Nov. 12, 1957 A. C. HARTLEY ET AL 2,812,640

APPARATUS FOR LAYING SUBMARINE CABLES

Filed July 2, 1954 2 Sheets-Sheet 1

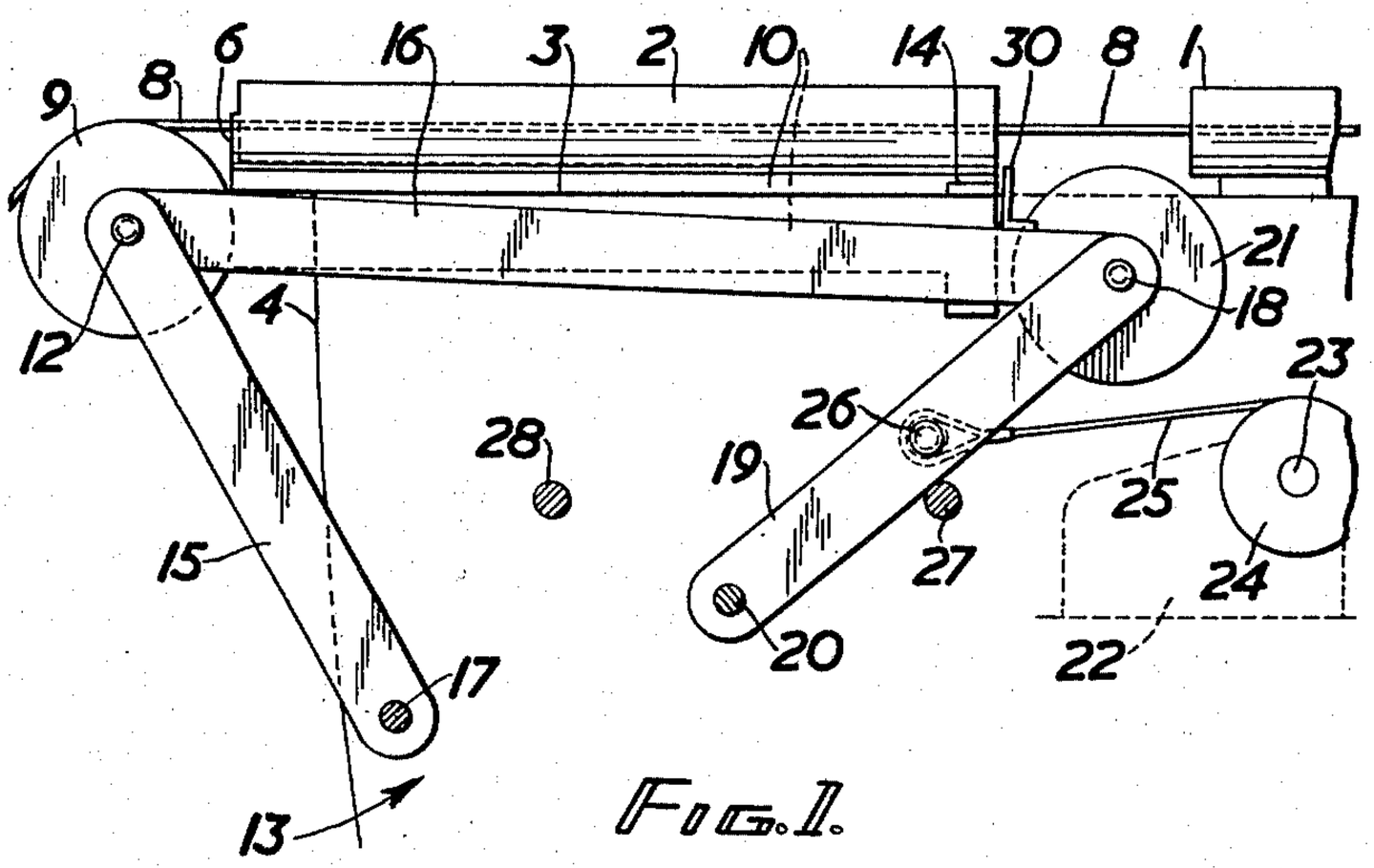


FIG. 1.

