

Jan. 27, 1959

C. H. SIEBENHAUSEN, JR., ET AL 2,870,609

DRILLING BARGE WITH ANTI-SCOURING PLATES

Filed March 2, 1954

2 Sheets-Sheet 1

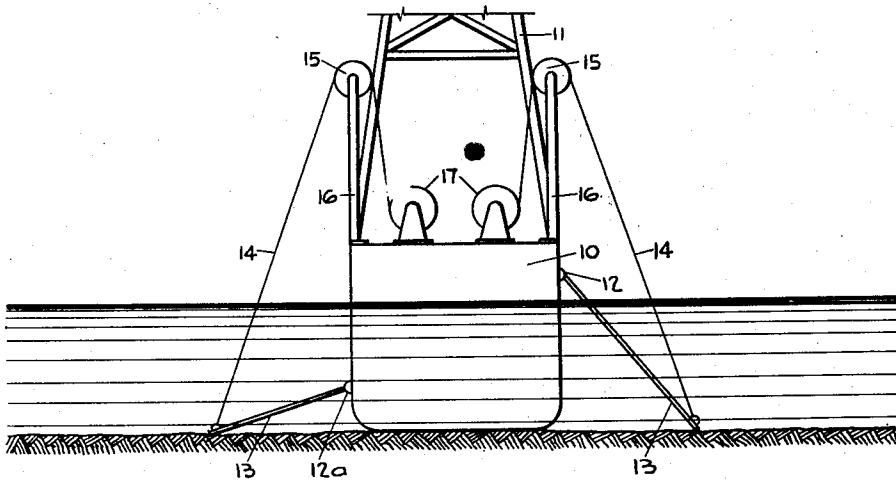


Fig. 1

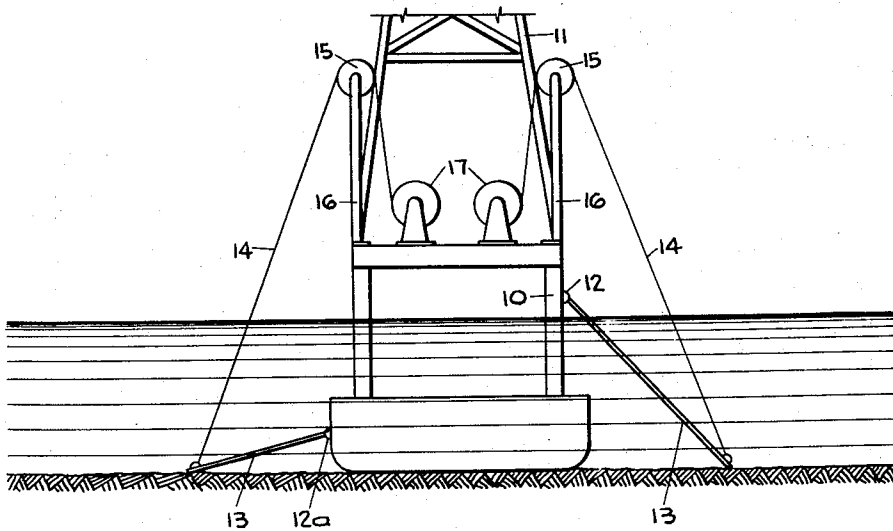


Fig. 1a

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2 Sheets-Sheet 2

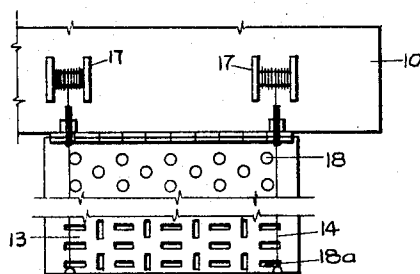


Fig. 2

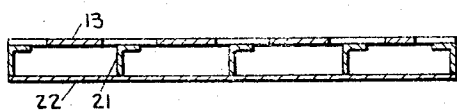


Fig. 3

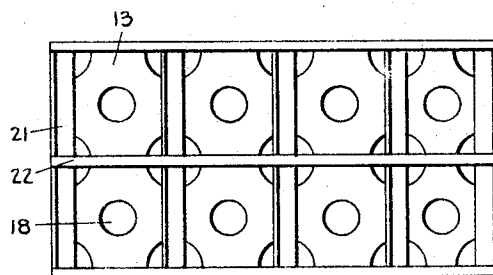


Fig. 4

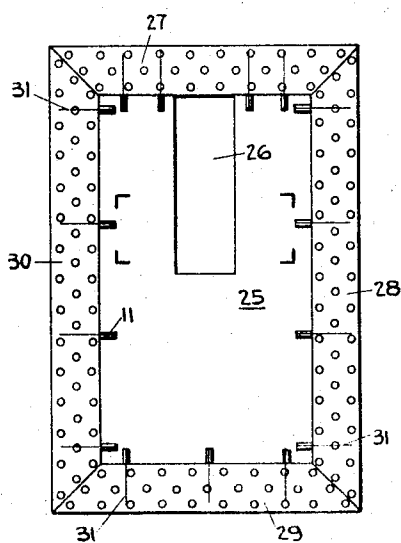


Fig. 5

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DRILLING BARGE WITH ANTI-SCOURING
PLATES

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Application March 2, 1954, Serial No. 413,494

5 Claims. (Cl. 61—46.5)

The present invention relates to barges used in drilling oil wells in off-shore locations and pertains more particularly to a drilling barge, i. e., a barge supporting drilling equipment, adapted to be floated to a predetermined location and sunk to the ocean floor where it is protected against the scouring action of waves.

In drilling an off-shore well, for example, a well off the Gulf Coast, it is a common practice to tow a drill barge containing the necessary drilling equipment, to a predetermined location where the barge is sunk to the bottom. Since the water in such off-shore locations varies in depth, the entire barge may sink below the surface of the water or the upper portion of the barge may remain above the surface of the water.

Since an off-shore well may take several weeks or several months to drill, there exists the problem of the ocean scouring the bottom soil around and/or under the edges of a submerged drilling barge or other submerged vessels, due to the action of the waves and currents. This scouring action, in time, often causes settling of the barge or other vessels, accompanied by a considerable dislocation of the drilling operations.

An object of the present invention is to provide a submersible drilling barge or any other vessel employed in drilling operations and adapted to be floated to a predetermined location where it is submerged, said barge or vessel being provided with suitable protection against the scouring action of the waves.

