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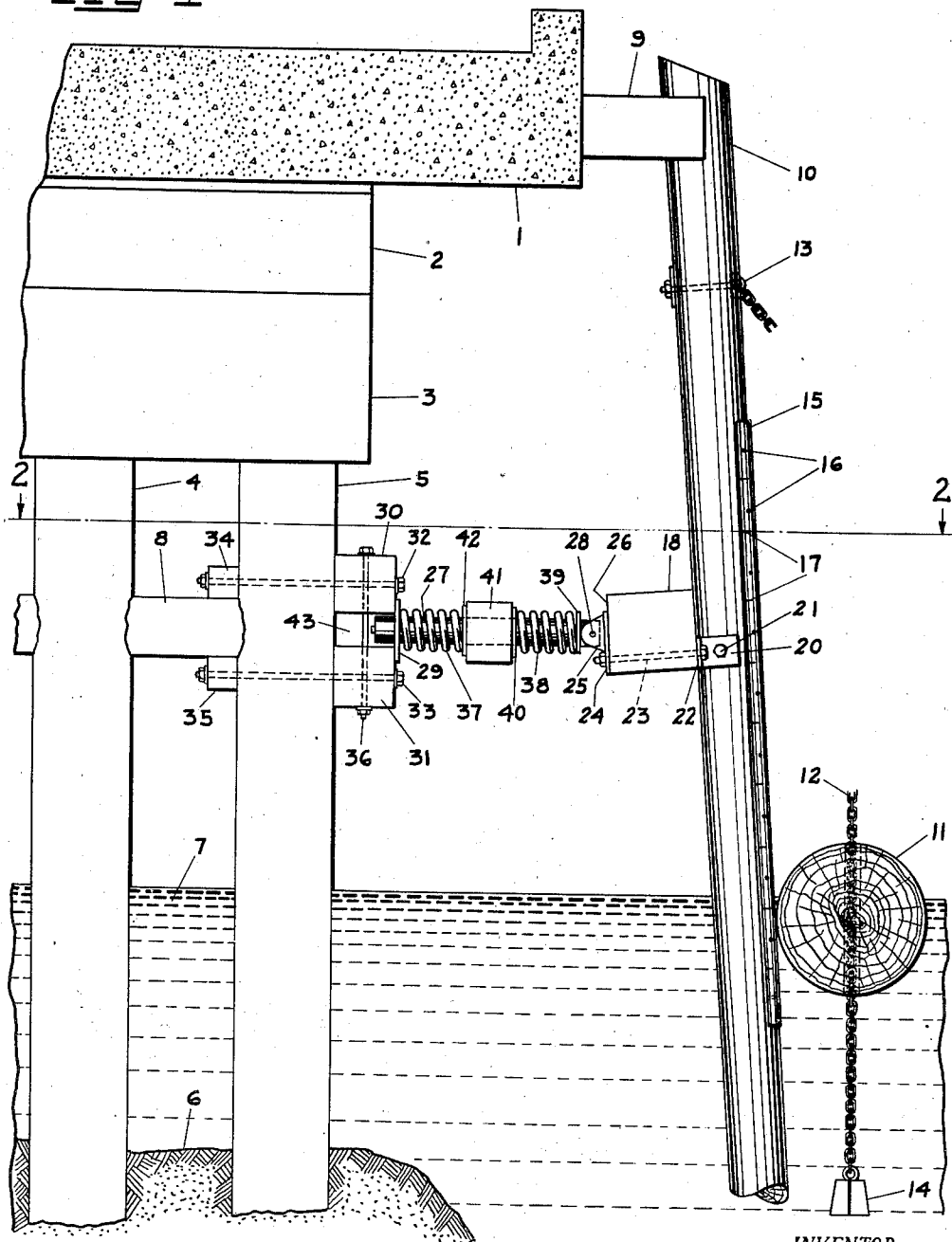
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FENDER PILES