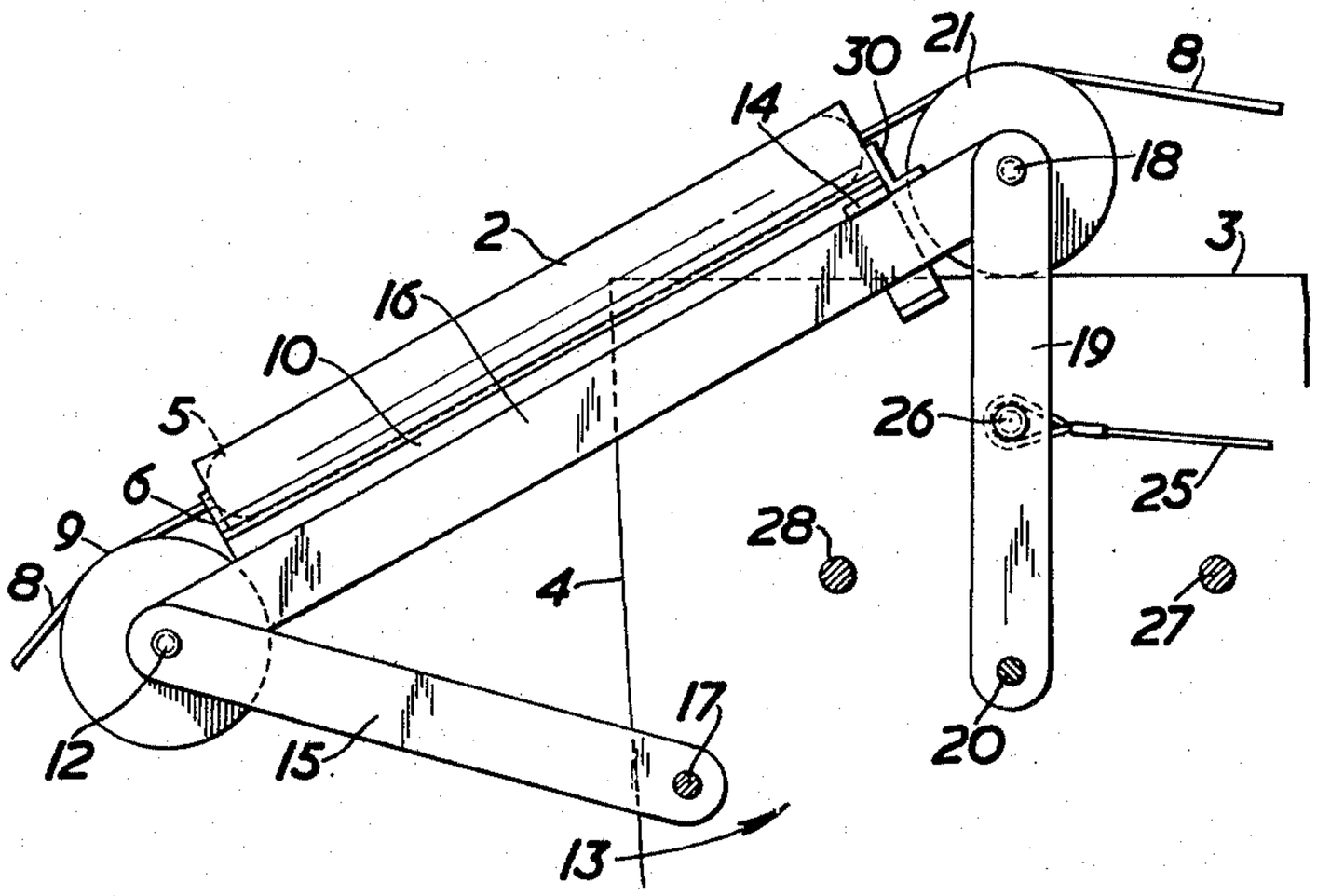


FIG. 2.

