

March 7, 1950

R. W. WAITE ET AL

2,499,433

HYDRAULIC CLAMSHELL BUCKET

Filed June 29, 1948

2 Sheets-Sheet 1

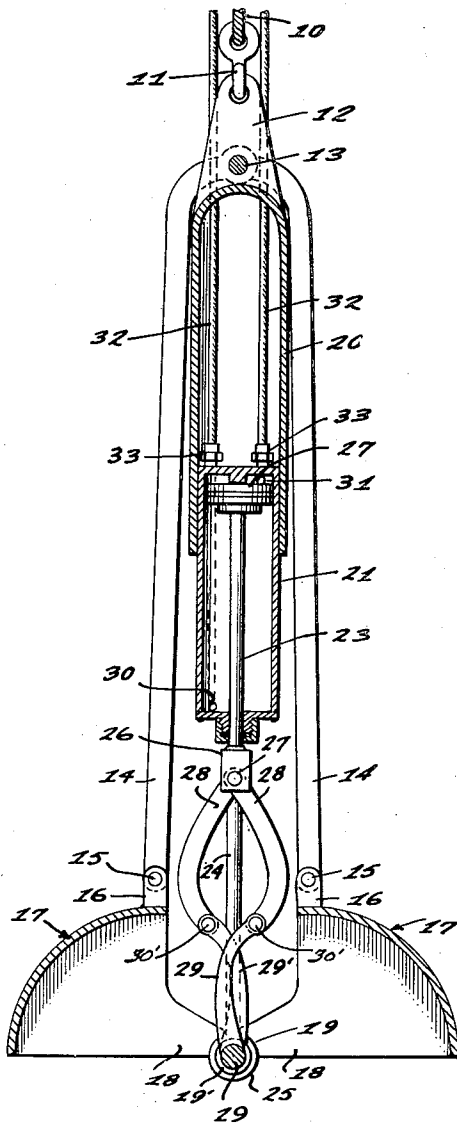


Fig. 1

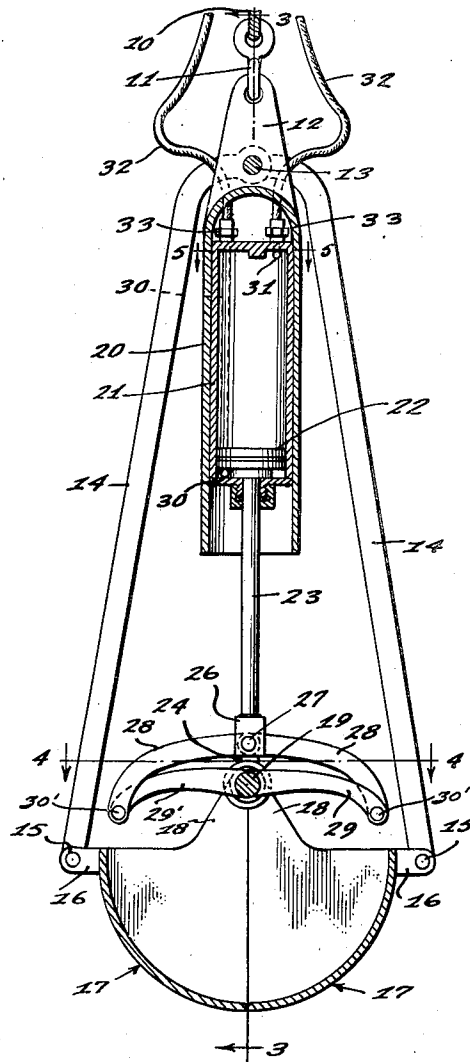


Fig. 2

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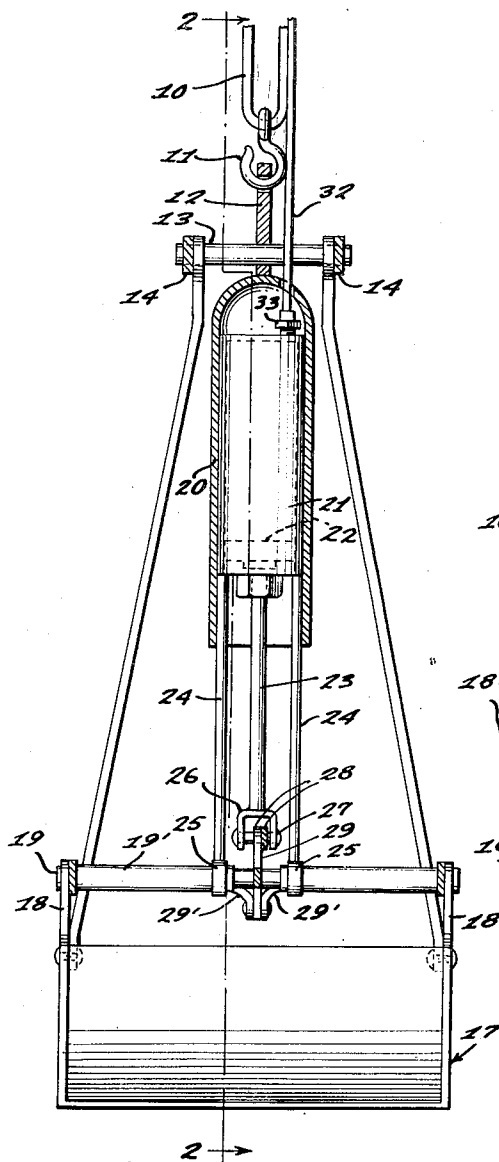