Filed April 7, 1945

2 Sheets-Sheet 1

Fig 1



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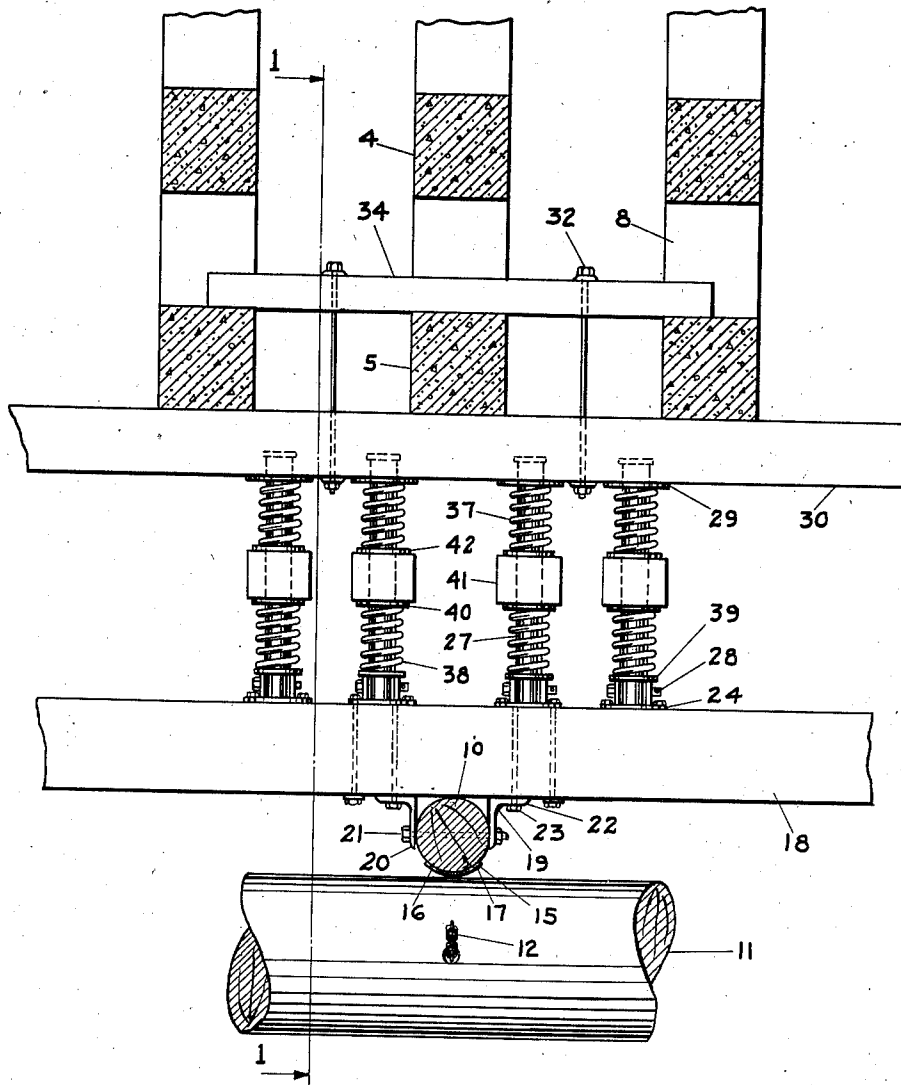
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Fig 2



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FENDER PILE

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3 Claims. (Cl. 61—48)

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This invention relates to fender piles and more particularly to those adapted for withstanding stresses to protect piers, docks wharves and the like from the impact of ships thereagainst during surges of waters in which the ships are riding.

At large docks, the cost of installing and maintaining fender piles is very great and when the piles are broken, it not only necessitates large expenditures for the repair and replacement, but also causes loss in docking space for ships.

The principal objects of the present invention are therefore, to protect the fender piles and avoid such repair and replacement costs, as well as space loss; to provide for allowing deflection short of breakage points of the fender piles under impact; to arrange for deflection of the fender piles without unnecessary internal strains; to provide against undue wear of the fender piles and protecting the surfaces thereof; and to provide improved elements and arrangements thereof cooperating with the fender piles and piers associated therewith for the noted purposes.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred form of which is illustrated in the accompanied drawings wherein:

Fig. 1 is a side elevational view of a pier and its protecting fender piles provided with the protective features of my invention.

Fig. 2 is a fragmentary plan view partly in horizontal section illustrating my invention, substantially on the line 2—2, Fig. 1.

Referring more in detail to the drawings:

1 designates a pier of suitable structure and composition that is supported by pile caps 2 and 3 which in turn, are mounted on pier supporting beams or piles 4 and 5 driven into the seabed 6 below the water line 7.

The pier supporting beams are preferably connected by cross beams 8 to strengthen the pier.

A top waler 9 is mounted on the pier 1 on the outer face thereof to form a support for the upper ends of fender piles 10. The fender piles 10 have a batter, as it is termed by the trade, of preferably about one inch per foot and are thus arranged to extend downwardly into the water 7 into the sea bottom or bed at an angle, as illustrated in Fig. 1. A conventional camel 11 is placed in the water in outwardly arranged relation to the piles 10 and is secured in this position by chains 12 passing through portions of the camel to allow the camel to rise and fall with the tide. The chains 12 are suitably secured to the pier, as indicated at 13, and may be provided

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with a weight 14 at their lower ends to hold the camel against the fender piles.

In order to protect the outer surfaces of the fender piles against undue wear and chafing, wear strips 15 are provided that may be secured to the fender piles by lag screws 16. As ships bear against the fender piles, it has heretofore been found that as the wear plates flex, the lag screws "pop" out of the fender piles and the wear plates are thus lost. I have found that by scoring the wear plates transversely, as indicated at 17, Fig. 1, the plates are allowed to flex and dish without causing loss of the lag screws and wear plates.

