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DESIGN AND DEVELOPMENT OF A NEW PURSE SEINING METHOD AND EQUIPMENT.

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A. SUMMARY

The aim of the research was to investigate a new method in purse seine netting as compared to the conventional power block method of hauling the net. The survey was carried out in Port Phillip Bay between July and September 1977 aboard the fishing vessel "Laurus". The new method was directed towards the pilchard fishery.

The development of a net spool to haul the purse seine net established the following:

1. There were no major faults in the design and operation of the spool gear.

2. A reduction in crew size was possible - from 5 crew members to three or four, depending on the size of the net used and the quantity of the fish expected.

3. The time taken for the net to be set to the completion of the shot (i.e. catch aboard the vessel) is reduced by approx. 15 mins.

4. As compared to conventional power block methods, there is minimal handling of heavy gear while in operation. It is in this respect that the crew size can be reduced.

5. The operation is safer for crew members without overstressing the equipment and in particular the net. Inherent in the design of the equipment, is a lower hauling point on the net, which provides greater safety when large catches are expected.

The disadvantages in the new method are:

1. The time taken to reset the net from the spool to the stern of the vessel is approx. 20 mins. The extra time could become an important factor but is partly off set by the time saved in hauling the net.

2. The uneven hauling of the net. This is a general problem associated with purse seine netting, but it can be avoided by re-slinging the net with an independent cork line.

It was concluded that the operation of the new method in hauling the net was successful. The potential of the new method is yet to be fully investigated with regard to fish catch success.

B. BRIEF DESCRIPTION OF METHOD & GEAR

The operations involved in setting the purse seine net are similar to that in the conventional manner. However, the principle difference is to haul the net from a forward position on the vessel onto a net spool and then, after the fish are aboard, to restack the net back onto the stern of the vessel.* In doing this, the net passes through a side roller, around a turning block and onto the net spool: the latter being powered and providing a positive haul on the net at all times. The net is restacked onto the stern of the vessel by passing it through a power block.

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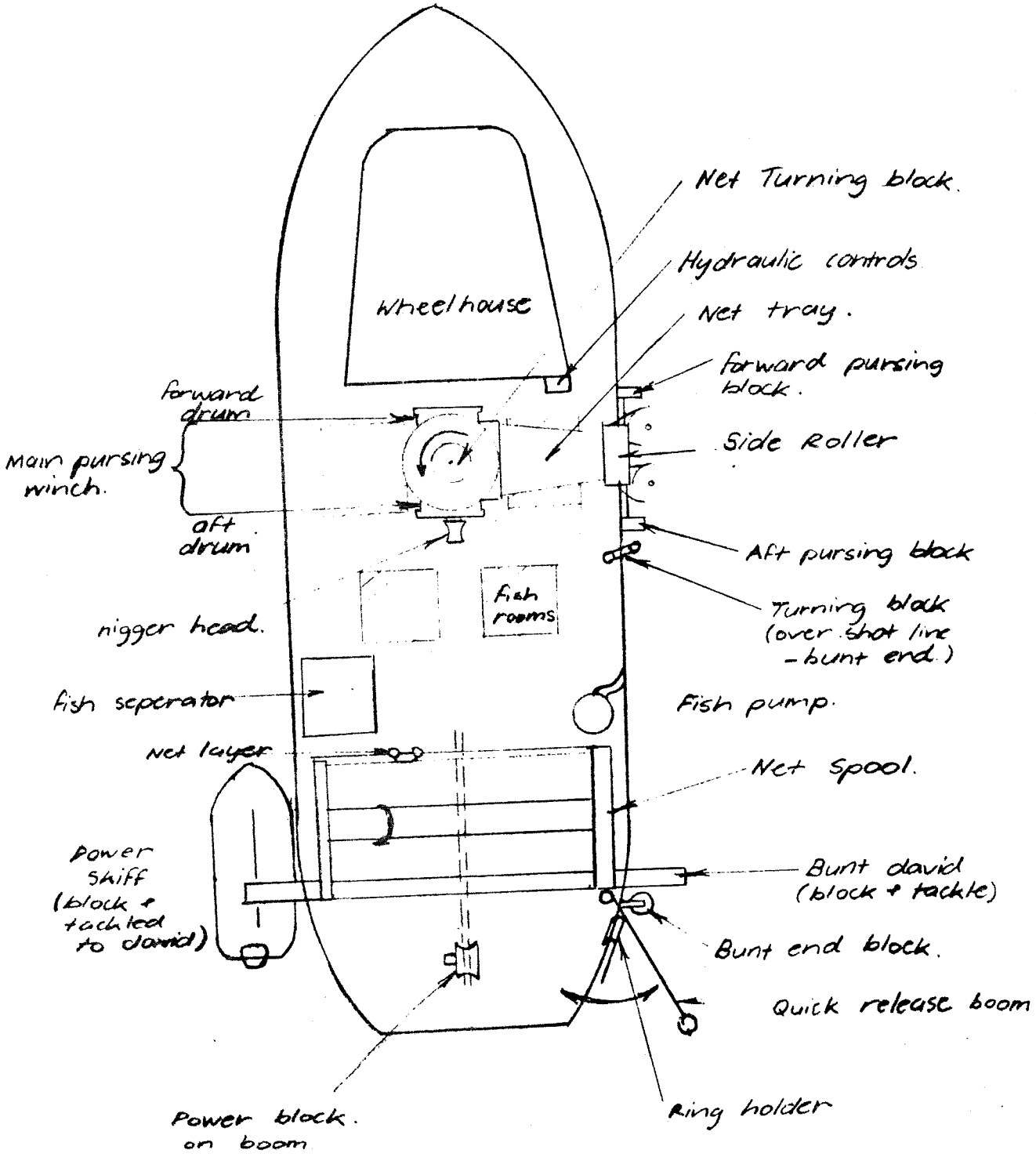
* The standard operation is to haul the net by a power block, restacking it immediately onto the stern of the vessel.

