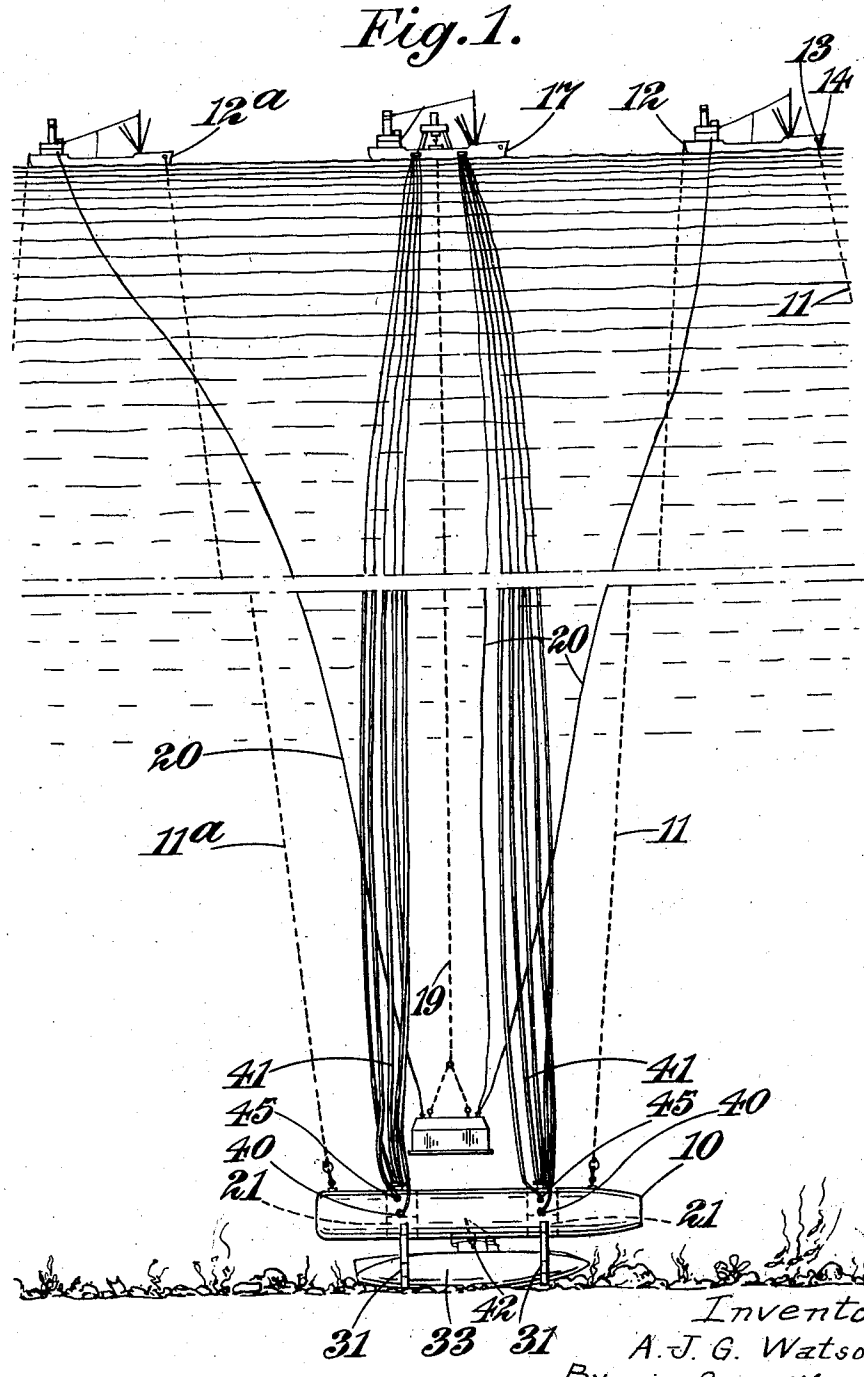
March 27, 1945. A. J. G. WATSON 2,372,347

GRAB

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Fig. 1.