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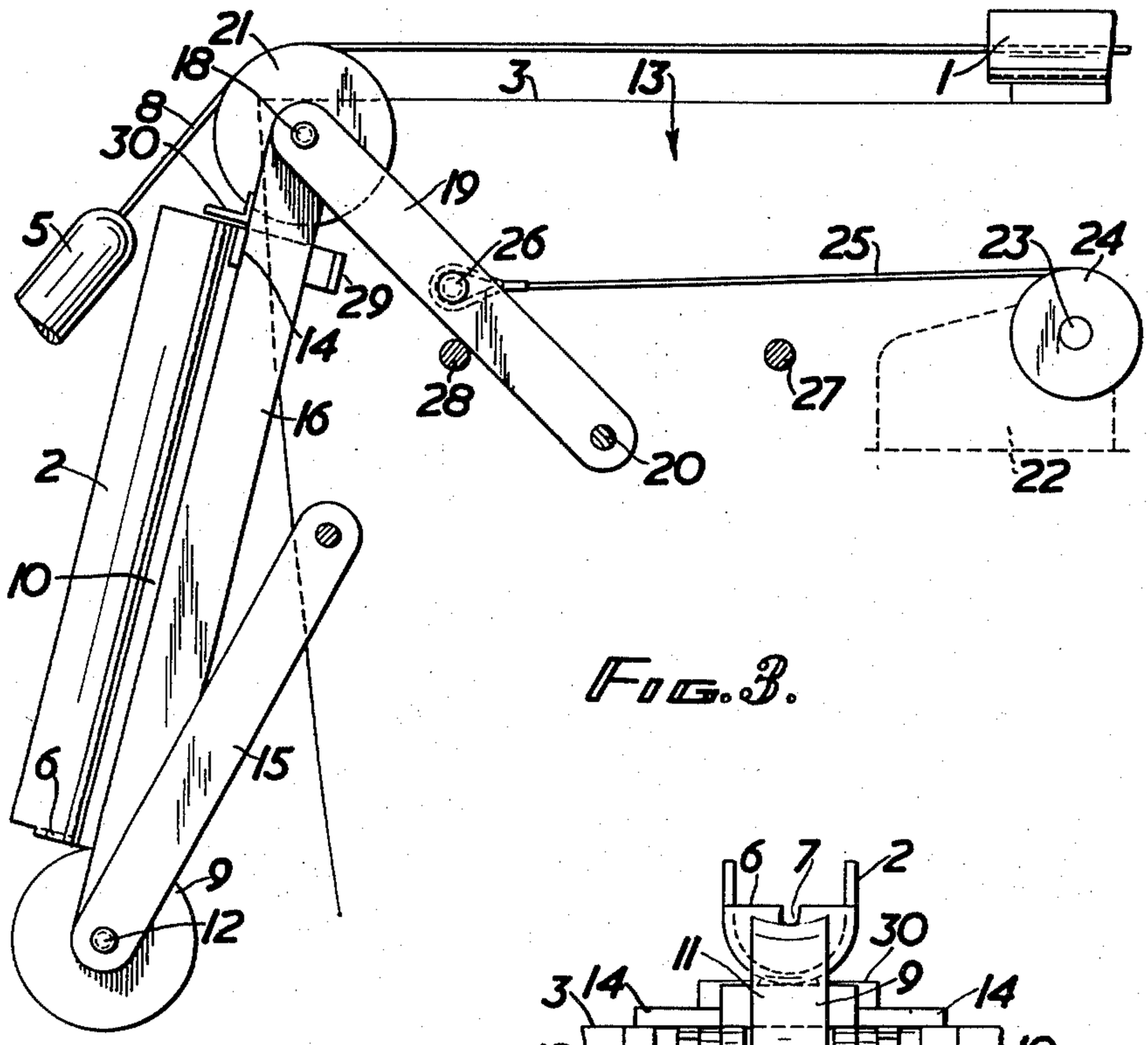


FIG. 3.

