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METHOD FOR REPAIRING EXISTING WOOD PILING

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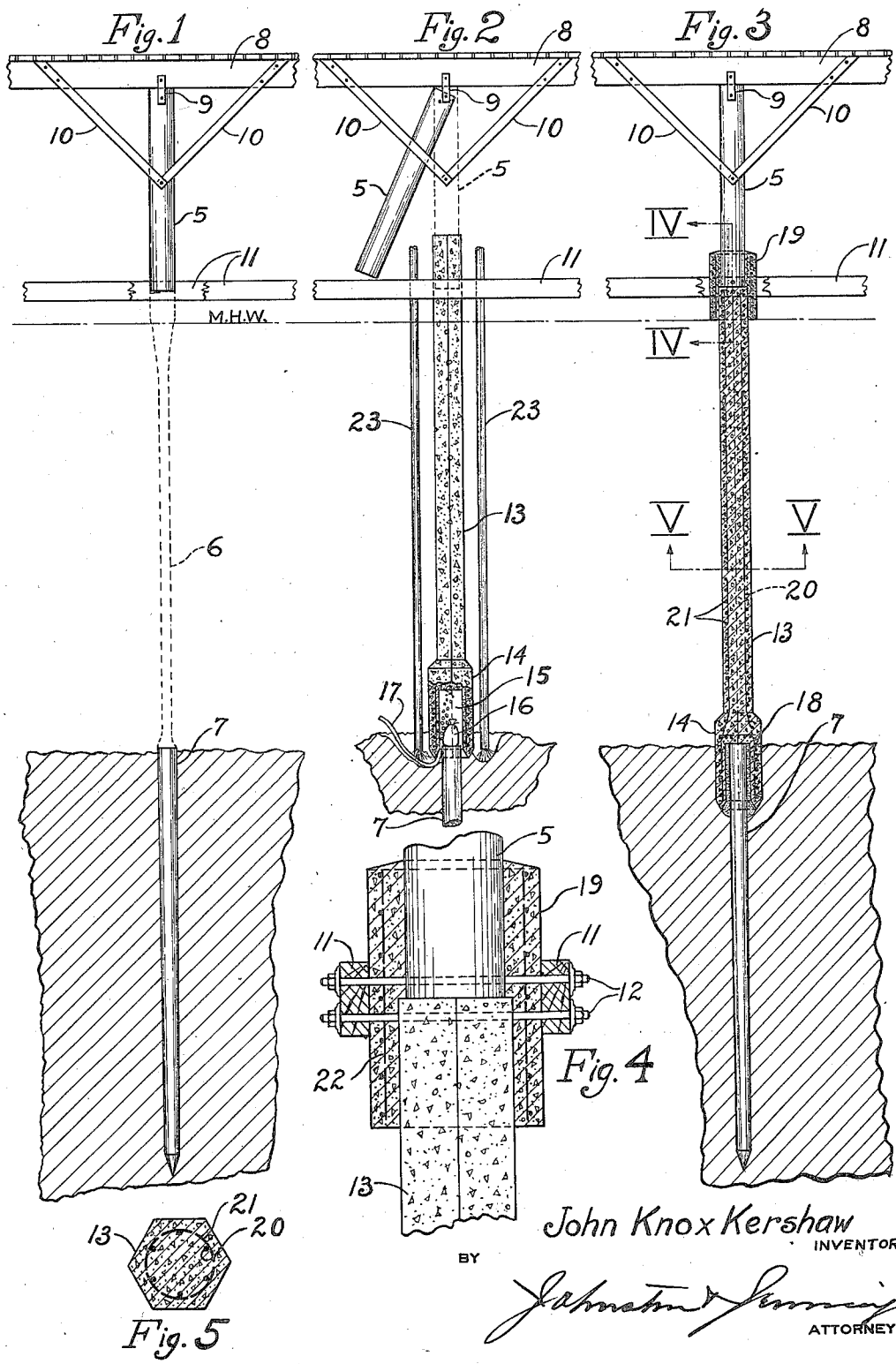


Fig. 4

Fig. 5

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METHOD FOR REPAIRING EXISTING WOOD PILING

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4 Claims. (Cl. 61—53)

My invention relates to a novel method of utilizing concrete pile sections to repair piling.

My invention, being more particularly concerned with the treatment of wood piles to avoid the necessity for their replacement with new piles, it is necessary to point out the existing practice with reference to the protection, repair and maintenance of wood piles and the disadvantage in respect of same in order that the advantages of my invention may be clearly understood.

An ordinary 65 foot wood pile, set in twenty feet of water, will have approximately thirty feet driven into the mud and fifteen feet exposed above the mean high water level. Of course such a pile is merely typical, but it will serve for illustrative purposes, and, according to the character of the wood and its condition, it will have a life of from three to five years by which time the twenty foot stretch between the mud line and the mean high water level will have been subjected to marine insect attack and weakened beyond the point of usefulness. Under such conditions, the generally employed method is to abandon the pile and drive a new wood pile into position alongside it to take its load. This involves the use of a pile driver and necessitates clearing away of dock or trestle work overhead so that the pile driver may be used.