C. LAYOUT, DESIGN + SPECIFICATIONS and PERFORMANCE OF EQUIPMENT.

1. Layout of equipment on M/V. LAURUS.

Diagram: (A)



As the net is hauled from forward points aboard the vessel; positioning of the net spool, turning block and side roller are subject to the amount of deck space available. It was necessary to place the turning block above the pursing winch and the side roller above the pursing davit. The net spool was placed aft, allowing enough space to restack the net aft of the spool, but still allowing access to the starboard side (bunting side) and the fish rooms.

Considerable attention was paid to the turning angle of the net as it passed from the side roller to the spool. The right-angled turn proved to be successful and the most convenient in order to conserve deck space. The net layer altered the 90° turn by approx. $\pm$ 15° and had no observable effect on the hauling capacity of the spool. The net also sustained the changing turn without adverse effect.

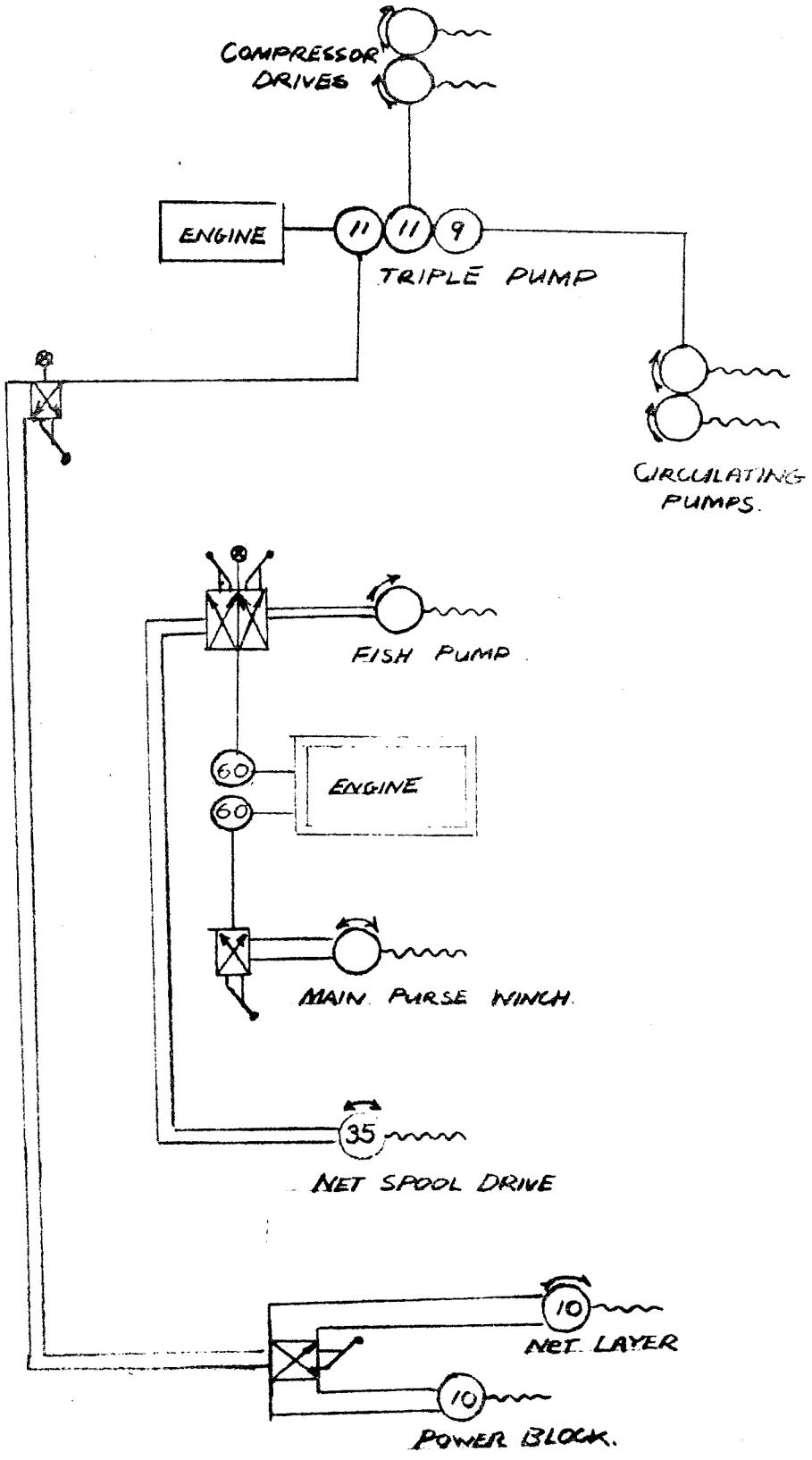
As mentioned above the pursing davit was positioned below the side roller but would have been better placed further aft (ref. Improvements in Layout Pg 15).