Fig. 3

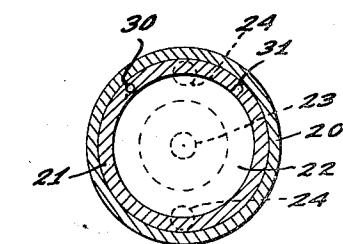


Fig. 5

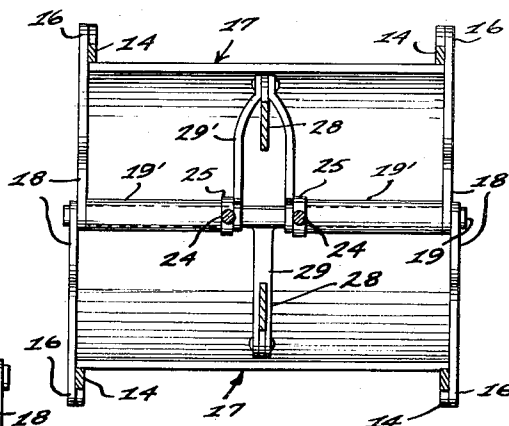


Fig. 4

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HYDRAULIC CLAMSHELL BUCKET

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4 Claims. (Cl. 37-185)

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Our invention relates to hydraulic clam shell buckets wherein a hydraulic cylinder is operatively connected to a pair of bucket sections for actuating the same to open and closed positions.

Hydraulically-operated clam shell buckets in general use are generally actuated only in a single direction by hydraulic pressure. That is, some such buckets depend upon the weight of the parts to open the bucket as the same is dropped to the ground and are closed by hydraulic pressure, or such buckets are opened and maintained open by hydraulic pressure, but rely on closing for the weight of the bucket and/or any contents which may be positioned between the open jaws. Thus, in the last-mentioned form, it necessitates an upward pull on the hoist to initiate closing, whereby an insufficient quantity of material is picked up by the bucket. The first-described form has the objection that when used under water, it does not necessarily stay entirely open, whereby an insufficient quantity of material is picked up.

With the foregoing in view, it is an object of our invention to provide an improved hydraulically-actuated clam shell bucket whereby the bucket is both opened and closed by hydraulic pressure.

A further object is to provide such an improved hydraulically-operated clam shell bucket which includes a hydraulic cylinder and piston, said piston being operatively connected to the bucket sections, means operatively connecting the cylinder to the bucket sections and means for actuating the cylinder and piston vertically in opposite directions simultaneously, whereby to provide a quick opening and closing of the bucket sections.

Other objects and advantages reside in the particular structure of the invention, combination and arrangement of the several parts thereof, and will be readily understood by those skilled in the art upon reference to the attached drawing in connection with the following specification, wherein the invention is shown, described and claimed.

In the drawing:

Figure 1 is a transverse vertical sectional view through a bucket according to the invention, the bucket sections being shown in the open positions;

Figure 2 is a view like Figure 1, but showing the bucket sections in the closed position;

Figure 3 is a longitudinal vertical sectional view taken substantially on the plane of the line 3-3 of Figure 2;

Figure 4 is a horizontal sectional view taken substantially on the plane of the line 4-4 of Figure 2;

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Figure 5 is an enlarged horizontal sectional view taken substantially on the plane of the line 5-5 of Figure 2.