Another object of this invention is to provide a submersible drilling barge equipped with suitable anti-scouring means which are adapted to be lowered into place against the ocean floor to break undertow velocity and/or the orbital velocities associated with waves around the main hull of the barge, so as to prevent or minimize the removal of material from under the barge by the scouring action of the waves.

A further object of this invention is to provide a well drilling barge with anti-scouring means adapted to be lowered into place after the barge has been submerged so as to prevent the tides and currents from scouring material from beneath the barge while a well is being drilled.

Another object of the present invention is to provide a submersible drilling barge equipped with anti-scouring means adapted to be lowered into position after the barge has been sunk to the ocean floor and to be subsequently raised against the hull of the barge to an inoperative position when it is desired to move the barge to another location.

These and other objects of this invention will be understood from the following description taken with reference to the drawing, wherein:

Figures 1 and 1a are diagrammatic views of a portion of off-shore drilling barges which have been submerged so that they rest on the ocean floor with the anti-scouring means lowered in place against the ocean floor.

Figure 2 is a diagrammatic plan view of a portion of drilling barge shown in Figure 1.

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Figure 3 and 4 are detailed views illustrating the reinforced construction of an anti-scouring plate employed in accordance with the present invention.

Figure 5 is a diagrammatic plan view of a drilling barge of the open-slot type which is entirely surrounded by a plurality of anti-scouring perforated or grid-like guard plates in accordance with the present invention.

Referring to Figures 1 and 1a of the drawing, a drilling barge 10, is illustrated as having drilling equipment including a derrick 11 supported thereon. Another suitable construction of a barge or other submersible vessel may be used in practicing the present invention.