The ring holder was placed on the starboard side just aft of the spool. A short "over shoot" line from the bunt end of the net is hauled from the nigger head via a block below the ring holder and a smaller turning block on the starboard bullwark.

The power block was slung from the boom at about 4m. above the deck. The higher the power block, the more convenient it is to restack the net.

2. Diagram of Hydraulics system on M/V LAURUS.

Diagram: (A1.)



~~~ Return line to reservoirs via oil coolers.

⊗ Hydrostat relief valve set at 1,750 p.s.i.

Two way motor

One way motor
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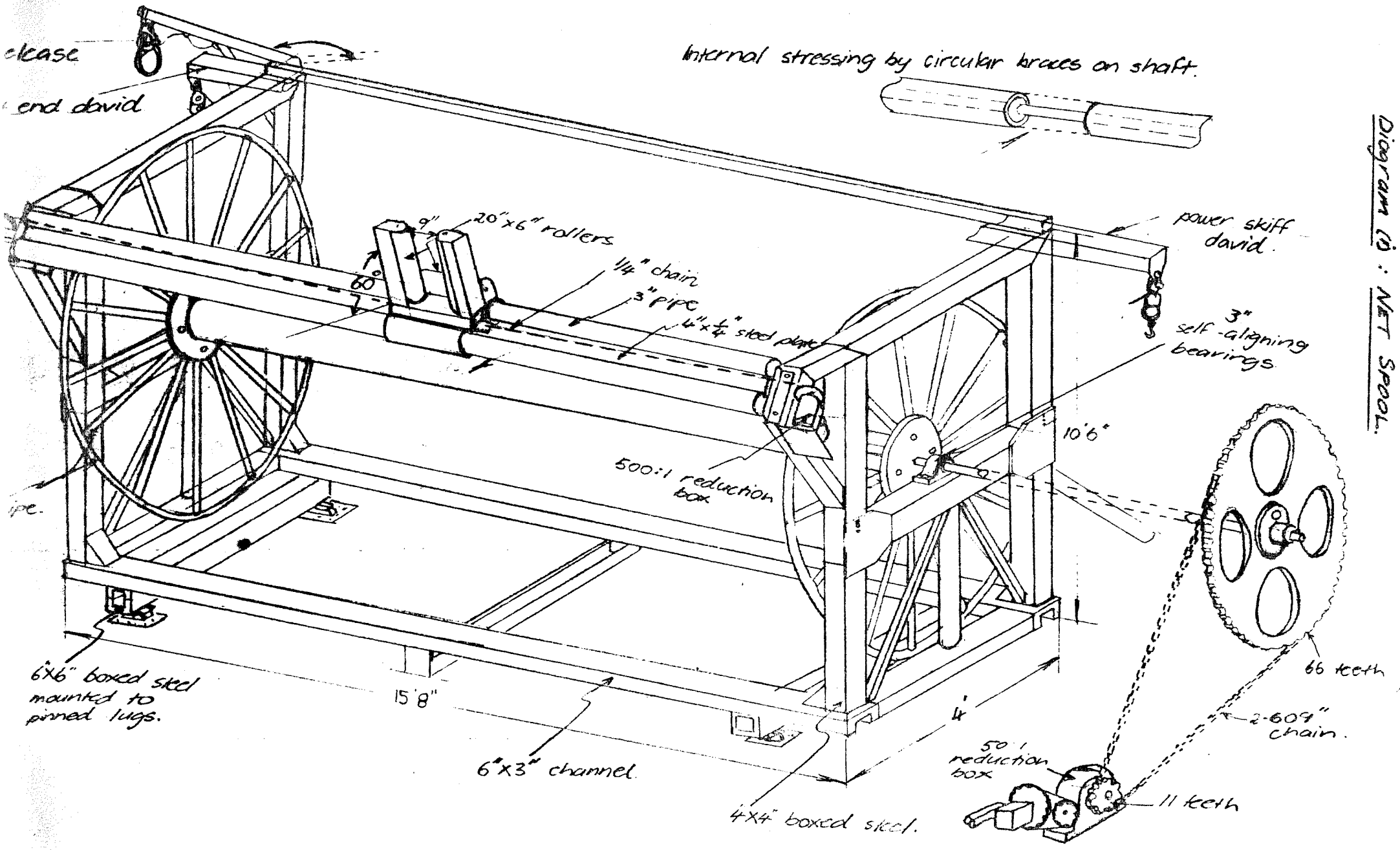


Diagram (i): Net Spool.

Net Spool Specifications:
(steel constructed)

1. Spool:
   Inside diam. : 12" (pipe)
   Outside diam. : 8'6"
   (to pipe circumference)
   Length : 14'6"
   Shaft : 3" mild steel internally stressed with two centre braces [see diag, (i)]

2. Framework:
   4" x 4" boxed steel constructed on 6" x 3" channel
   Top half of framework bolted to uprights allowing removal of spool if necessary.
   Framework braced by 3" pipe to aft bullwarks and by four 3/8" chain and turnbuckles to chain plates.

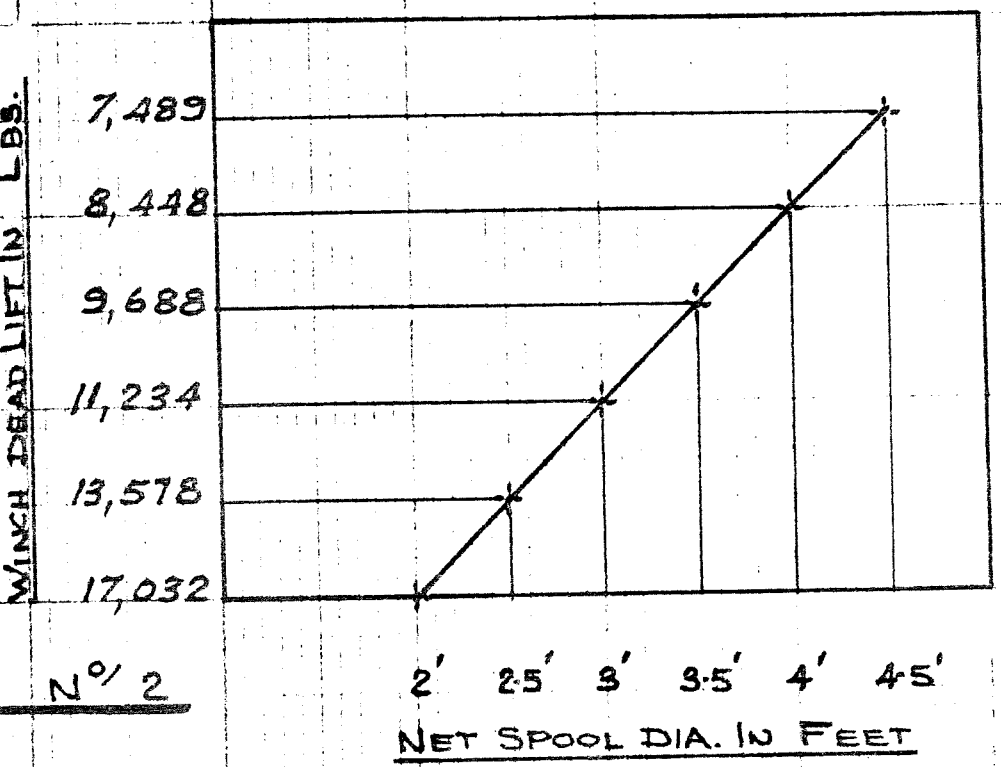
3. Net Layer:
   Set at 60° to horizontal which achieves max. haul at min stress to layer.
   Three ball racer rollers : 20" x 6" on 1" shaft.
   Layer mounted on 2' x 3" split pipe. 1/4" chain to 500:1 reduction box driven by a direct drive "Vickers" motor 10 gall/min.

4. Main Sprocket Drive: 6:1 reduction to a 50:1 reduction box.