Referring specifically to the drawing, wherein like reference characters have been used throughout the several views to designate like parts, 10 designates a cable having a hook 11 carried by the bight thereof, which is detachably secured to a plate 12 depending therefrom. The plate 12 has journaled therein transversely thereof a stub shaft 13, the opposite ends of which have pivoted thereto depending hangers 14, there being two hangers 14 pivoted to each end of the stub shaft 13. The hangers 14 extend downwardly and their lower ends are pivoted by any suitable pivot pins 15 to ears 16 fixed to substantially identical bucket sections 17 of the clam shell bucket. Each bucket 17 includes a side wall terminating in an upwardly-directed ear 18 when the bucket is in the closed or Figure 2 position. The ears 18 of one bucket section are disposed laterally inwardly of the corresponding ears 18 of the other section, as is readily seen in Figure 4. The outermost ears 18 are fixed to a bucket shaft portion 19 which is solid and spans the ears. The innermost ears 18 are each fixed to tubular sleeves 19' which extend inwardly along the solid shaft 19, but which terminate in laterally-spaced relation to each other. Thus, the solid shaft 19 and sleeves 19' comprise a bucket shaft whereby the bucket sections 17 are hingedly connected together for swinging movement to and from the Figure 1 and Figure 2 position, whereby the bucket is opened and closed.

The plate 12 aforesaid has fixed thereto below the stub shaft 13, a guide member 20 which in the embodiment illustrated comprises an inverted cup-shaped member having cylindrical side walls. A hydraulic cylinder 21 is vertically slidable relative to the guide member 20 inwardly thereof. A hydraulic piston 22 is vertically slidable inwardly of the cylinder 21 and has a piston rod 23 depending therefrom and extending axially outwardly and downwardly relative to the cylinder 21. The cylinder 21 is provided with at least one depending rod member 24 which extends downwardly therefrom toward the bucket shaft. The lower end of the rod member 24 is formed with a ring 25 which is journaled on one of the sleeves 19'. Thus, the cylinder 21 is pivotally connected to the bucket shaft in vertically-spaced relation thereto. The lower end of the piston rod 23 is provided with a yoke 26, the legs of which are spanned by a pivot pin 27. A pair of oppositely laterally outwardly-directed lazy-long levers 28 are pivoted at one end to the pivot

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pin 27. The outer ends of the levers 28 are pivoted by any suitable means 30' to the free ends of a pair of bell crank levers 29 and 29'. The inner end of the bell crank lever 29 is fixedly connected to the solid shaft 19, while the inner ends of the bell crank 29' are fixedly connected to at least one of the sleeves 19'. In the embodiment shown, the bell crank lever 29' comprises a pair of arms whereby each arm is fixedly connected to one of the sleeves 19'.

As best seen in Figures 2 and 5, the cylinder 21 is provided with a pair of inlet ports 30 and 31, the port 31 opening into the cylinder adjacent the lower end thereof and the port 30 opening thereinto adjacent the upper end thereof. The ports 30 and 31 are connected to any suitable source of hydraulic fluid under pressure, not shown, by tubular and flexible conduits 32 which are connected to the cylinder by any suitable fittings 33. It is to be understood in this connection that suitable valve means, not shown, are intended to be located adjacent the operator's station for the bucket, whereby he may selectively admit fluid under pressure to either end of the cylinder 21.

In the operation of the device, and with particular reference to Figures 1 and 2, it is apparent that with the parts in the Figure 1 position, when hydraulic fluid under pressure is admitted to the cylinder 21 through the port 31 adjacent the upper end of the cylinder, the fluid will simultaneously move the cylinder 21 upwardly while the piston 22 is loaded for movement downwardly. The upward movement of the cylinder 21 on account of the connection 24 between the same and the bucket shaft elevates the bucket shaft, whereby the bucket sections 17 tend to be closed by swinging of such sections on the pivot pins 15 of the hangers 14. At the same time, the downward thrust on the piston 22 in the cylinder 21 loads the lazy-tong levers 28 and bell cranks 29 and 29', so that the solid bucket shaft portion 19 tends to be rotated in one direction, while the tubular sleeves 19' tend to be rotated in the opposite direction, whereby positive torque loads in closing directions are imposed on the sleeves 19' and shaft portion 19 of the bucket sections 17 as the cylinder 21 moves upwardly. At first, the piston is unable to move, as such movement would result in upward pivotal movement of the pins 15 which is prevented by the hangers 14. However, the linear thrust on the piston is translated into oppositely-directed torques on sleeves 19' and shaft 19 which tends to assist the cylinder to close the bucket as the bucket shaft 19, 19' is moved upwardly. Also, as the bucket sections approach the closed position, Figure 2, the pivots 15 pass a dead center, after which the piston moves downwardly slightly as the cylinder completes its upward stroke, whereby the final closing of the bucket sections is materially assisted by the slight piston movement. On the contrary, when the parts are in the Figure 2 position and the bucket sections are closed, fluid is admitted to the cylinder 21 through the lower port 30. This action simultaneously moves the cylinder 21 downwardly as the piston 22 is loaded for upward movement. Such upward load on the piston imparts reverse torques to the bucket shaft portions, whereby, to assist the movement of the bucket sections 17 to an open position which is incident to the simultaneous downward movement of the cylinder 21. As in the closing of the bucket sections, movement of the piston occurs only near the end of the stroke after the

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pivots 15 have passed a dead center. However, such slight movement of the piston insures a full opening of the bucket sections, and thus materially assists the downward movement of the cylinder, which is transmitted to the bucket shaft by the depending rods 24 aforesaid. Thus, in the movement to the open position, a positive opening of the bucket is provided.