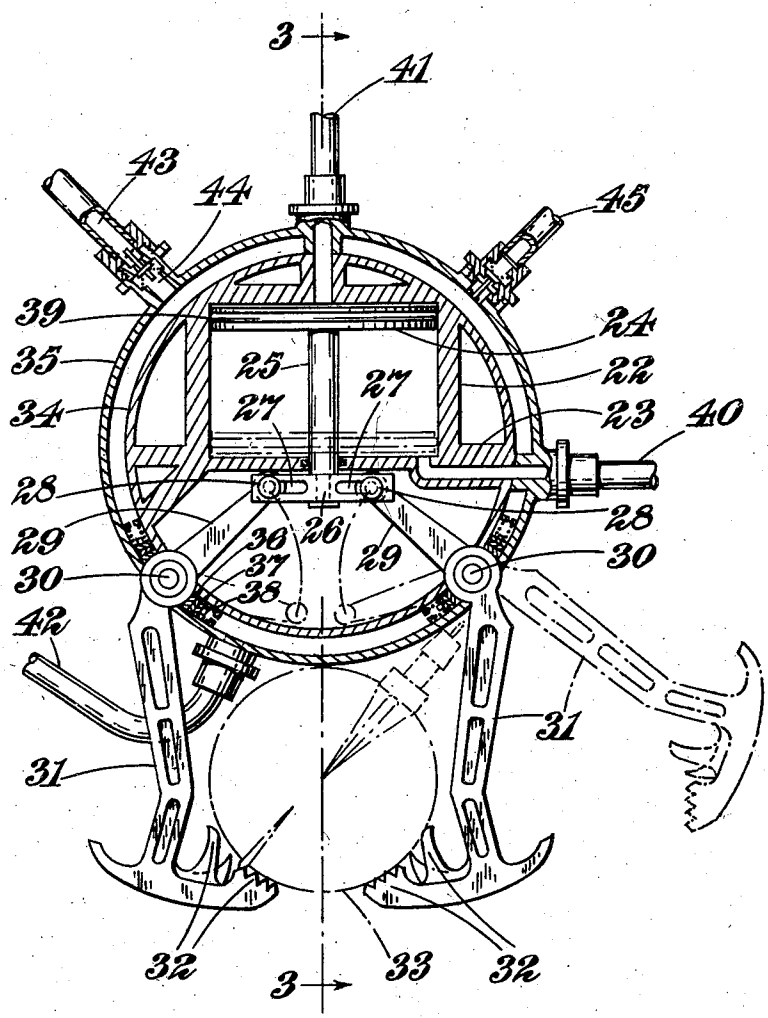
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Fig. 2.



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Fig. 3.

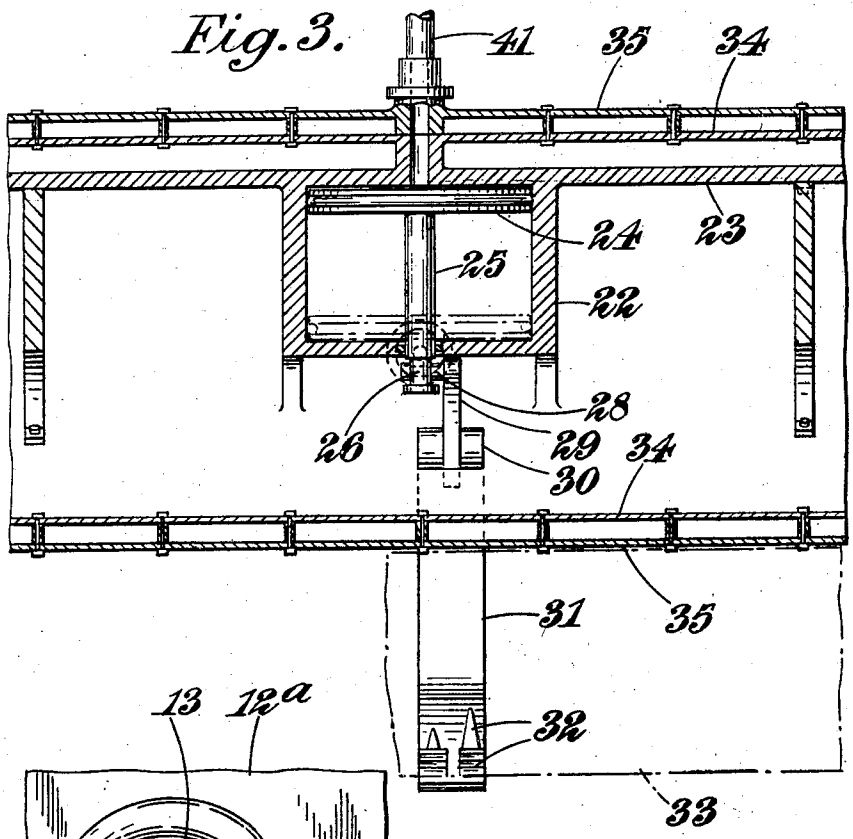
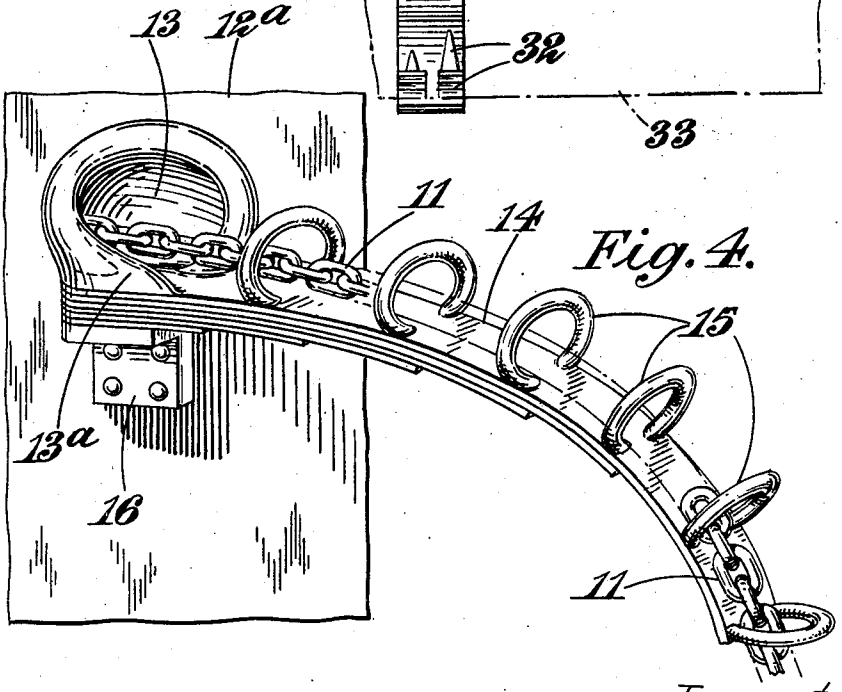