The cost of such a replacement pile, including labor and mechanism for its replacement, will run approximately $2.00 per foot of pile and it will be obvious that since wood piles must be depreciated at the rate of from 33⅓% to 20% per annum, there results a fixed maintenance charge of from .66¢ to .40¢ per foot of pile per annum. In order to reduce this high cost of maintenance, attempts have been made to protect with a concrete jacket the section of the pile exposed to the water, concrete being a substance at present regarded as having the highest resistance to deterioration under water. Due, however, to the impossibility of establishing a water tight bond between the concrete jacket and the tapering pile and of preventing the occurrence of minute cracks in the jacket through which the marine insects can gain access to the wood pile, it has been found that though such jackets retard the rate of deterioration of the wood pile they do not prevent its destruction so that it is debatable whether their cost is justified by the reduction of maintenance charges.

The pile section below the mud line being practically imperishable and the upper pile section above the mean water line being where it can be protected by painting or treatment, it has been proposed to produce a new composite pile comprising a lower wooden pile end, an intermediate reinforced concrete pile section, and an upper wooden pile section, the composite pile being assembled and driven into place so as to leave only the concrete section exposed between the mud line and the mean high water level. It is difficult to drive such a sectional pile into place and there is always the possibility of the intermediate concrete section being injured or damaged by the pile driver blows. While this proposal may reduce the maintenance cost for new piling, up to the present time no feasible method has been found to salvage the sound portions of defective wooden piles in place and restore such piles without the use of a pile driver and without leaving any perishable part exposed to marine insect attack.

The object of my invention briefly stated, therefore, is to devise a means whereby when existing wood piling has deteriorated beyond the point of usefulness, those portions of the piles which are still sound and represent approximately 70% of the pile, can be saved and the piling restored without disturbing the superstructure which it supports or necessitating the use of any pile driving equipment.

I propose to accomplish the foregoing object by cutting away the damaged intermediate portion of the wood pile, making one cut under water at the mud line and another cut about a foot and a half above the mean high water level, and I propose to interpose between the spaced wood pile sections a reinforced concrete splice pile section which will be joined in a novel manner to, and be supported by, the lower embedded end of the old pile and which will be suitably spliced to the upper end of the old pile whereby the old wood pile is reestablished in its load supporting functions by the interposition of an intermediate reinforced concrete section which is of permanent durability in that it will not be attacked by marine insects, and therefore an old wooden pile, thus repaired, will have practically indefinite life.

My invention further comprises the novel manner in which the concrete splice section is coupled to the wooden pile sections and to the manner in which it is installed in position, all of which will be more clearly understood by reference to the accompanying drawing wherein the manner of practicing my invention in its preferred form is illustrated,

Fig. 1 shows an old wood pile with its intermediate defective portion, that has been cut away, shown in dotted lines.

Fig. 2 shows the process of restoration of the pile of Fig. 1 by the insertion of the concrete splice pile section, the lower end of the wood pile being broken away.

Fig. 3 shows the pile of Fig. 1 completely restored with its reinforced concrete splice sections shown in vertical central cross section.

Fig. 4 is an enlarged cross sectional view taken on the line IV—IV of Fig. 3.

Fig. 5 is a corresponding view taken on the line V—V of Fig. 3.

Similar reference numerals refer to similar parts throughout the drawing.

In the embodiment of my invention illustrated in the accompanying drawing, I show in Fig. 1 a typical wood pile comprising a top portion 5 above the water level, an intermediate portion 6, and a lower end 7 driven into the mud. It is tied to a superstructure 8 by splice irons 9 and braced thereto by the diagonal braces 10. It is connected to the other piles by the horizontal wood bracing 11 tied to the pile by upper and lower bolts 12.

The portion 5 of the pile above the mean high water line, indicated by the dotted line marked M. H. W., is shown to be sound and serviceable. The lower end 7 of the pile below the mud line is always sound and perfectly preserved. Only that intermediate section 6 of the pile that is exposed to the water between the mud line and the M. H. W. level has been attacked and practically destroyed by marine insects. Such a defective pile under present practice would be condemned and a new pile would be driven to replace it.

My method for the restoration of such a pile is illustrated in Figs. 2 and 3. It will be noted the pile section 6 has been cut away near the mud line and overhead about a foot and a half above the mean high water line, the horizontal bracing having been disconnected or if necessary detached, to permit this. The intermediate section 6 of the pile is then discarded and a precast reinforced concrete splice pile section 13 is provided. This splice pile section has at its lower end an enlarged base 14 recessed to provide a chamber 15 adapted to telescope over the upper end of the pile section 7 left in the mud and to make a fairly close fit about it. The length of this splice pile section is such that, when it has been telescoped into position over the wood pile section 7, its upper end will abut or fit snugly against the upper pile section 5, thus replacing the cut away portion 6 of the pile.

The manner of placing the splice pile section is important and will now be described.