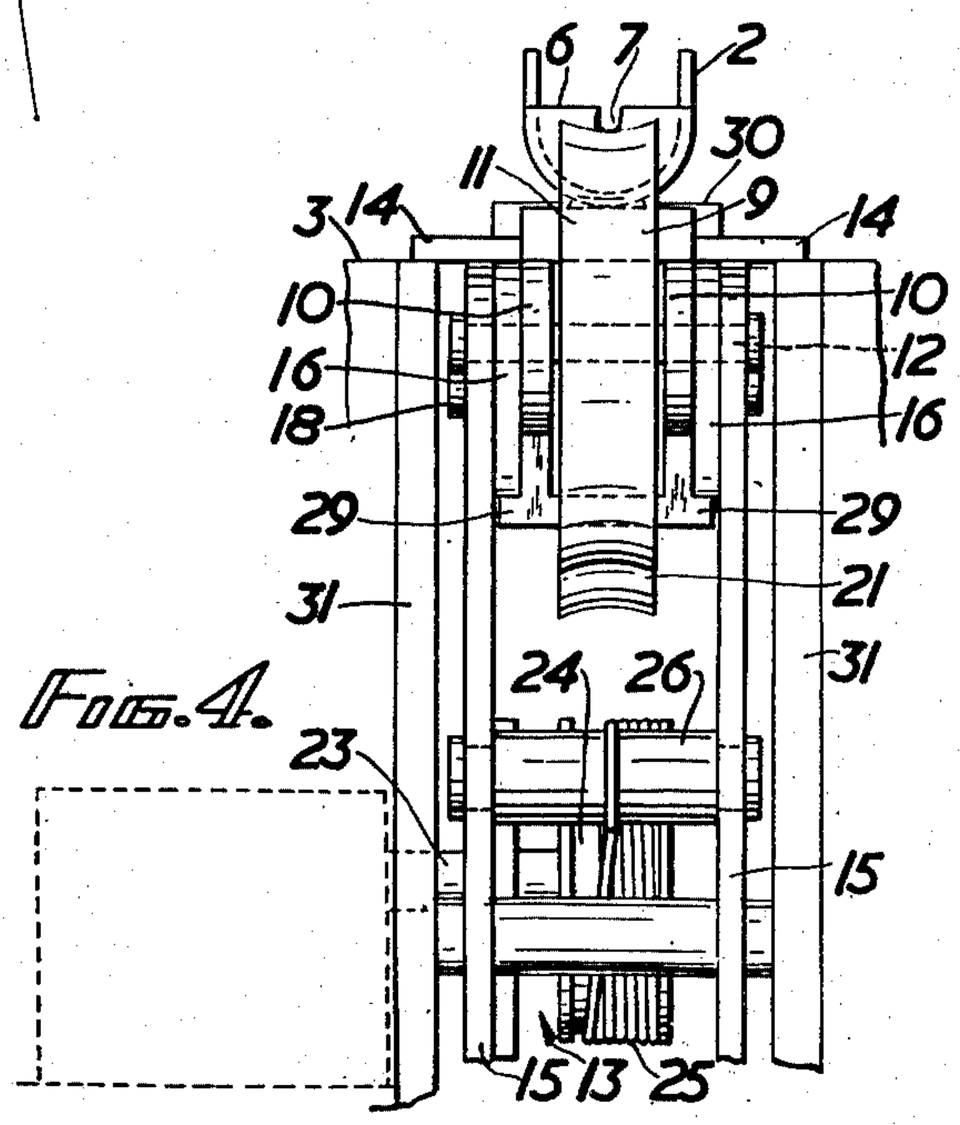


FIG. 4.

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APPARATUS FOR LAYING SUBMARINE CABLES

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Application July 2, 1954, Serial No. 440,962

Claims priority, application Great Britain July 6, 1953

4 Claims. (Cl. 61—72)

This invention relates to apparatus for laying submarine cables, and, more particularly, submarine cables in which repeaters are connected at intervals of say 50 miles.

The object of the invention is the provision of improvements in such apparatus and particularly in the launching mechanism by which the repeaters are passed over the stern of the ship into the sea.

The invention consists broadly of an apparatus for guiding a submarine cable from a cable-laying ship into the sea, said cable having a solid object such as a repeater connected in its line, comprising main and auxiliary pulleys having a normal correlation such that the cable passes above the auxiliary pulley, without bending round it, and then bends round the main pulley into the sea, and means whereby, when said object has passed said auxiliary pulley but not said main pulley, the pull of the cable itself effects relative movement of said pulleys to a launching correlation such that said main pulley occupies a position beneath said auxiliary pulley and said cable bends round said auxiliary pulley into the sea without bending round said main pulley.

In order that the invention may be the more clearly understood a launching mechanism in accordance therewith will now be described, reference being made to the accompanying drawings wherein:

Figure 1 is a side elevation of said launching mechanism at the normal position at which it forms a guide for the cable being payed out over the stern of the ship;

Figure 2 is a similar view of the same at an intermediate launching position, at which it is in process of launching a repeater connected in the line of cable;

Figure 3 is a similar view of the same at its final launching position at which it has launched the repeater, which is between the ship and the sea.

Figure 4 is an end elevation to a larger scale, looking from the left of Figure 1, of the upper portion of the launching mechanism.