Fig. 4.



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UNITED STATES PATENT OFFICE

2,372,347

GRAB

Alfred John Goodrick Watson, Beccles, England

Application November 3, 1943, Serial No. 508,851
In Great Britain October 16, 1942

2 Claims. (Cl. 114—51)

This invention relates to grabs, and has for one of its objects to provide an improved construction of grab which, owing to its buoyancy, shall be particularly adapted for use in salvaging submerged objects, such as wrecked watercraft, e. g. submarines, and parts thereof.

According to the invention there is provided a grab comprising in combination a cylinder, a piston movable vertically therein, jaws that are operatively connected with the piston and are arranged to engage an object to be raised when the piston is moved upwards in the cylinder, and pneumatic means for creating at opposite sides of the piston a difference of air pressure for moving the piston in the cylinder. Owing to the presence of air in the cylinder when the grab is operated, its buoyancy tends to raise the object gripped by the grab.

Preferably the cylinder has a jacket to contain air for increasing the buoyancy of the grab.

The pneumatic means may comprise means for supplying compressed air, or air at atmospheric pressure to the cylinder below the piston, and means for evacuating air from the cylinder above the piston and thereby creating a partial vacuum.

Jaw-closing means comprising guides, cams or the like, may be provided for causing the jaws to approach one another for engaging an object when the piston moves upwards from its lowest position in the cylinder.

An operative connection between each jaw and the piston may comprise an arm that is attached at one end to the piston and is pivotally connected at its other end to the allotted jaw and extends through a hole in the cylinder which is provided with packing means for closing the hole fluid-tight in all positions of the arm and the jaw attached to it.

One embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows the grab in use in raising a sunken submarine;

Figure 2 is a transverse section through the grab;

Figure 3 is a section taken on the line 3—3 of Figure 2, and

Figure 4 shows the manner in which a cable supporting the grab is led into a co-operating ship.

Like reference characters designate like parts in all the figures of the drawings which are diagrammatic.

As shown in Figure 1, the grab is in the form of an armour-plated drum 10 shaped like a cigar. The grab 10 is supported by means of chain cables 11 and 11a from two ships 12 and 12a, and each ship has a power-driven capstan for paying the cables in and out. Each cable 11 and 11a is led into the ship in the manner shown in Figure 4 for the cable 11. The cable is led to the hawse-hole 13 over the top of a multi-plate leaf-spring 14 and through rings 15 which guide it. The spring 14 is supported by a bracket 16 and a projecting part 13a of the hawse-hole frame, and serves to ease the strain on the cable in a rough sea. A third ship 17 supports a diving bell 18 by a chain cable 19, and the occupants of the bell are in communication with all three ships through telephone cables 20. The bell 18 is lighted and provided with a powerful searchlight to illuminate the sea bed.

The drum 10 is provided with two identical grabbing devices 21, one of which is shown in Figures 2 and 3. Each grabbing device comprises a large cylinder 22 carried by the main frame 23 of the drum, and a piston or platform 24 mounted to reciprocate in the cylinder. A piston rod 25 extends down from the piston 24 through a suitably packed opening in the bottom of the cylinder 22, and supports a bar 26 which is situated within the drum and can turn on the piston rod. The bar 26 is formed with jaw-closing means comprising slots 27 or guides which are engaged by pins 28 on the ends of arms 29 that are pivoted at 30 in the skin of the drum 10. The arms 29 are integral with jaws 31 which are formed with teeth 32, prongs or the like to grip the submarine 33 or other article to be salvaged. The drum 10 is formed with a double skin formed by an inner cylindrical shell 34 and an outer cylindrical shell 35, the pivots 30 for the drums 29 and jaws 31 being formed between these shells. The openings through which these parts pass are packed by means of steel shutters 36 provided with strong flat springs 37 for keeping them seated and other springs 38 above them. An air-tight joint may be provided between the periphery of the piston 24 and the cylinder walls by means of a rubber ring 39.

