(No Model.)

R. M. FRANKLIN.

YIELDING AND BUOYANT PILE BREAKWATER.

No. 260,016. Patented June 27, 1882.

Fig 1.

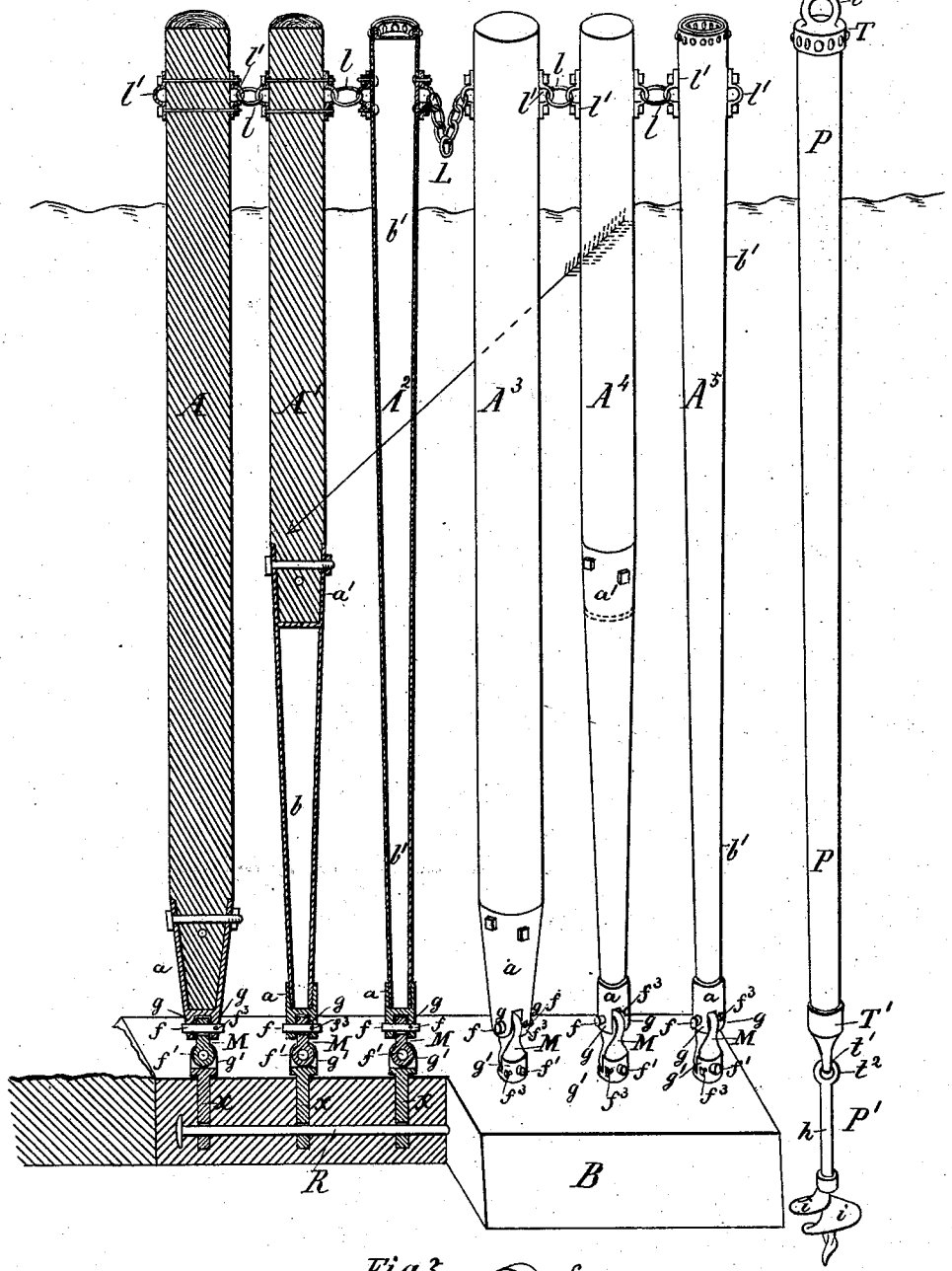
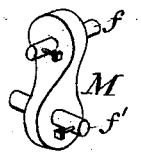


Fig 2.

Fig 3.



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UNITED STATES PATENT OFFICE.

ROBERT M. FRANKLIN, OF GALVESTON, TEXAS.

YIELDING AND BUOYANT PILE BREAKWATER.

