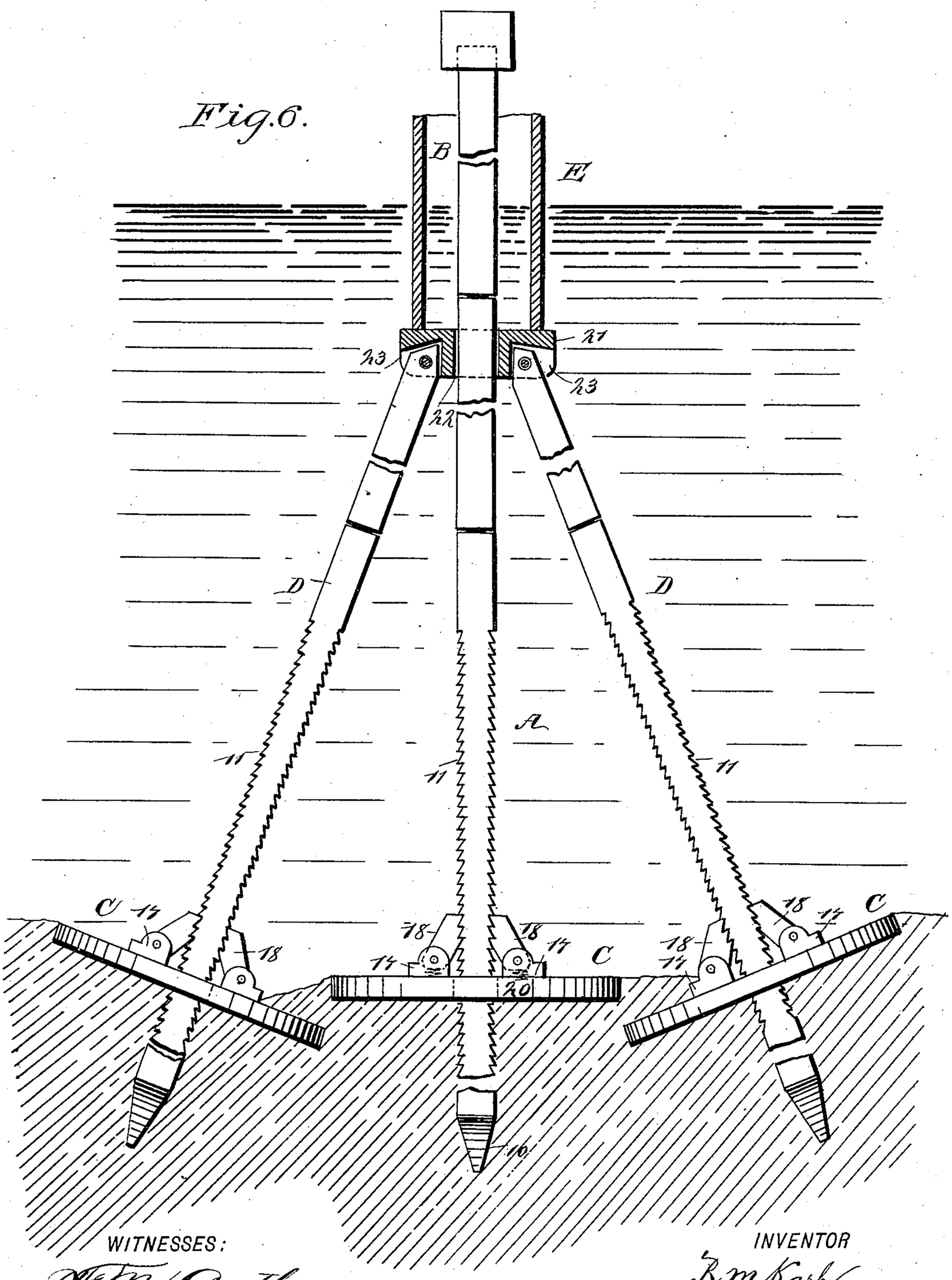
Fig. 6.



WITNESSES:

O. F. McArdle.

C. Sedgwick

INVENTOR

B. M. Kash

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BERNARD M. KASH, OF JOPLIN, MISSOURI.

BRIDGE CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 510,264, dated December 5, 1893.

Application filed June 6, 1893. Serial No. 476,747. (No model.)

To all whom it may concern:

Be it known that I, BERNARD M. KASH, of Joplin, in the county of Jasper and State of Missouri, have invented a new and useful Improvement in Bridge Construction, of which the following is a full, clear, and exact description.