The upper wood pile section 5 has its braces 10 and 11 and connections 9 to the superstructure loosened or removed sufficiently for it to be displaced and allow the precast concrete splice pile section to be lowered into position over the bottom pile section 7. The diver, who made the saw cut at the mud line guides the chambered base 14 of the precast splice pile section into position over the upper end of the wood pile section 7 and then places on top of the pile 7 a frangible water-proof package 16 containing liquid grout, tar or any suitable filler.

An air pipe connection 17 from the diver's outfit is utilized to introduce air into the chamber 15 in the precast pile, if necessary, to displace the water therefrom. The precast pile is then lowered into position over pile 7 and water jet pipes 23 are used by the diver as a convenient means for displacing the sand around the base 14 of the precast pile so that it can be sunk into the mud until it comes to rest on the wood pile section 7. As the precast pile is thus lowered, a portion of the air will be displaced by the pile 7 and finally the pile 13 will compress and burst the package 16 of filler effecting its discharge into the upper portion of the chamber 15 and causing it to be forced downwardly as the precast pile settled. In thus settling, the filler 18 follows the air that has been displaced and seals the clearance between the wood pile 7 and the chamber walls 15 and will exude from the bottom, thus effectively sealing this joint. Any voids in the joint will remain filled with air that will prevent access of water to the pile 7 and the base of the precast pile will telescope deeply enough into the mud to maintain the seal against access of water to the enclosed wood pile section 7. The precast pile's upper end is brought into alignment with the wood pile section 5 and a form having been placed about this joint, a reinforced concrete splice sleeve 19 is cast about the joint with the bolts 12 in place, a hole having been provided in the upper end of the precast pile to receive the lower bolt.

The horizontal bracing 11 is then tied to these bolts 12, the diagonal bracing 10 is reinstated, the irons 9 are reconnected, and we have the completely restored pile with its component parts 5, 13 and 7 ready to render long service as it will be free from attack by marine life.

It will be observed that this replacement has been accomplished by a diver and the necessary hand labor and tackle to lower the precast splice pile 13 to position on the pile section 7. No disturbance of the superstructure 8 is required, no pile driving equipment is necessary, and the repaired pile will have the full load supporting strength of the original pile because it will rest on the old wooden pile section below the mud line which is imperishable. The precast concrete section 13 that alone will be exposed to the water is likewise practically imperishable and the upper wood pile section 5 will be highly durable but should it deteriorate, a short replacement section can be readily dropped in place without material expense or disarrangement of the superstructure. The maintenance charges are thus practically eliminated and the repair of old wood piling can be thus accomplished at a fraction of the cost of replacing it with new wood piles.

Preferably the lower end of the base is tapered to facilitate its penetration into the mud. The body 13 of the precast pile is hexagonal in shape with longitudinal and circumferential reinforcing elements 20 and 21, which are typical of any suitable reinforcement, provided therein.

Preferably the splice sleeve 11 is itself provided with a suitable reinforcement 22.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. The herein described method for the repair of wood piling, which comprises cutting away the intermediate defective portion of the pile between the mud line and solid wood above the mean high water level, interposing a concrete pile section to replace the cut away wood pile section, provid-

ing a base extension on the concrete section shaped to telescope over the upper end of the lower wood pile section left in place and lowering the concrete section into position onto the lower wood pile section, and connecting the upper end of the concrete section to the upper portion of the wood pile.

2. The herein described method for the repair of wood piling, which comprises cutting away the intermediate defective portion of the pile between the mud line and solid wood above the mean high water level, interposing a concrete pile section to replace the cut away wood pile section, providing a base extension on the concrete section shaped to telescope over the upper end of the lower wood section left in place introducing air in the chamber in the base of the concrete section to displace the water therefrom and using water jets to lower the concrete section into position onto the lower wood pile section, and connecting the upper end of the concrete section to the upper portion of the wood pile.

3. The herein described method for the repair of wood piling, which comprises cutting away the intermediate defective portion of the pile between the mud line and solid wood above the mean high water level, interposing a concrete pile section to replace the cut away wood pile section, providing a base extension on the concrete section shaped to telescope over the upper end of the lower wood pile section left in place, placing a frangible package of a liquid filler in position between the bottom wood pile section and the concrete section and lowering the concrete section to rest on the lower wood pile section, causing the fracture of the filler package and the sealing thereby of the voids in the telescoped joint between the wood and concrete pile sections, and joining the upper end of the concrete pile section to the upper remaining portion of the wood pile.

4. The herein described method for the repair of old wood piling, which comprises cutting away the existing wooden pile adjacent to the mud line, providing a precast reinforced concrete replacement pile section, providing a portion on said pile section to telescope over the cut away lower end of the wood pile and to project substantially below the mud line, interposing air in said recessed end of the precast pile to free it of water and placing a fluid filler in a frangible container on the upper end of the lower wood pile section, and lowering the precast pile section into position on said lower wood pile section so as to crush the container and force the filler under pressure to exude from the joint between the concrete and wood pile sections, and connecting the upper end of the concrete pile section overhead to the superstructure.

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