This positive action of the bucket in the opening and closing movements is highly desirable, as aforesaid, when operating under water, as in dredging. Likewise, we prefer the use of hydraulic fluid rather than a gaseous medium such as steam, because of the fact that condensation of the steam prevents it from being effectively used under water. The hydraulic fluid used by us is substantially unaffected by water temperatures, whereby it may be used in many places where steam cannot be used.

While we have shown and described what is now thought to be a preferred embodiment of our invention, it is to be understood that the same is susceptible of other forms and expressions. Consequently, we do not limit ourselves to the precise structures shown and described hereinabove except as hereinafter claimed.

We claim:

1. In a hydraulic clam shell bucket including a pair of bucket sections hinged to a bucket shaft for swinging movement in opposite directions to open and close said bucket, and a hanger pivotally connecting each bucket section to a hoist, the improvement comprising a vertical tubular guide depending from said hanger above said sections, a hydraulic cylinder slidably mounted in said guide for vertical sliding movement therein, means rigid with said cylinder for pivotally connecting said cylinder to said bucket shaft, a pair of bell cranks, there being a bell crank fixed to each of said bucket sections, a piston in said cylinder, a piston rod depending from said cylinder and extending axially outwardly thereof, a lazy tongs connecting said rod to said bell cranks, and means for selectively admitting hydraulic fluid under pressure to opposite ends of said cylinder, whereby to actuate said cylinder and piston relatively in opposite directions for rapid opening and closing of said bucket.

2. A hydraulic clam shell bucket including a pair of bucket sections hinged to a bucket shaft for swinging movement in opposite directions to open and close said bucket, and a hanger pivotally connecting each bucket section to a hoist, the improvement comprising a vertical guide depending from said hanger above said sections, a hydraulic cylinder slidably mounted in said guide for vertical sliding movement therein, means rigid with said cylinder for pivotally connecting said cylinder to said bucket shaft, a pair of bell cranks, there being a bell crank fixed to each of said bucket sections, a piston in said cylinder, a piston rod depending from said cylinder and extending axially outwardly thereof, a lazy tongs connecting said rod to said bell cranks, and means for selectively admitting hydraulic fluid under pressure to opposite ends of said cylinder, whereby to actuate said cylinder and piston relatively in opposite directions for rapid opening and closing of said bucket.

3. A hydraulic clam shell bucket including a pair of bucket sections hinged to a bucket shaft for swinging movement in opposite directions to open and close said bucket, and a hanger pivotally connecting each bucket section to a hoist, the improvement comprising a vertical guide

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depending from said hanger above said section, a hydraulic cylinder slidably mounted in said guide for vertical sliding movement therein, means rigid with said cylinder for pivotally connecting said cylinder to said bucket shaft, said bucket shaft comprising a solid shaft fixed to one bucket section and a pair of tubular sleeves fixed to the other bucket section and journaled on opposite end portions of said solid shaft, a pair of bell cranks, there being a laterally-directed bell crank fixed to said solid shaft, a second and laterally-oppositely-directed bell crank fixed to at least one of said sleeves, a piston in said cylinder, a piston rod depending from said cylinder and extending axially outwardly thereof, a lazy tongs connecting said rod to said bell cranks, and means for selectively admitting hydraulic fluid under pressure to opposite ends of said cylinder, whereby to actuate said cylinder and piston, relatively in opposite directions for rapid opening and closing of said bucket.

4. In a hydraulic clam shell bucket including a pair of bucket sections, means providing a

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hinge hingedly connecting said sections together for simultaneous movement in opposite directions to open and close said bucket, and a hanger pivotally connecting each bucket section to a hoist, the improvement comprising a vertically-disposed hydraulic cylinder, means pivotally connecting said cylinder to said hinge in vertically-spaced relation thereto, a piston in said cylinder, a piston rod fixed to said piston and depending from said cylinder, a pair of bell cranks, there being a bell crank fixed to each bucket section, means pivotally connecting said piston rod to said bell cranks, means mounting said cylinder on said hanger for vertical movement relative thereto, and means for actuating said cylinder and piston relatively in opposite vertical directions for rapid opening and closing of said buckets.

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No references cited.