

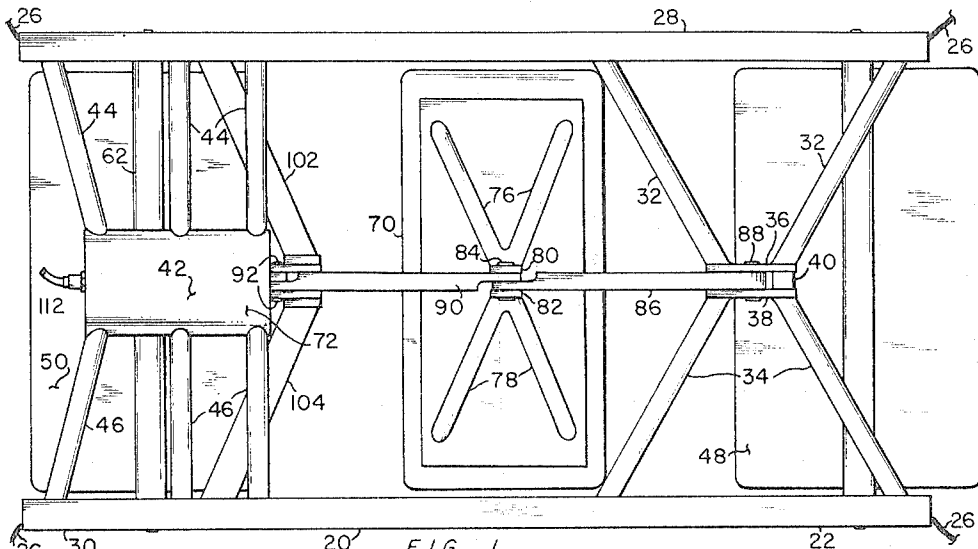
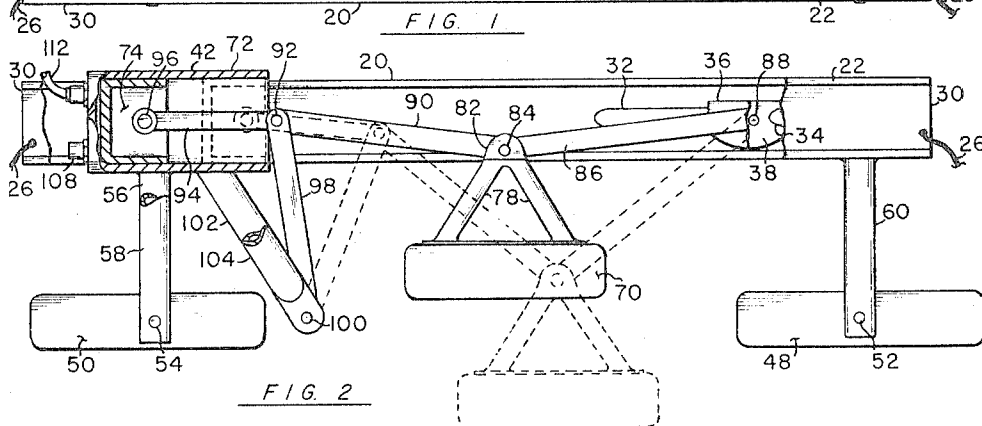
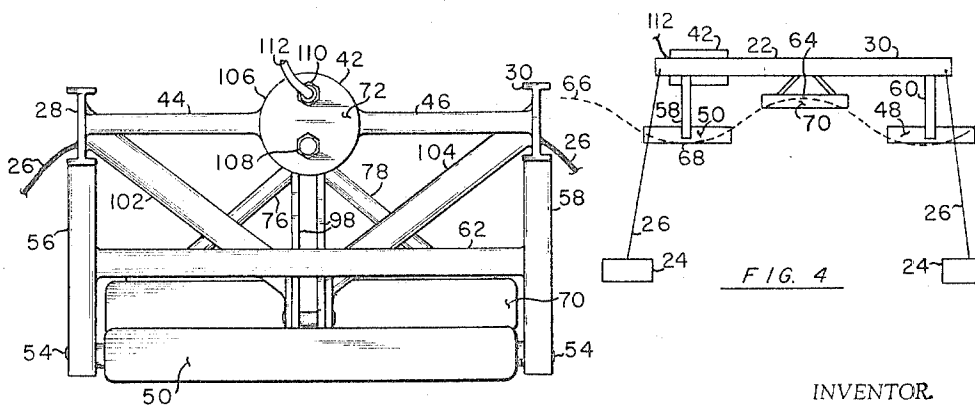
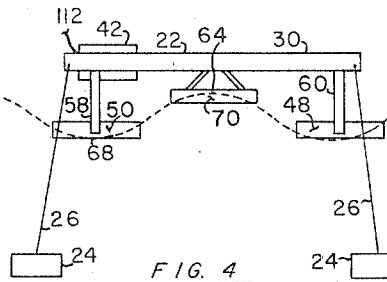
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PUMP ACTUATED BY OCEAN SWELLS

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3,274,941

PUMP ACTUATED BY OCEAN SWELLS

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The present invention relates to a pump and more particularly to the type of pump which is actuated by the swell movements of water.