Secured to at least one side of the barge 10 by means of a hinge member 12 is a perforated plate 13. One or more cables 14 are secured to the edge of the guard plate 13 opposite the hinged edge for raising the guard plate 13 whenever it is desired to move the barge 10 to another location. The cable may pass over a sheave 15 mounted on the derrick or at the top of the post 16 which is, in turn, secured to the barge 10 so as to be positioned above the deck thereof. After passing over the sheave 15, the cable 14 is wound on a winch 17 which is employed for raising and lowering the guard plate 13.

As shown in Figure 2 of the drawing, the guard plate 13 may be provided with a plurality of perforations or openings 18 which may be of any suitable size and shape and are preferably arranged in a pattern most suited to reduce the wave and current action against the hull of the barge 10. In Figure 2 of the drawing, for illustration purposes, half of the perforations are shown as circular holes 18, while the other half are shown as rectangular holes 18a. The guard plate 13 may be of any suitable construction and is preferably formed of sheet metal or the like. The thickness of the guard plate is sufficient to permit it to withstand the wave impact.

If desired, the guard plate 13 may be reinforced in any suitable manner as by affixing vertical angle irons 21 and horizontal bracing members 22 to the plate 13, as shown in Figures 3 and 4 of the drawing.

The size and number of the present anti-scouring plates 13 to be employed may depend on many factors, such as the size and location of the submerged barge, the depth of the water, the exposure of the location, the severity of the wave or current action, etc. As shown in Figure 1 of the drawing, at least one of the guard plates 13 is positioned on the windward side of the drilling barge 10. The edge of the guard plate 13 adjacent the hull may be hinged to the barge at varying heights above the ocean floor, the height being determined by experience with or study of the wave action or currents in the area where the barge is to be used. Preferably, the hinge member 12a is secured to the hull of the barge at a point at least about one-third the distance from the ocean floor to the upper deck of the barge hull. However, the hinge member may be positioned much higher and in shallow water, if desired, even above the surface of the water, as shown at 12.

The size of the guard plate 13 may be determined only from the experience of drilling operations in the specified area. However, best results are obtained if the guard plate 13 has a length at least equal to one-half the length of the side of the hull to which it is attached. As diagrammatically shown in Figure 5 of the drawing, a U-shaped drilling barge having an open slot 26 therein may be entirely surrounded by 4 guard plates 27, 28, 29 and 30, or these four long plates may be replaced by a plurality of shorter guard plates. Each of the guard plates 27 to 30 is provided with one or more cables 31 for raising or lowering the plates into position. In the event the barge 10 is provided with a drill rig 11 as shown in Figure 1, the plates 27 to 30 (Figure 5) may be low-

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ered by means of a drill rig hoist instead of having each plate equipped with one or more winches.

In operation, the present barge is towed to a predetermined off-shore drilling location, where it is sunk in any suitable manner, as by flooding, so that the bottom of the barge rests on the ocean floor. During towing operations, the guard plate or plates 13 hinged to the barge are carried in an upright position, that is, with the plate 13 being in a substantially vertical position or substantially parallel to the sides of the barge. After the barge 10 is in position on the ocean floor, cable 14 is allowed to unwind from the winch 17, thus allowing the outer end of the plate 13 to drop until it contacts the ocean floor, as shown in Figure 1. With the plate or plates 13 in this position, the action of waves or currents against the hull of the barge 10 is substantially reduced thereby preventing or minimizing to a great degree the scouring action of the waves or currents which tend to remove the unconsolidated particles of the ocean floor from beneath the edges of the barge.

As already stated hereinabove, it is the basic purpose of this invention to provide means for a gradual absorption of wave energy, which is effected by opposing to the shock of waves, an inclined and perforated, that is, wave pervious barrier. This is in contrast with the usual guard of breakwater principle, wherein an immovable barrier is opposed to the waves normally thereto, which requires conventional breakwater elements to have a commensurate strength and weight or size. The perforated or grid-like guard plates of the present invention are so designed that a gradual and partial, rather than complete, interference with water motion is achieved as the waves engage the present guard plates at an acute angle, and the water has a certain freedom to pass from one side of the plates to the other. Such action is best achieved when the guard plates are positioned to form an angle of at least 15° with the ocean floor. The water-pervious guard plates of the present invention thus interfere with the orbital motion of the waves, thereby reducing the forces exerted by said waves against the barge, and particularly the scouring action of said waves.