SPECIFICATION forming part of Letters Patent No. 260,016, dated June 27, 1882.

Application filed October 31, 1881. (No model.)

To all whom it may concern:

Be it known that I, ROBERT M. FRANKLIN, a citizen of the United States, residing at Galveston, in the county of Galveston and State of Texas, have invented a new and Improved Yielding and Buoyant Pile Breakwater; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings and letters of reference marked thereon, forming a part of this my specification of said invention, in which drawings—

Figure 1 shows a part of a line of piles constituting my improved breakwater erected upon a concrete anchor-block. Fig. 2 represents a single pile of one section of a line of piles constituting a breakwater erected upon a short screw-pile in lieu of the concrete anchor-block shown in Fig. 1. Fig. 3 is a detached view of the link employed to secure the piles shown in Fig. 1 to the concrete anchor-block shown in Fig. 1.

The nature of the invention will fully appear from the subjoined description, when considered with reference to the accompanying drawings, forming a part of this specification.

The object of my invention is the production of a cheap, durable, and efficient breakwater for localities exposed to the destructive action of the waves; and it consists mainly in a line of single-column buoyant piles, arranged side-by-side, and grouped together in sections, as hereinafter described, and anchored to their waterbed, and also in certain constructions and combination of parts hereinafter described and specifically claimed.

In Fig. 1 I have shown two sections of a line of piles composing a breakwater, said sections being in this instance composed of three piles each; but I do not confine myself to such number of piles for a section of a line of piles composing a breakwater, as a greater number may be used to advantage in each section of the line. In said figure, for example, A A′ A^2 are piles composing one section and A^3 A^4 A^5 are piles composing another section of the general line of piles constituting a breakwater, the piles of one of said sections being shown in perspective view, while the piles of the other section are shown in central longitudinal sectional view. The piles A A′ A^2, composing one section of the piles, are near their top connected together by single links *l*, as shown, and the piles A^3 A^4 A^5, composing an adjoining section of piles, are also connected together near their top by single links *l*, while the two sections are connected together by a chain, L, the length of which may be adapted to the power of the waves in a given locality, to wit: When the waves are ordinarily very powerful the chain L will be of greater length than when the waves are less powerful. This is done, not only to allow one or more sections to sway or have motion in the direction of the line of the breakwater, and so avoid sudden and severe strains upon the single-link connections *l* when the power of the waves is expended upon the breakwater in the direction of the line of the same, but also to allow one or more sections to sway or oscillate in a direction lateral to the general line of the breakwater, and thus not strain the whole line of the breakwater by a wave much shorter than the whole length of the line. Besides this, in case a wave should strike the section composed of the piles A^3 A^4 A^5 in the direction of the arrow, this section would instantly sway toward the shore, thus enlarging the opening between the adjoining piles A^2 A^3 of the two sections, and the water rushing between them in much greater volume than elsewhere between the piles composing the two sections, the power of the wave will in a great degree be exerted to hold in an upright position the section composed of the piles A A′ A^2 in opposition to the lateral sway of the section composed of the piles A^3 A^4 A^5, and thus the very power of the wave will become utilized to break down its own force.

B indicates a concrete anchor-block, to which the piles, at their lower ends, are securely attached. The piles used in constructing my improved breakwater may all be constructed with their body portion of wood and with a metal ferrule, *a*, at their lower end, as shown by piles A and A^3 in Fig. 1; or their body portion may consist of a hollow iron tube, *b*, with a ferrule, *a′*, into which an upper wooden section is fitted, as indicated by piles A′ and A^4; or the entire pile may be a hollow iron tube, *b′*, as signified by piles A^2 A^5. If the entire body of a pile is made of wood, as signified by the piles A A^3, or partly of wood, as shown by

the piles A′ and A⁴, then it should be covered with a metal wrapper, so as to protect the wood from the salt-water worm.

In Fig. 1 a portion of the concrete anchor-block B is cut away, showing the anchor-rods *x* of the piles, which have eyes at their lower ends, through which, as shown, the tie-rod R is inserted before the concrete block is moulded. The anchor-rods *x*, with their tie-rod R in place, are suspended in the proper position in the mold in which the concrete block is cast, and the liquid cement is then poured in and allowed to set firmly around the rods *x* and R, said rods having first been coated heavily with pitch or any pigment that will serve to prevent corrosion. The anchor-block B must be of a size and weight adequate to counteract the bouyant effort of the piles and the drawing action of the waves, which would tend to displace it. After molding, this block B is placed in position upon the water-bed, and the piles are pivoted to it by a diver, with the universal joint M, as shown; or each pile may be attached to the anchor-block on a boat provided with suitable derricks for dropping them into their positions.