   Powered by a "Vickers" hyd. motor (35 gall/min) at a 1:1 drive to reduction box.
   Chain size : 2.609"
   Breaking strain : 16,000 lb.

GEAR RATIO N° 1

WINCH 10 R.P.M.

EFFECTIVE H.P. 32



GEAR RATIO N° 2

WINCH 7.5 R.P.M.

EFFECTIVE H.P. 32

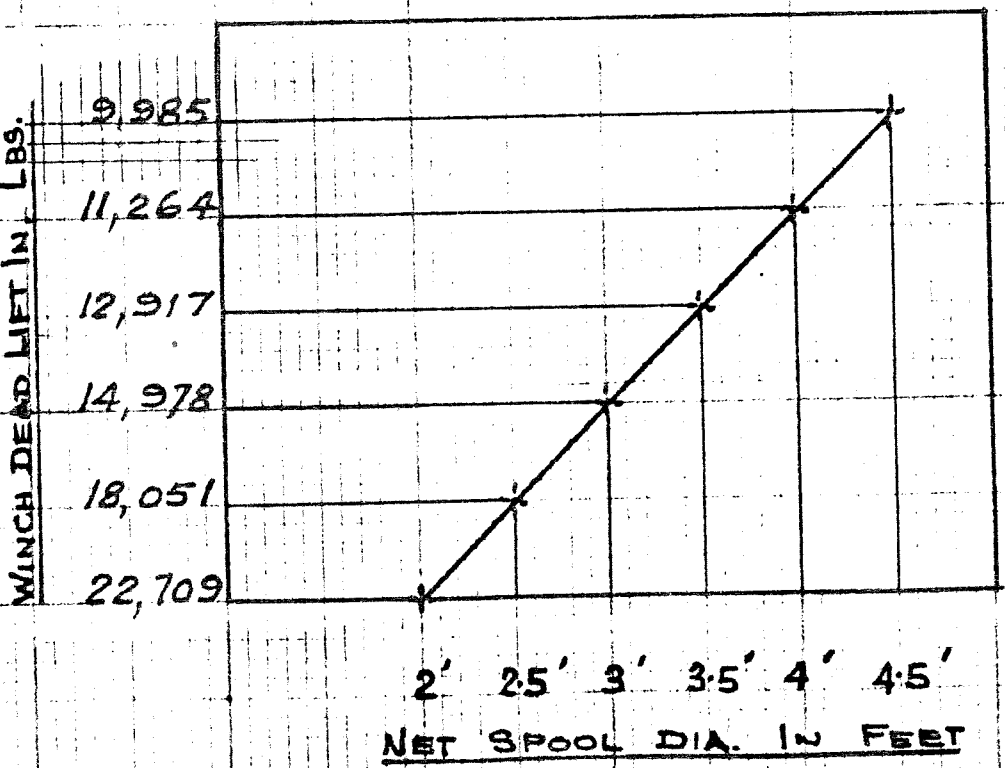
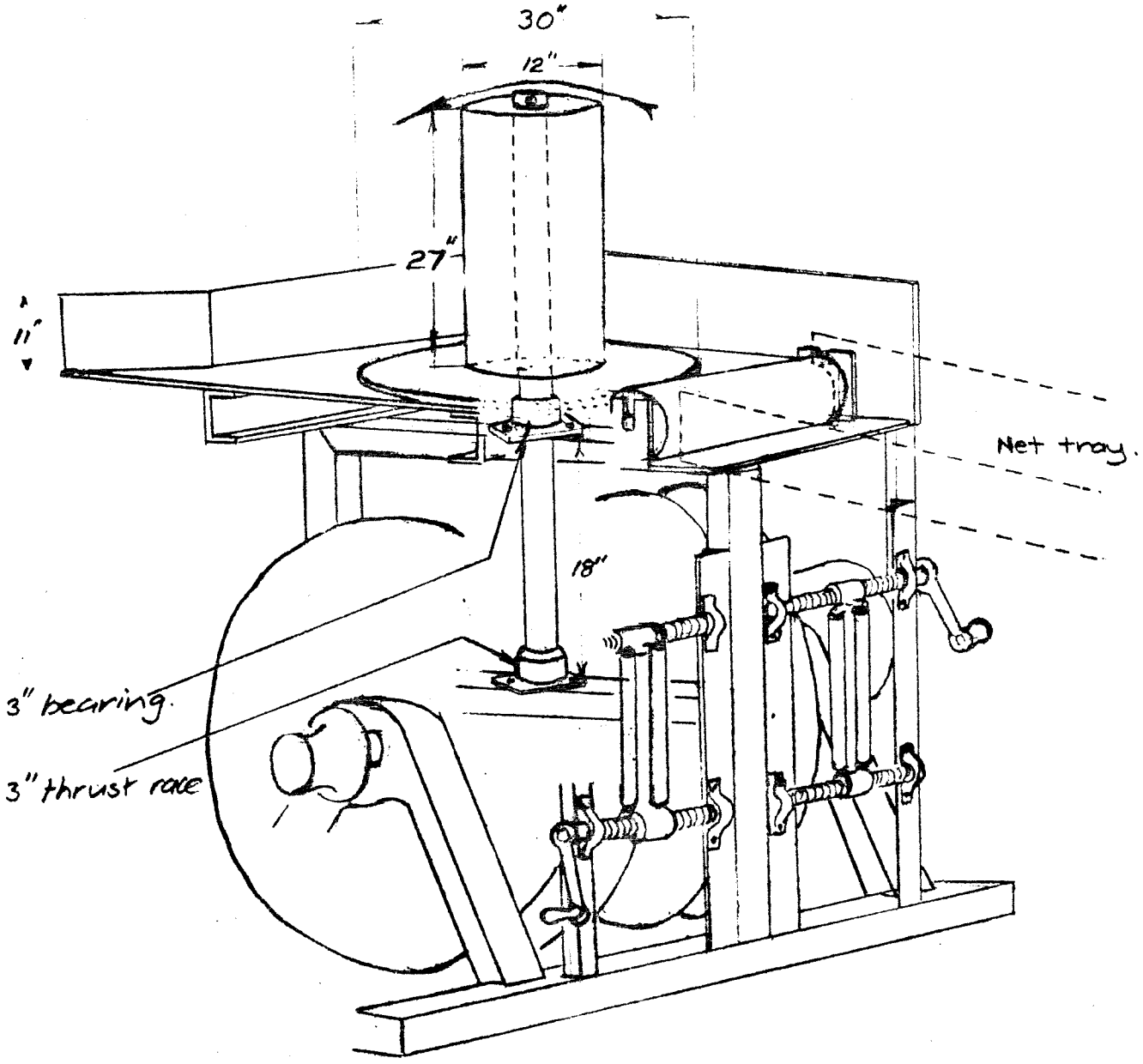


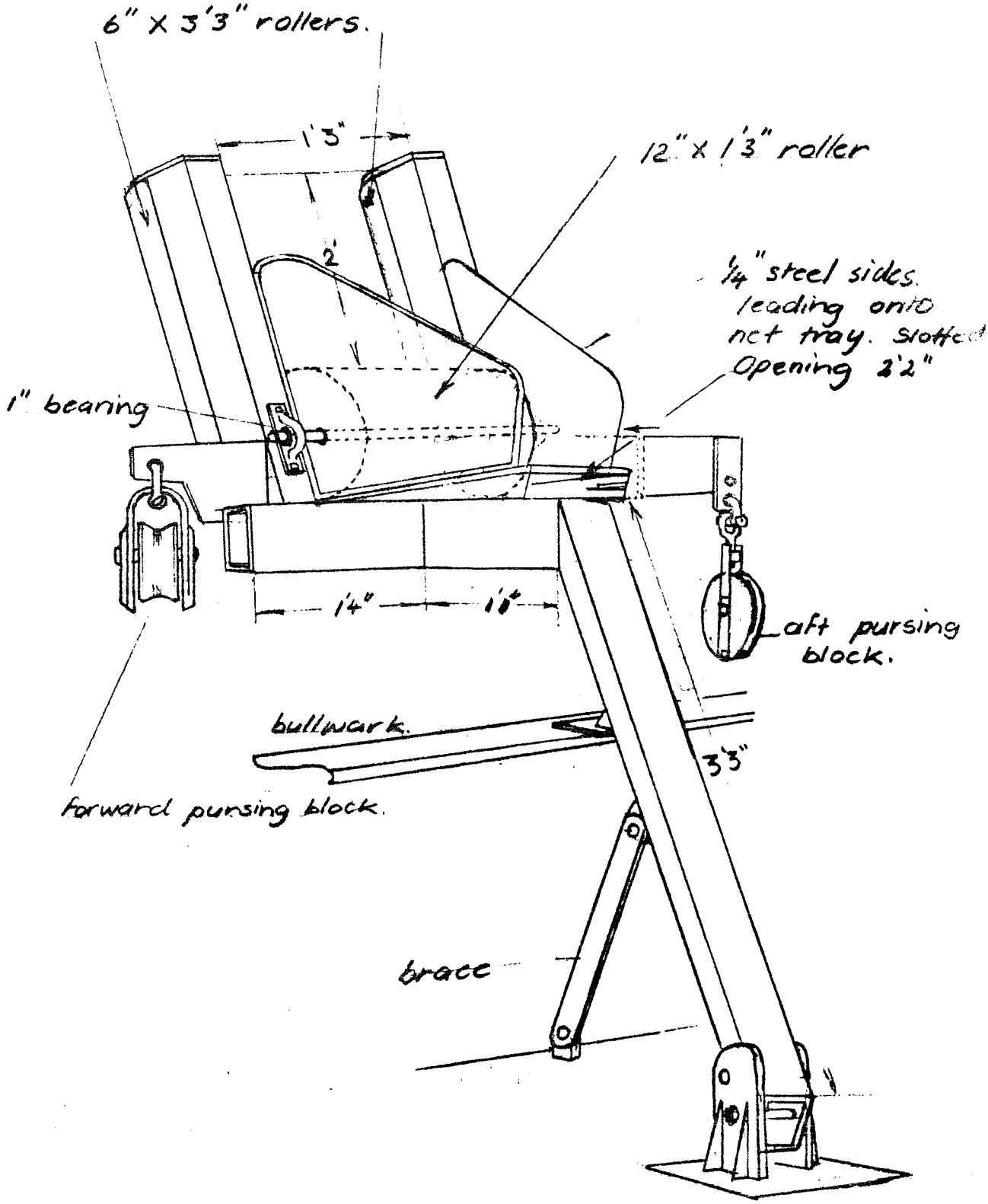
Diagram: (ii) : TURNING BLOCK (cut away view)

- Turning block mounted on 6"x3" channel onto main pursing winch
- 3"x3'6" shaft bedded on a 3" thrust race.
- 27"x6" roller on 1" shaft.
- 1/8" steel tray allowing -
  a 2 ft. opening on net spool side and
  a 20" opening on side roller side.
- Base of turning block 6 ft above deck.



- Net tray : 1/4" plywood 2'2" x 7'9" constructed on 1/4" flat steel.

Diagram (iii) : SIDE ROLLER



(D) FISHING OPERATION:

(i) Net Design:

The net used during the survey was a 225 x 32 fathom, 210/½", 9/12/18 ply anchovy-pilchard net. It was found that there was no need to change the rigging on the net as it is set up for conventional use; except for minor alterations at the wing end. The net had 37 clips and bridles and 2 clips from the wing-end were removed to allow separation between the net and the purse-line on the hook up (see diag. (B) pg. 13).

(ii) Setting the Net:

The purse net is set up on the stern of the vessel as in the conventional manner, except that the wing-end is set first and the bunt-end last, or in other words back to front or reverse to the standard practice. The wing-end is held by a quick release device which, when released, drops enough net into the water to enable the net to run freely from the vessel: i.e. a power skiff is not required to start the net flowing. At this stage, one man is required to release the net and check the flow of the net off the stern of the vessel; while the other is attending the winch.