Prior to moving the drilling barge to a new drilling location, the cable winch 17 is actuated so as to wind the cable 14 and raise the porous plate 13 into its original and substantially vertical position. Due to the perforate or grid-like construction of the plates 13, there is generally little accumulation of sedimentary material on the upper surface of the plate which might interfere with the raising of the plate. If it is found necessary to remove any sand or other material which may have settled on the top of the plate 13, this may be readily accomplished by directing a stream of pressure fluid through a pipe or hose against the accumulated sand.

We claim as our invention:

1. A submersible drilling barge adapted to be towed to a predetermined location and sunk to the ocean floor, at least one side of said barge being provided with anti-scouring means to interfere with and prevent wave action from scouring earth from beneath the sunken barge, said anti-scouring means comprising perforate plate means positioned in the water adjacent the barge to attenuate the effect of the orbital velocities of waves, said perforate plate means being pivotally secured to the side of said barge to pivot outwardly therefrom so that the edge of the plate means opposite the pivoted edge rests on the ocean floor with the plate means forming an angle of at least 15° with the ocean floor.

2. A submersible drilling barge adapted to be towed to a predetermined location and sunk to the ocean floor, at least one side of said barge being provided with anti-

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scouring means to interfere with and prevent wave action from scouring earth from beneath the sunken barge, said anti-scouring means comprising a perforate plate positioned in the water adjacent the barge to attenuate the effect of the orbital velocities of waves, said perforate plate means being pivotally secured to the side of said barge to pivot outwardly therefrom so that the edge of the plate opposite the pivoted edge rests on the ocean floor, the pivoted edge of said plate being secured to said barge at a level of at least about one-third the distance from the ocean floor to the upper deck of the barge hull.

3. A submersible drilling barge adapted to be towed to a predetermined location and sunk to the ocean floor, at least one side of said barge being provided with anti-scouring means to interfere with and prevent wave action from scouring earth from beneath the sunken barge, said anti-scouring means comprising a perforate plate positioned in the water adjacent the barge to attenuate the effect of the orbital velocities of waves, said perforate plate means being pivotally secured to the side of said barge to pivot outwardly therefrom so that the edge of the plate opposite the pivoted edge rests on the ocean floor, the pivoted edge of said plate being secured to said barge at a level of at least about one-third the distance from the ocean floor to the upper deck of the barge hull, and means attached to the outward edge of said plate for supporting said plate throughout the pivotal motion thereof.

4. A submersible drilling barge adapted to be towed to a predetermined location and sunk to the ocean floor, said barge being provided with an anti-scouring means to interfere with and prevent wave action from scouring earth from beneath the sunken barge, said anti-scouring means comprising perforate plate means positioned in the water adjacent the barge to attenuate the effect of the orbital velocities of waves, said perforate plate means being pivotally secured to the sides of said barge to pivot outwardly therefrom so that the edge of the plate means opposite the pivoted edge rests on the ocean floor with the plate means forming an angle of at least 15° with the ocean floor, and cable means attached to the outward edge of said plate means for supporting said plate means throughout the pivotal motion thereof.

5. A submersible drilling barge adapted to be towed to a predetermined location and sunk to the ocean floor, said barge being provided with an anti-scouring means to interfere with and prevent wave action from scouring earth from beneath the sunken barge, said anti-scouring means comprising perforate plate means positioned in the water adjacent the barge to attenuate the effect of the orbital velocities of waves, said perforate plate means being pivotally secured to the sides of said barge to pivot outwardly therefrom so that the edge of the plate means opposite the pivoted edge rests on the ocean floor with the plate means forming an angle of at least 15° with the ocean floor, and winch means for winding and unwinding said cable means to raise and lower said perforate plate means.

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