The pump of the present invention includes a frame. A pair of floats is carried by the frame and these floats are spaced from one another a distance substantially equal to the distance between the crest of next adjacent swells of the water. These floats together with the frame, are retained in a position in which the floats are raised and lowered substantially in unison by the swell movements of the water. A third float is positioned in such a manner so that it rises and lowers substantially contra to the movement of the pair of floats, that is, as the first mentioned pair of floats is being raised by adjacent swells, the third float is being lowered into a valley between crests, and as the third float is being raised by a swell, the pair of floats is being lowered. Inasmuch as there is a contra movement between the pair of floats and a third float, this movement is utilized for actuating movable mechanism of a pump.

In the embodiment illustrated, the third float is utilized for actuating a movable element of a pump. Specifically, the pump illustrated is of the cylinder and piston type in which one of these elements is reciprocated by the third float.

Other features and the advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the invention is illustrated.

In the drawing:

FIG. 1 is a top plan view of the pump;

FIG. 2 is a side view of the pump, part of the cylinder and piston being shown in section;

FIG. 3 is a side view of the pump looking toward the right of FIGS. 1 and 2; and

FIG. 4 is a view showing the pump in position in the ocean.

Referring more in detail to the drawing, the pump 20 includes a frame 22 which is anchored in the ocean by a plurality of anchors 24 and cables 26.

The frame 22 includes two sides rails 28 and 30 which are connected at the right end thereof with one another by connecting members 32 and 34. The members 32 are connected with a plate 36 and the members 34 are connected with one another by a plate 38. These plates are suitably connected with one another and for spacing the same by a spacing element 40. The rails 28 and 30 are connected with one another at the left end through a cylinder 42 and connecting members 44 and 46.

The frame 22 is carried by a pair of floats; the frame may be suspended by the floats or carried above the floats as herein shown. One of these floats is indicated at 48 and the other at 50. These floats 48 and 50 are connected by pivot pins 52 and 54, respectively, by pairs of legs. One of these pairs of legs is shown at 56 and 58 for the float 50. Similar legs are provided for the float 48, one of which is shown at 60. The legs of a pair are connected with one another by horizontally extending braces, one of which is shown for the pair of legs 56 and 58 at 62. A like brace is provided for the pair of legs at the right side of the frame.

The distance between the pair of floats 48 and 50 is substantially equal to the distance between the crests of next adjacent swells of water, for example, the water in the ocean, when the rails 28 and 30 of the frame extend

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at right angles to the crests of the swells. Adjacent crests of the swells are shown, more or less diagrammatically in FIG. 4 at 64 and 66. The bottom of the valley is shown at 68.

A third float 70 is so disposed with respect to the floats 48 and 50 so that it substantially rides in the bottom of the valley 68 when the floats 48 and 50 are riding upon the crest of waves. In the preferred embodiments, and as illustrated, the float 70 is interposed between the floats 48 and 50. As the floats 48 and 50 rise on swells, the float 70 lowers and when the floats 48 and 50 lower, the float 70 rises. This contra movement between the pair of floats and the third float is utilized for actuating a pump element of a pump 72.

In the embodiment illustrated, the pump 72 is of the reciprocating type including the cylinder 42 and a piston 74, one of which is reciprocated relative to the other. In the present embodiment the cylinder 42 is fixed to the frame 22 while the piston 74 is reciprocated. The cylinder 42 or the piston 74 may be reciprocated either by the floats 48 and 50 or by the float 70. In the present embodiment, the piston 74 is reciprocated by the raising and lowering of the float 70. The float 70 includes a pair of upwardly extending arms 76 and upwardly extending arms 78. The upwardly extending arms 76 and 78 merge, respectively into upwardly extending flanges 80 and 82 which are arranged parallelly of one another for carrying a pin 84 which extends through the flanges 80 and 82 for pivotally supporting the float 70. A link 86 is also pivotally supported by the pin 84 and the link is also pivotally supported on a pin 88 carried by the plates 36 and 38 of the connecting members 32 and 34. One end of a link 90 is also pivotally supported on the pin 84 and is connected by a wrist pin 92 to a connecting rod 94, which in turn is connected by a wrist pin 96 to the piston 74. A link 98 is also pivotally connected to the pin 92 at one end thereof and the other end of the link 98 is pivotally connected by a pin 100 to two braces 102 and 104. These braces are attached at the upper ends to the rails 28 and 30 respectively. The link 98 provides a guide for the connecting rod 94.