The whole system in which the launching mechanism is incorporated is as described in our copending application Serial No. 427,502, filed May 4, 1954, now Patent No. 2,756,873, except that the launching mechanism itself is different. In the present arrangement the tubular track described in said application continues aft beyond the after winch, but does not extend, as in said application, over the stern of the ship. Instead, it terminates, as indicated at **1** (Figures 1 and 3), close to the forward end of a trough **2**, which is normally in line with it just above the level of the deck **3**, and whose after end is normally just outboard over the stern **4** of the ship. This trough **2** is of a size to comfortably receive a repeater **5** (Figures 2 and 3). Its forward end is open, and its after end is closed at **6**, but the closure of said after end is formed with a notch **7** which allows the cable **8** to pass freely through it. Immediately to the aft of the after end of said trough **2** there is normally a stern sheave or pulley **9**, and normally, i. e. during the paying out of the 50 miles

or so of cable **8** between repeaters **5**, the cable passes from the after winch to said stern sheave **9** over which it passes direct into the sea.

When a repeater **5** arrives it passes through the two winches in succession, as described in said aforesaid application, and then continues along the track **1**, and, from the after end of said track, it slides into the trough **2** until it abuts against the closure **6** at the after end of said trough. During this time the cable will have been passing along the trough, and, through the slot **7** in the closure **6**, to the stern sheave **9**.

The trough **2**, which is of U-section as shown, is permanently mounted on a longitudinal support beneath it, which support is constituted by two parallel elongated side plates **10** in vertical planes, said plates being connected at their upper edges by means of horizontal cross pieces **11** which form supports for the two ends of the trough and to which said trough is fixedly secured. These two plates **10** extend aft beyond the aft end of the trough **2** and their extending portions are pivoted to the spindle **12** of said stern sheave **9**, one each side of said stern sheave. The ship has a longitudinal vertical slot **13** cut into it from the stern end, and the trough **2** is normally located immediately above said slot. The plates **10** at their forward ends have respective feet **14** extending outwardly from them, and these feet normally rest on the deck one each side of the slot **13** and thereby support the rear end of said plates.

The spindle **12** of the stern sheave constitutes a pin which pin joints two links **15** and **16**, each of which consists of two parallel plates pivoted to said spindle **12** one each side thereof as shown in Figure 4. The link **15**, hereinafter called the after link, normally extends downwardly and forwardly from said stern sheave **9**, into said slot **13**, and is pivoted at its lower end to the ship by means of a pivot pin **17**. The other link **16**, hereinafter called the connecting link, normally extends forwardly and at a very slight angle downwardly into said slot **13**, and, at its forward end is pin-jointed by means of a pivot pin **18**, to one end of a third link **19**, hereinafter called the forward link which normally extends downwardly and rearwardly within said slot **13** and has its lower end pivoted to the ship by means of a pivot pin **20**.

Thus, said connecting link **16** is normally within the slot **13** just beneath the trough **2**. Its forward end is to the fore of the forward end of said trough. The pin **18** which joints the connecting link **16** to the forward link **19** forms the spindle of a second sheave or pulley **21**, hereinafter called the auxiliary sheave or pulley. This normally lies within the slot **13** with the uppermost portion of its periphery just above deck level as shown in Figure 1.

When the repeater **5** abuts against the closure **6** at the after end of the trough **2** as heretofore described, continued paying out of the cable **8** forces said trough **2** afterwards, and therefore, owing to the pivot connection of said trough to the spindle **12** of the stern sheave **9**, forces the whole linkage aftwards through the position of Figure 2 to the position of Figure 3. That is to say the aft link **15** swings downwards until the stern sheave **9** occupies a position about vertically beneath its normal position, and the forward link **19** swings aftwards until the auxiliary sheave **21** occupies a position just forwardly of the normal position of said stern sheave **9**. The connecting link **16** therefore is tilted nearly to the vertical position with its major portion outboard from the stern of the ship.

During the first portion of this movement of the linkage, the trough **2** moves aftwards with its rear feet **14** sliding along the ship's deck, but after a short movement the connecting link **16**, whose rear end is rising as well as moving aftwards, engages said feet **14** and picks

the trough 2 up, and thereafter said trough moves entirely with said connecting link. Finally therefore, as shown in Figure 3, said trough 2 reaches a position at which it is tilted nearly to the vertical and is held outboard from the stern 4 of the ship at a level wholly beneath deck level.

During this aftwards movement of the auxiliary sheave, which rises somewhat, as well as moving aftwards, picks up the cable 8 which thereafter runs over it, and at some point during the simultaneous downward movement of the stern sheave 9 and the trough 2, said stern sheave departs from the cable, leaving the same at its normal angle from the auxiliary sheave 21 to the sea, and said trough 2 likewise departs from the repeater 5, leaving it supported solely by the cable 8 as shown in Figure 3, until it passes with the cable into the sea.