The lower end of each cylinder 22 communicates with a flexible pipe 40 which extends to the ship 17 (Figure 1) and connects to an air pump in that ship, so that compressed air can be pumped into the lower half of the cylinder to raise the piston 24 therein, as shown in Figures 2 and 3. The upper part of the cylinder communicates with a flexible pipe 41 which extends to the ship 17 and communicates therein with a vacuum pump so that the upper part of the cyl-

inder can be evacuated to assist in raising the piston 24. Valves are provided in the ship 17 for reversing the connections between the pipes 40 and 41 and the pumps, so that the piston 24 can be forced down in the cylinder. As can be seen from Figure 2, when the piston 24 is raised, the jaws 31 close and grip the article to be salvaged. When the piston is lowered, as indicated in broken lines, the jaws 31 open and release the article. In use, the drum 10 is positioned over the article to be salvaged with the jaws 31 open; then the piston 24 is raised so that the jaws 31 close on the article and grip it. In order to sink the drum 10, water may be pumped into the space between the shells 34 and 35 of the double skin through a flexible pipe 42 which extends to the ship 17 and can be connected to a force pump therein. The pipe 42 can also be connected to a suction pump in the ship 17 so that the water can be pumped out of the space between the shells. Compressed air can be admitted to the space between the shells 34 and 35 through a pipe 43 which also extends to the ship 17 and communicates with an air pump therein. By displacing the water by air, the drum 10 can be made more buoyant when it is to be raised with the article to be salvaged. A non-return valve 44 is provided in the pipe 43. Another pipe 45 extends to a valve in the ship 17 and permits the escape of air when water is pumped into the drum to sink it.

In use, the drum is filled with water and then lowered over the article to be salvaged together with the diving bell. The ships are manoeuvred in accordance with instructions telephoned from a person in the diving bell to bring the drum to the correct position. The jaws 31 are then closed and air is pumped into, and the water is pumped out of, the drum to make it more buoyant. The drum is then raised by means of the cables 11. The drum, supporting the article to be salvaged, can then be towed to port by the attendant ships. If desired, the drum may be fitted with a low-powered engine (not shown) to drive a screw so that it can be manoeuvred under its own power when in port as, for example, to allow it to enter a dry dock. The engine would also drive compressed air and vacuum pumps for maintaining the air pressure and vacuum within it, and valves would be provided to allow of these pumps being connected up in place of the pipes 40, 41, 43 and 35. The engine and pumps would be housed in a water-tight compartment, to which access could be had through a water-tight door.

The invention is not restricted to the precise constructional details enumerated. For example, the vacuum pipes leading from exhaust pumps to the drum may be reinforced as by means of strong coiled steel springs within them, for enabling them to withstand high hydraulic pressure. Also, where the arms extend out of the drum, the outer shell may be of double thickness with a space between them for the flat springs aforesaid. A similar arrangement may be made in connection with the inner shell of the drum. Further, all three ships should be fitted with wireless transmitting and receiving apparatus.

I claim:

1. A grab comprising in combination a buoyant drum, a cylinder therein, a piston movable vertically in the cylinder, a pair of jaws outside the drum for engaging an object to be raised when the piston is moved upwards in the cylinder, connecting means operatively connecting each jaw with the piston, and pneumatic means for creating at opposite sides of the piston a difference of air pressure for moving the piston in the cylinder, which connecting means comprises two arms that are pivotally attached at one end to the piston and form each a rigid extension of an allotted jaw, which arms extend fluid-tight through the drum in all positions of the jaws.

2. A grab comprising in combination an air-jacketed drum, a vertical cylinder therein, a piston that is movable in the cylinder, and has its rod extending through the lower end of the cylinder, a pair of jaws outside the drum, jaw-closing means for causing the jaws to approach one another for engaging an object when the piston moves upwards from its lowest position in the cylinder, pneumatic means for moving the piston in the cylinder comprising means for supplying compressed air to the cylinder below the piston, and means for evacuating air from the cylinder above the piston and thereby creating a partial vacuum, which jaw-closing means comprises two guides carried by the piston rod below the cylinder, and a pair of arms which are slidably connected at one end to the guides and form each a rigid extension of an allotted jaw, which arms extend each through a hole in the drum, which holes are provided with packing means for closing them fluid-tight in all positions of the arms and the jaws.

ALFRED JOHN GOODRICK WATSON.