From the foregoing it will be seen that as the float 70 rises relative to the downward movement of the floats 48 and 50, the piston 74 will be moved to the left as viewed in the drawing, and, as the float 70 falls with respect to floats 48 and 50, the piston will be moved to the right. The head 106 of the cylinder 42 is provided with an intake check valve 108 and an outlet check valve 110. The outlet check valve 110 is connected with a pipe 112. The pump is herein shown as an air compressor in which air is drawn into the cylinder through the check valve 108 and is expelled into the tube 112 through the check valve 110. The overall length of the piston 74, connecting rod 94, links 90 and 86, is such that when the pivot pin 84 is in alignment with wrist pin 96 and pivot pin 88, the left end of the piston is substantially in contact with the inside wall of the head 106 of the cylinder whereby substantially all air is ejected when the piston is in its extreme left position. It will also be observed that the pivot pin 84 can be raised above direct alignment between the wrist pin 96 and the pivot pin 88. This is desirable since the design is such so as to insure that the pivot pin 84 reaches alignment with the wrist pins 96 and 88, every time the float rides up the crest of the swell intermediate the valleys in which the floats 48 and 50 are riding, but, since these swells vary in height at times, the crest may carry the float to a position in which the pivot pin 84 is above the line intersecting the wrist pins 96 and the pivot pin 88.

It is well known that the distance between two crests of swells is approximately twenty-eight feet and that the

swells occur every fourteen seconds. Thus it is apparent from the foregoing that there has been provided a simple and inexpensive pump which is constantly operated by the constant swell in the ocean.

The swells vary in height in different parts of the world. It will be appreciated that by changing the lengths of links and levers, the pump can be adapted to accommodate various heights of swells.

While the mechanism herein shown and described, constitutes preferred form, it is to be understood that other forms may be adopted falling within the scope of the claims that follow.

I claim:

1. A pump, comprising in combination:

- (A) a frame;
- (B) a pair of floats carrying the frame, said floats being spaced from one another at such distance so as to float substantially simultaneously on the crests of swells of the water in the ocean;
- (C) means for retaining the frame in position in which the floats are raised and lowered substantially in unison by the swell movement of the water;
- (D) a movable element, connected with the frame, for effecting pumping;
- (E) a third float positioned for raising and lowering substantially contra to the movement of the pairs of floats by the swells in the water;
- (F) and means responsive to the relative movement between the third float and the pair of floats for moving the movable pumping element;
- (G) means for pivotally connecting the pair of floats to the frame;
- (H) and means for pivotally connecting the third mentioned float with the movable pumping element.

2. A pump, comprising in combination:

- (A) a frame;
- (B) a pair of floats carrying the frame, said floats being spaced from one another a distance substantially equal to the distance between the crests of next adjacent swells of the water in the ocean;
- (C) means for retaining the frame in position in which the floats are raised and lowered substantially in unison by the swell movement of the water.
- (D) a cylinder element carried by the frame.
- (E) a piston element in the cylinder, said elements being reciprocable relative to one another.
- (F) a third float positioned for raising and lowering substantially contra to the movement of the pair of floats;
- (G) means connecting the third float with one of said

elements for imparting relative reciprocating movement between said elements;

- (H) and means for maintaining the third float aligned with the pair of floats and for positioning the float midway of the pair of floats when the third float rides the peak of the crest.

3. A pump, comprising in combination:

- (A) a frame;
- (B) a pair of floats carrying the frame, said floats being spaced from one another a distance substantially equal to the distance between the crests of next adjacent swells of the water in the ocean;
- (C) means for retaining the frame in position in which the floats are raised and lowered substantially in unison by the swell movement of the water;
- (D) a cylinder element carried by the frame;
- (E) a piston element in the cylinder, said element being reciprocable relative to one another;
- (F) a third float positioned for raising and lowering substantially contra to the movement of the pair of floats;
- (G) a link pivotally connected with the third mentioned float and the frame;
- (H) and link means pivotally connecting the third mentioned float with one of said elements for imparting relative reciprocating movement between said elements.

4. A pump as defined in claim 3, characterized in that the link means (H) includes:

- (1) a connecting rod connected with one of said elements;
- (2) a link pivotally connected with the third mentioned float and the connecting rod;
- (3) and means for guiding the connecting rod.

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