18 designates a waler arranged transversely of the fender piles 10 and secured thereto substantially below the upper ends of the fender piles by angle brackets 19. The flanges 20 of the angle brackets are secured to the fender piles by bolts or the like 21, arranged in the neutral axes of the fender piles. This arrangement has a distinct advantage in that the bolt hole through the neutral axis of the piling does not reduce the moment of resistance of the piling as would otherwise be the case. The flanges 22 of the angle brackets 19 may be secured to the walers 18 by bolts 23, which also secure flanges 24 of pivot brackets 25 to the face 26 of the waler 18.

A shaft 27 which may be a pipe, or the like, is pivoted at one end to the pivot brackets 25, as indicated at 28; the other end of the shaft 27 passing through an opening in a bearing plate 29 that is mounted on spaced walers 30 and 31. The walers 30 and 31 are mounted on the pier supporting beams 5, as by the bolts 32 and 33 which are backed up by beams 34 and 35. The walers 30 and 31 may also be secured to each other and reinforced by bolts 36.

In order to provide for compressibility and flexibility of the fender piles short of their breaking points, springs 37 and 38 are mounted on a shaft 27. One end of the spring 38 bears against a bearing plate 39 that is mounted on the shaft 27 and the other end of the spring 38 bears against a bearing plate 40 secured to a spacing block 41 also mounted on the shaft 27. A bearing plate 42 on the shaft 27 and spacing block 41 forms a seat against which one end of the spring 37 bears, the other end of the spring 37 bearing against the bearing plate 29 on the walers 30 and 31.

It will be noted that the space between the walers 30 and 31 forms a recess 43 into which the shaft 27 may extend as the springs are compressed responsive to the deflection of the fender piles 10.

It is preferable to stress the springs 37 and 38

during the assembly of the springs between the beams 5 and fender piles 10. This may be accomplished by arranging the springs on the shaft, and applying a jack or the like, to move the fender piles 10 away from the beams 5 and provide space to arrange the springs between the fender piles 10 and beams 5 in unstressed condition. Then when the jack is removed the fenders spring back to normal position and stress the springs.

It is believed the operation of devices embodying the present invention is apparent to those skilled in the art, inasmuch as ships bearing against the fender piles 10, due to surges of the seas in which they ride, cause inward deflection of the fender piles against tension of the springs. The springs resist deflection of the fender piles and prevent their breaking under impact which normally would shatter the fender piles and damage the pier.

It is apparent, therefore, that I have provided an improved arrangement for fender piles which protects the same and the piers to which they are related and which overcomes disadvantages of conventional fender piles in an expeditious and relatively inexpensive manner.

This invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In combination with a pier having an under-structure, fender piles connected to the pier at their upper ends and embedded in the earth below a water line at their lower ends, means for reducing stresses on the fender piles comprising a transversely scored wear plate on the outer faces of the fender piles, angle brackets, means extending through the neutral axes of the fender piles connecting one of the flanges of the angle brackets thereto, a waler arranged transversely of the fender piles having the other flanges of the angle brackets secured thereto, at least one pivot bracket on the side of the waler opposite the angle brackets, a shaft having one end pivoted to said pivot bracket, spaced bearing plates on the shaft, a spacing block on the shaft between the bearing plates, pre-stressed springs on the shaft having ends bearing against the bearing plates and spacing block respectively, and walers mounted on the pier understructure in substantially parallel relation to the first named waler, said walers having one of said bearing plates mounted thereon and being spaced to provide a recess into which said shaft may extend against

pressure of said springs responsive to stresses applied to said fender piles in the direction of the pier understructure.

2. In combination with a pier having an under-structure, fender piles connected to the pier at their upper ends and embedded in the earth below a water line at their lower ends, means for reducing stresses on the fender piles comprising angle brackets, means connecting one of the flanges of the angle brackets to the fender piles, a waler arranged transversely of the fender piles having the other flanges of the angle brackets secured thereto, at least one pivot bracket on the side of the waler opposite the angle brackets, a shaft having one end pivoted to said pivot bracket, spaced bearing plates on the shaft, a spacing block on the shaft between the bearing plates, pre-stressed springs on the shaft having ends bearing against the bearing plates and spacing block respectively, and walers mounted on the pier understructure in substantially parallel relation to the first named waler, said walers having one of said bearing plates mounted thereon and being spaced to provide a recess into which said shaft may extend against pressure of said springs responsive to stresses applied to said fender piles in the direction of the pier understructure.

3. In combination with a pier having an under-structure, fender piles connected to the pier at their upper ends and embedded in the earth below a water line at their lower ends, means for reducing stresses on the fender piles comprising a compressible element arranged between the fender piles and pier understructure substantially below the pile connected ends of the fender piles, and means for additionally protecting the fender piles comprising a wear plate having fastening devices securing the same to the fender piles, said wear plate having transverse score lines to allow flexing of the plate without forcing the fastening devices out of the fender piles.

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