Fig. 3 is an enlarged perspective view of the universal link M, with its pivot-bolts *f f′*. These pivot-bolts *f f′* pass through the double lugs *g* on the lower ends of the piles and double lugs *g′* on the anchor-rods *x* and through holes in the universal joint M, as shown, and are held in place by bolts or screws, f^3, tapped into them through said lugs; and in this manner the piles A A′ A^2 and A^3 A^4 A^5, composing two sections, as shown in Fig. 1, of a line of piles for a breakwater, are held in position at their lower ends to an anchor-block, B, when the use of such block becomes necessary on account of the rocky bed of the body of water in which the breakwater is be erected. When, however, the bed of the sea or other body of water in which my improved breakwater is to be erected is mainly or entirely of sand or earth I employ, for example, piles constructed throughout as shown in perspective view, Fig. 2, with which to make up a section of piles. In this view a hollow metal pile, P, having a metal cap, T, riveted upon its upper end, and with a ferrule, T′, upon its lower end, is shown. The cap T is provided with a ring, *t*, and the ferrule T′ at its lower end terminates in an eye *t′*, as indicated in said figure.

P′ indicates a short auxiliary screw-pile, made of metal, with its body portion, as at *h*, terminating at its upper end with an eye, t^2, and its lower end provided with a screw having broad flanges, as at *i i*, in order that it may seat itself with a firm bearing when screwed into the sand or earth bed of the body of water in which the pile P is to be used. The pile P, it will be seen, is mounted upon the screw-pile P′ by having the eye t^2 of the latter interlocked with the eye *t′* of the former, thus allowing the pile to freely oscillate, and when thus mounted, the one upon the other, as shown, the ring *t* of the pile P affords the means whereby, with the use of a hand-lever, the auxiliary short screw-pile P′ may be screwed down firmly in the said bed, and so afford a proper support for and hold upon the pile P. Sections of such piles, when used for a breakwater having a sandy foundation, composed of, say, six piles to a section, will be provided with connecting-chains L, the same as shown in Fig. 1, while the adjoining piles of each section will be held together with links *l*, engaging with iron loops *l′*, bolted to the upper ends of the piles, in the same manner as shown for the two sections of piles represented in Fig. 1.

The piles P may also with great advantage be used singly in roadsteads and exposed places, to which vessels may tie up with greater security than they could get with the ordinary anchors with which they may be provided.

The general operation of my improved breakwater is as follows: The piles being constructed and anchored, as described, off the shore to be sheltered, with the piles composing each section connected together, from ten to fifteen inches apart, by links *l*, and each section of a line of piles composing the breakwater held together by chains L, offer just sufficient resistance to break the waves as they strike the work without causing the undercutting of the reflex waves, which occurs when the waves break against a perpendicular wall, while from the yielding and buoyant character of the piles the impact of the wave is expended in all directions through the surrounding water, as well as against the piles, the inertia of the lower and undisturbed strata of water in which the piles oscillate also aiding to break the power of the waves.

Heretofore, among other modes of construction, breakwaters have been composed of a series of "frames" composed of two beams joined at their lower ends and diverging upwardly from such ends in the form of a letter V, with buoys and louver-boards applied transversely to such beams, which beams, at their lower ends, are connected to an anchor by a bolt and ring, and that said frames, at their top, have been connected by rods having eyes at their ends to take upon studs erected upon the upper transverse buoys of the frames.

I would also state that I do not under this patent claim a main single-column pile for breakwaters erected with a hinging-connection upon an auxiliary screw-pile, as shown in Fig. 2 of the drawings, since such pile is adjudged to constitute the subject-matter of a separate patent, which I propose to apply for.

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

1. A breakwater composed of piles, each consisting of a single column, as shown, connected together at or near their top by a link, *l*, and with their lower ends hinged to a water-bed anchor, substantially as and for the purpose described.

2. A breakwater having single-column piles

erected upon hinging-connections which are anchored to a water-bed and grouped and connected together in sections of three or more piles, said sections being connected by a chain, L, so as to permit the several sections to sway in lateral opposite directions, as well as move in the direction of the line of the breakwater, without affecting the whole series of sections composing the line of the breakwater, substantially as described.

3. The piles of a breakwater, in combination with a concrete block, B, having rods for the attachment of the piles set in the concrete block during the act of casting the block, substantially as described.

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