The cable 8 can now continue to be payed out, passing over the auxiliary sheave 21, but, at some time before the next repeater 5 arrives, the whole launching gear must be returned to the normal position, preparatory to another aftwards movement for launching said next repeater. This return to the normal position must be effected by power, and, in order to obtain the maximum resultant thrust of the cable on the sheaves is best effected while the after winch is being restored to the operative position and the cable runs at an angle downwards therefrom to the stern of the ship.

In the arrangement illustrated the return of the launching gear to the normal position is effected by means of a prime mover 22 mounted on one side of the slot 13 with its spindle 23 extending into said slot and having a winding drum 24 mounted on it in said slot. A hawser 25, which is coiled on said drum, has its end secured to a cross rod 26 which extends between the two plates forming the forward link 19. By rotation of the drum 24 the hawser 25 is wound thereon and said link 19, and therefore the whole launching, is pulled back to the normal position illustrated in Figure 1. A high ratio step-down transmission gearing is provided between said prime mover 22 and said spindle 23.

Stops 27 and 28 are provided to engage the forward link 19 and thereby limit the linkage at both its normal and its launching positions. Gravity maintains said linkage against said stops at both positions.

Describing now some of the constructional details, the two plates 10 which support the trough 2 have downward extensions at their rear ends from which respective lugs 29 project outwards vertically beneath the feet 14, and at a level beneath the two plates forming the connecting link 16. The purpose of these lugs 29 is to ensure against the trough 2 ever falling right away from the connecting link 16, say by inertia, during movement to the launching position.

The connecting link 16 has mounted on it, immediately to the fore of the forward end of the trough 2, a transverse partition 30. Normally the upper edge of this partition is just about level with the bottom of the trough 2, but, as said connecting link 16 rises to pick up said trough, said partition 30 rises relative to said trough, and, during the movement into the launching position constitutes a closure for the forward end of the trough. This partition, like the closure 6 at the aft end of the trough, has a notch in it to accommodate the cable.

The slot in the ship is lined at its sides with plates 31 to carry the pivot pins 17 and 20 and the stops 27 and 28, which latter consist of transverse rods extending between said plates 31. These plates 31 also serve to prevent any possibility of the linkage buckling.

Obviously the launching mechanism described can be employed with other forms of paying-out mechanism, such as that described in copending application Serial No. 331,035, filed January 13, 1953, in the name of George Thomas William Whitehead, now abandoned, cognate with copending application Serial No. 346,903, filed April 6, 1953, in the name of David Graham, now Patent No. 2,792,930.

We claim:

1. An apparatus for guiding a submarine cable from a cable-laying ship into the sea, said cable having solid object such as a repeater connected in its line, said apparatus comprising main and auxiliary pulleys rotating on horizontal axes, each being mounted on a supporting link pivotally mounted in spaced relation on the ship for adjustment to two guiding positions, in the first position the auxiliary pulley being below and out of the path of travel of the cable and out of the path of travel of the solid object, said main pulley guiding the cable into the sea, and in the second position the main pulley being out of the path of travel of the cable and the auxiliary pulley guiding the cable into the sea; linkage means pivotally connected between the spaced pulleys and movable as a unit with said pulleys, guide means on said linkage means for receiving and guiding the solid object between the pulleys in the first position thereof, said guide means having a member for obstructing the travel of the solid object toward the main pulley in the first position of the pulleys; said solid object engaging said obstructing member and by continued travel of the cable being moved with the linkage means and the pulleys into the second position and said movement of the pulleys into the second position moving the obstructing member out of the path of travel of the solid object and moving said auxiliary pulley into guiding engagement with the cable.

2. An apparatus according to claim 1, wherein one of said supporting links is pivoted to said connecting link adjacent the main pulley so that, in moving to the second position of the pulleys, said main pulley moves on a path mainly downward, and the other supporting link is pivoted to said connecting link adjacent to the auxiliary pulley so that, in moving to said second position said auxiliary pulley moves upward toward the cable.

3. An apparatus according to claim 1, a prime mover connected to one of said supporting links to return the pulleys from the second position to the first position.

4. An apparatus according to claim 1, wherein the guide means comprises a trough mounted on said linkage means with the end adjacent the main pulley closed by a wall for obstructing the passage of the solid object and having a notch therein for the passage of the cable.

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