Attached to the wing-end of the net is a retrieve line. This line passes out through the forward pursing-davit block and runs out freely as the net is being set. The retrieve line is stopped as the circle of the net is being completed and is winched onto the forward drum of the pursing winch - this line also acts as an overshoot line.

During the trials, a short line (10 fathoms) attached to the bunt end was used to enable the bunt end to clear the vessel by about 4 fathoms. The vessel could be slowed by going astern without fouling the net. The man on the quick release gear checks that part of the operation and then attends the hook up at the side roller. Hauling the net then commences.

(iii) Hauling the Net:

Prior to setting the net, a hooked line attached to the net spool passes over the net layer, around the turning block and over the side roller. As the retrieve/purse line is hauled the wing-end is attached to the hook and released from the retrieve line by a quick release link [ref. diag (B)]. The net can then be hauled independently from the purse-line. The skipper controls the rate of net haulage (at the hydraulic control point) and confers with the winch-man as to the rate of pursing. The other man who has made the hook up checks that the net clears the purse line and the bow of the vessel. He also unclips the rings as the net is being hauled.

As the net is being hauled the cork line may fall behind the lead line or vice-versa. However the unequal haul rate can be compensated for by clipping rings together or doubling the corks, depending upon which applies (this is dealt with further in the discussion).

Attention was also paid to the bunt end during hauling to make sure that it was clear of the stern. It was sometimes necessary to lift the webbing on the bunt-end (up to the last bridle) as hauling/pursing commenced, depending on the extent of over-shooting, sea conditions etc.

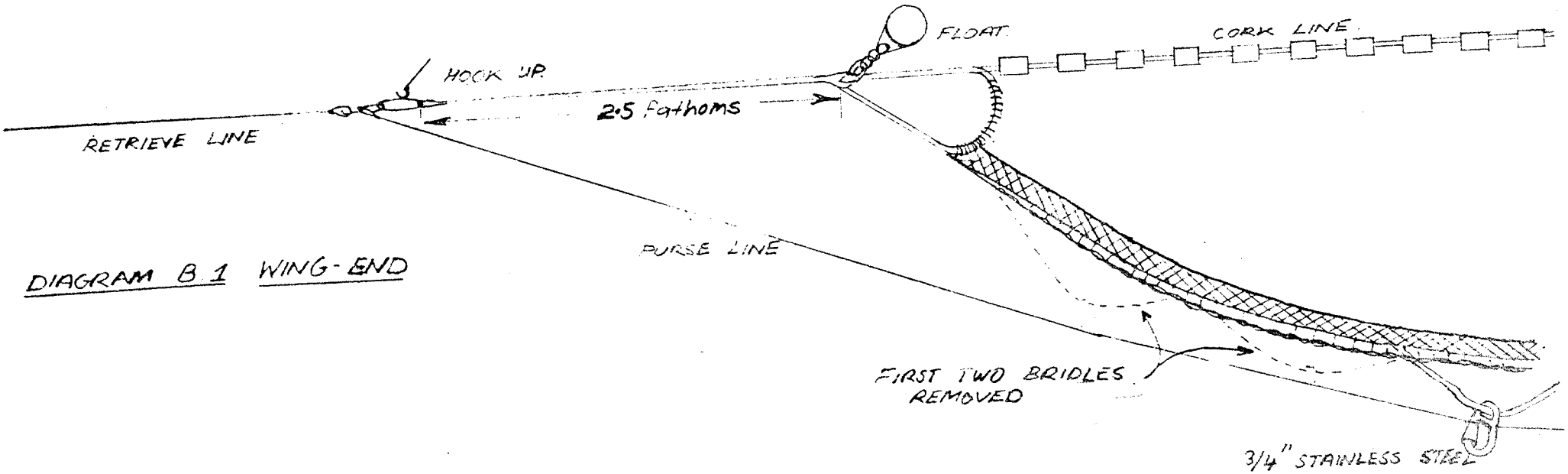
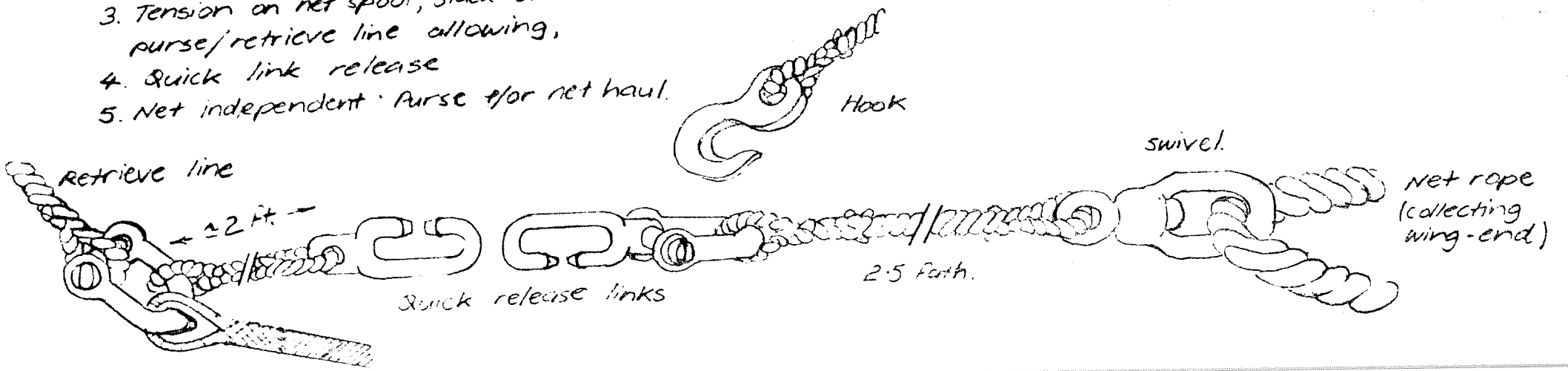


DIAGRAM B 1 WING-END

DIAGRAM B.2. HOOK UP ARRANGEMENT

1. Purse to block
2. Stop purse and hook up.
3. Tension on net spool, slack on purse/retrieve line allowing.
4. Quick link release
5. Net independent · Purse &/or net haul.



The bunt-end cork line was then lifted by a block and tackle fixed from a davit that extends from the net spool. Once the fish are bunted they can then be pumped or brailed aboard.

(iv) Re-stacking the Net:

After the completion of the shot, the net is re-stacked from the net spool onto the stern of the vessel. The bunt is passed up through the power block and two men can stack the net: one on the lead line and clips, the other laying corks and net. The skipper controls the rate of this operation which can take between 20-25 mins. The last part of the net to fall is the wing-end which can then be attached to the quick release gear.