My invention relates to an improvement in the construction of bridges, and the object of the invention is to provide a means whereby a foundation or support for bridges may be erected in an expeditious, convenient and durable manner in deep water, and to provide a support capable of upholding a pier, or constituting a portion of a bridge pier, or to provide a support capable of being used in connection with suspension bridges.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth and pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a partial side elevation and partial sectional view of one of the piles employed in carrying out the invention, the said pile being represented as driven into the bed of a stream, and the said figure represents the first step in the erection of the pier or support for a bridge. Fig. 2 is a side elevation of the pile shown in Fig. 1, and a sectional view through a sub-base, or base support used in connection with the pile. Fig. 3 is a view representing the pile shown in Figs. 1 and 2 in side elevation, and illustrating in sectional view a caisson adapted for use in setting the sub-base upon the bed of a stream. Fig. 4 is a horizontal section through the pile, taken practically on the line 4—4 of Fig. 2. Fig. 5 is a detail sectional view illustrating the manner in which sections of the pile are united; and Fig. 6 is a side elevation of a main or central pile, braces for the same, and a sectional view of the coupling of the braces.

In carrying out the invention all of the piles employed in the construction of the bridge foundation are formed in the same manner. A pile may be made up of any desired number of sections, the lower section being designated in the drawings as A, and the sections above it as B. All of the sections are made of metal, and may be made as heavy or as light as may be found necessary to carry out the work to be performed. The piles are preferably made polygonal or rectangular in cross section, and the lower one is provided with a point 10, which is so hardened as not to be turned aside or affected by any hard object through which it may of necessity have to be driven, or with which it may come in contact. Above the point a series of teeth 11, is produced in opposite sides of the said lower pile. The teeth are given a downward inclination; therefore their straight surfaces face toward the bottom of the pile; and at the top of the lower pile it is preferably provided with a socket 12, as shown in Fig. 5, to facilitate coupling with a second pile. In the event the teeth should weaken the pile at the point, they may be omitted. All of the piles above the lower one are of like cross sectional shape as the lower pile, but are not provided with a point. All of the piles above the lower one are provided in one end with a socket 12^a, similar to the socket 12 referred to in connection with the lowest pile, the sockets being longitudinally produced; and at the opposite end each upper pile is provided with a reduced or tenoned section 13, which has the same cross sectional shape as the sockets, since the tenon of one pile is adapted to enter the socket of the abutting pile; preferably, however, the tenon sections are made circular in cross section, and the sockets are of similar contour.

When the tenon section of a pile is entered into the socket of another pile, the two piles are coupled together in a rigid manner by passing a pin 14 through both of them. The pin is preferably made somewhat conical or tapering, as shown in Fig. 1, and the aperture or opening into which it is driven is consequently of like shape, and said aperture or opening, designated as 15, is produced partially in one wall of the socket and in one side of the tenon adapted to enter the socket, as is clearly shown in Fig. 5. The pin is made flush with the faces of the pile through which it passes, and as the opening receiving the pin

is made partially in both sections of the piles neither section will be broken, or weakened to any appreciable extent.

In connection with a pile, no matter how many sections it may comprise, a sub-base C, is employed. This sub-base may be of any dimensions that occasion may demand, but it is made quite heavy, since it is to sink to the bottom of the bed of the stream in which the bridge support is to be erected. The sub-base is usually of disk-like form, but it may be given other contour if desired, and at its center it is provided with an opening 16 of a shape corresponding to the cross sectional shape of the pile, as the pile is adapted to pass through this opening. At opposite sides of the sub-base opening 16 a socket 17, is formed. Said socket is preferably made integral with the sub-base, and in each socket a pawl 18, is pivotally located, said pawls being provided with teeth 19 upon their inner faces, said teeth being adapted to engage with the teeth upon the sides of the pile, as shown in Fig. 2. The pawls are kept normally inclined over the sub-base opening 16, and in a position to grip with any object passed between them by means of springs 20, which springs exert an upward and inward tension upon them. Ordinarily the springs are located beneath the lower ends of the pawls, as shown in Fig. 2. The inward movement of the pawls, or movement toward each other, is controlled by their lower outer ends coming in contact with a side wall of the socket in which they are pivoted; and their outward movement is limited by the said lower ends engaging with the base wall of the socket.

It frequently happens that the pile when driven will need braces D, as shown in Fig. 6, and when these braces are required they are of like construction as the main pile. When braces are employed usually two are used, and these two are in that event coupled at their upper ends by a connecting bar or head 21, provided with a central opening 22 to loosely receive the main pile, and with openings 23 at each end in its under surface to receive the upper ends of the braces, the said upper ends of the braces being pivotally attached to the connecting bar or head.

In the operation of constructing a foundation, one or more vessels may be employed, and the lower section of the pile to be driven is lowered over the side of the vessel, or between the vessels if two of them are used, and the said lower section is held by cables or otherwise with its upper end above the water until the second pile section can be connected with or coupled to the lower one; and one section is in this manner added to the other until the bottom of the pile shall strike the bottom of the stream or body of water over which the bridge is to be erected. By means of cables or other devices the pile lowered is straightened, and when in the perpendicular position the pile is driven by means of a pile-driver, or any approved device which may be located upon one of the vessels in service, until a solid foundation is reached which may be very deep in the earth. After the pile has been properly driven into the bed of the body of water, a sub-base is entered over the top of the pile and is permitted to drop down to the bed, so that it engages with the soil, as shown in Fig. 2. In passing down the pile the dogs of the sub-base pass freely over the teeth of the pile; but when the bottom is reached the dogs will be in locking engagement with the teeth and will assist in holding the pile in an upright position, and will likewise in a measure relieve the point of the pile from pressure, and thereby prevent the pile sinking to a greater depth than desired. If the bed of the stream is quite hard, the sub-base will seat itself properly; but in the event the ground is soft it is necessary that the base should be driven into the ground until it finds a firm and solid seat. This is preferably accomplished by passing down around the pile a tube or caisson E, as shown in Fig. 3, which tube is made in sections, and the sections are coupled in any approved manner, as for example by means of unions 25. When the tube is in place, resting upon the base, the tube by means of hydraulic or steam pressure applied to it, is utilized to force the base to a firm position in the ground. The tube is then removed, and if one pile is insufficient for purposes of support the next pile is proceeded with; but in the event that braces are needed, brace piles are driven in like manner as the main pile; and after the top sections of the brace piles have been placed in position, the said brace piles entering the ground at a point much farther from the main pile than where they approach it at the top, the sub-base is placed over each brace pile and temporarily secured in position on the upper section; the brace piles are then attached to the connecting bar or head 21, and the tube or caisson E, is again placed over the main pile to a bearing upon the connecting bar 21, and by exerting downward pressure upon the tube the brace piles are driven to place. After they have been fixed in the ground the bases are released and will travel downward to an engagement with the ground, as in the matter of the main brace.

It is evident that by the means of the piles above described, and the method of driving and locating them, bridges may be built over a deep and vast expanse of water, and a firm foundation be provided for the structure to be erected, no matter how heavy it may be, or whether the bridge is to be erected upon abutments or is to be a suspension bridge.

It will be understood that the teeth 11, may be produced upon as many piles as may be found necessary, and that the braces may be made to sustain any relation to the main piles that circumstances may demand.

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

1. In the construction of bridges, a pile provided with teeth upon opposite sides, and an anchor consisting of a base having an opening to receive the pile, and clutches capable of engagement with the pile, as and for the purpose specified.

2. In the construction of bridges, a pile constructed in sections and provided with means for locking the sections, and an anchor consisting substantially of a sub-base having an opening through which the pile may pass, and spring-controlled clamps carried by the sub-base, adapted for engagement with the pile, substantially as shown and described.

3. In the construction of bridges, the combination, with a pile provided with teeth upon opposite faces, of an anchor consisting of a sub-base having an opening through which the pile may pass, and spring-controlled clamp devices adapted for engagement with the teeth of the pile, substantially as shown and described.

4. In the construction of bridges, a pile adapted to be driven into the bed of a stream, the said pile being constructed in sections, and a coupling located at the junction of the sections, sundry of the sections of the pile being provided with teeth, substantially as shown and described.

5. In the construction of bridges, a pile consisting of series of sections, one section being provided with a socket, and the opposing section with a tenon entering the socket, and a pin passed partially through a wall of the socket and partially through the tenon, sundry of the sections of the pile being provided with teeth adapted for locking engagement with an anchor, as and for the purpose specified.

6. In the construction of bridges, the combination with a pile provided with a series of teeth upon opposite sides inclined in a downward direction, of an anchor, the same consisting of a plate having an opening through which the body of the pile may pass, and spring-controlled pawls provided with teeth upon their inner faces, said pawls being located at opposite sides of the opening in the plate, their teeth being adapted for engagement with the teeth of the pile, as and for the purpose set forth.

7. In the construction of bridges, a pile provided with a series of teeth upon opposite faces, and an anchor having locking engagement with the toothed surface of the pile, of a connecting bar loosely mounted upon the pile, and brace piles of like construction as the main pile, attached to the connecting bar, and anchors located upon the brace piles, as and for the purpose set forth.

8. The herein described method of constructing supports for bridges, the same consisting of lowering into the water a pile made up of sections, driving the pile into the bed of the body of water, lowering an anchor over the pile, locking the same to an engagement with the bed and to an engagement with the pile, and driving the anchor to a firm seat in its bed, substantially as described.

BERNARD M. KASH.

Witnesses:
A. ARNOLD,
J. A. BECKER.