The purse line is rewound from the forward spool to the aft spool, stopping at the retrieve line. The purse line is then passed through the aft davit block (pursing block), the ring holder, shackled to the retrieve line (from the forward pursing block and clear of the starboard side), and clipped by the quick release link to the wing-end of the net. The float is attached by a quick release link to the net and then the boom is swung over the side of the vessel.

The net is ready to be set again.

(E) DISCUSSION

(i) Improvements in Layout:

Owing to the existing layout aboard the "Laurus", it was not possible to place the side roller forward of the pursing davit without incurring major structural changes to the vessel. As mentioned before the side roller was placed above the pursing davit.

During the hauling operation the net ran over the pursing blocks. As such the net could not be hauled until pursing was near completion (or when the purse-line was running). To avoid this situation the side roller must be at least 2 metres forward of the pursing davit.

The location of the turning block over the winch proved to be inconvenient for the winch man to observe the turning block and pursing points. However the turning blocks functioned well without proving to be a major handicap to the hauling operation.

The problems associated with the layout of gear could be overcome if the vessel was designed to accept this new method of net hauling (e.g. a bow thruster would prove to be added advantage in slight to calm conditions).

(ii) Improvements in Net Design:

As already mentioned, the conventional purse net functioned well after minor adjustments to the net were made over the first three shots. However as the net was hauled it was found that the cork line rode to the top of the net on the spool, causing the corks to haul at a slightly faster rate then the lead line.

This could be reduced by rigging the net with an independent cork line; or if attention is paid to laying the net evenly on the spool (net layer), then the amount of slack in the lead line is further reduced. After several shots it was found that the slack was reduced and only a few feet of net had to be taken in towards the bunt-end.

(iii) Improvements in Gear:

The Laurus is currently engaged in hake trawling off Portland Vic. The net spool has been adapted to accept bridles, sweeps and a 120ft. head line trawl net. A pinned clutch on spocket drive and a disc brake is being fitted to the spool in order to reach optimum efficency in hauling.

The clutch will prove to be a benefit in re-stacking the purse net, where as previously hydraulic control of both the net spool and the power block was necessary. Time will be saved as the net will be able to free wheel to the power block.

(F) COST ANALYSIS

During the survey period the schooled pilchards in Port Phillip Bay became scarce. It was decided to continue the work for another two weeks at a later date when the fish become more abundant. This will allow the fishing potential of the new method to be fully explored and compared to the cost efficiency of standard methods of purse-seining.

The cost analysis of equipment and the overall operation is thus still pending. Supplementary reports on cost analysis, adaptability to trawling and catch results will be forwarded.