SEA FISH INDUSTRY AUTHORITY
Industrial Development Unit

FISHING GEAR HANDLING TRIALS OF A TWIN-RIG TRAWLING SYSTEM USING A TWO WARP ARRANGEMENT (M.F.V. 'LAURA EVE' NORTH SHIELDS)

Internal Report No. 1310 March 1987
MAFF Commission Ref: JAB 16(d) K. Arkley

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SUMMARY

There has been considerable increase in the number of European Fishermen adopting multi-rig trawling techniques over the past few years.

Danish and Norwegian Fishermen in particular have adopted twin-trawl systems, using a three warp arrangement to exploit Nephrops, Shrimp and White Fish fisheries.

The three warp system requires the vessel to be equipped with a three barrel winch arrangement. A specification not normally found on standard trawl winches.

Seafish decided to evaluate a twin-rig trawling system utilising a two warp arrangement that could be

adopted by most fishing vessels equipped for normal bottom trawling operations. A rig was designed and made-up and fitted aboard a 12m stern trawler fishing for Nephrops from the North East coast port of North Shields.

The trials described in this report present an evaluation of the twin trawl system with regard to the handling of the rig. The trawls used in these trials were two identical nets designed by Seafish. The nets are the same ones as were used in previous trials to evaluate a double-rig system using the three warp arrangement. (Internal Report No. 1297).

This report contains a description of the fishing operation using the twin-rig arrangement and highlights the advantages and problems associated with this system.

Included in this report is an assessment of the performance of a purpose built sledge introduced to replace the chain 'clump' weight normally used in these operations.

The work carried out in this project was supported by M.A.F.F. as part of their 1986/87 Commission of Fisheries Research Projects, Code JAB 16(d).

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1. INTRODUCTION

Multi-Rig trawling is by no means a new idea. This method of fishing, in various forms, has been used by fishermen from countries all around the world for many years. Many of the world's main fisheries are exploited using multi-rig trawling methods. For example, multi-rig trawl systems, using outriggers/derricks for towing multiple nets have been in operation in the Gulf of Mexico Shrimp fisheries for many years.

The traditional forms of multi-rig are based on specially designed vessels using towing derricks designed to tow the nets from each side of the vessel.

In recent years European fishermen have been looking at ways of adapting the multi-rig trawling techniques to their traditional fisheries and utilising

their traditional designs of bottom trawlers. Particular interest has been shown by Danish fishermen in adapting a twin-rig system to exploit both Nephrops and Shrimp fisheries in Northern waters. Since the initial interest in Nephrops and Shrimp fisheries, the method has also been adopted by other fishermen, (namely Norweigan and British), to exploit both flat fish and demersal round fish.

The interest shown by Danish fishermen in twin-rig trawling systems has been increasing, so much so that Danish fishermen and net manufacturers are predicting that all Danish bottom trawlers will be utilising these systems within the next ten years.

The idea behind the technique of multi-rig trawling is that a larger area of ground can be covered by allowing a wider spread of ground rope to be worked, without towing the increased area of netting associated with one much larger single trawl giving similar ground coverage. For example; a vessel which normally tows an 8 fathom ground rope trawl, can, for the same horsepower, tow two 6 fathom nets, giving an extra 4 fathom of ground rope coverage and hence increasing catching potential without increasing drag and fuel consumption.

With Prawn trawling, the main catching area of the gear is the bosom section of the footrope, therefore by towing two nets, and hence two bosoms, then catching potential is greatly increased.

It has been shown that twin-rig trawl systems can increase catch rates significantly without increased fuel consumption.

The double-rig trawl system has recently been adapted and developed in a number of forms by Danish, Norwegian and British fishermen, (see Internal Report 1240).

The two commonest variations of the double-rig technique adopted by European fisheremn involve the use of either 2 or 3 main warps, (see figures 1, 2 and 3).

The method involving the use of three main towing warps is the most expensive system to adopt in the initial instance as there is a requirement for a three-barrelled main winch. A number of Danish trawlers, having seen the advantages of multi-rig trawling, are now investing in conversions and installations of three-barrelled winches.

However, the double-rig method can be undertaken, utilising any bottom trawlers existing two warp trawling arrangement. This variation can be undertaken by almost any demersal trawler, without the need for extensive rigging or constructional modifications.

In October 1985, Seafish carried out some gear trials to evaluate a double-rig trawl system utilising the three warp arrangement. The trials served a dual purpose, the objective being to evaluate the effectiveness of a separator trawl in comparison with a

conventional trawl when towed side-by-side, in a twin-rig mode, (see Internal Report No. 1297).

Unfortunately, due to a combination of circumstances, insufficient time was available to gain an adequate assessment of the system.

It was decided that for further work involving multi-rig systems, the 2 warp method would be used. This method has the advantage that it does not require the specialised winch.

A rig was designed and made up, suitable for a vessel in the 12 - 15m class, rigged for bottom trawling operations from the stern. The intention being to evaluate the system on the North East coast Nephrops fishery.

2. OBJECTIVES

The main objective of this trial was to put together a twin-rig system utilising the two warp arrangement, that could be adopted by vessels currently undertaking normal bottom trawling operations, without involving any major alterations or modifications to the vessels existing gear handling system. Once the system had been rigged, the objectives were to;

- Establish the easiest handling techniques for such a system and to iron out any handling problems that arise.

- Establish the optimum rigging of the gear with regard to ease of handling. It was also envisaged that, by using SCANMAR hydro-acoustic remote measuring equipment, the optimum rigging of the gear with regard to catching efficiency could be indicated.

- Evaluate the performance of a purpose built central sledge weight as the central point of attachment of the gear. (Replacing chain weights as used in previous trials, IR 1297).

- If conditions allowed; to undertake some comparative fishing with vessels working standard bottom trawls in the single mode.

3. DETAILS OF THE CHARTER VESSEL

M.F.V. 'Laura Eve' - SN 54.

Shelter decked steel stern trawler fitted with a net drum sited at the stern of the vessel.

Owners	-	J. Kelly, J. Jardine, Engine and Gearbox Exchange, Dunston, Tyne and Wear.
Skipper	-	Dennis Cave.
Crew	-	Skipper and 2 deckhands.
Length	-	44'
Beam	-	17' 6"
Main Engine	-	Gardener, 172 H.P.
Winch	-	James Robertson, Fleetwood.
Wheelhouse Equipment	-	Koden Chromascope CVS 8808.
	-	Koden M D - 300 Radar.
	-	Decca MK 21 + Plotter.

4 FISHING GEAR AND OPERATION

4.1 Fishing Gear

The nets used for these trials were two modified, 380 x 70mm dual purpose prawn/white fish trawls designed by Seafish. The nets were rigged with rubber disc footropes (2½") and fitted with 70mm cod-ends for Nephrops. Full details of the nets are given in the net plans shown in figure (5).

The twin-rig arrangement designed for these trials was designed so as to be suitable for most vessels of this class, rigged for bottom trawling operations.

Full details of the rigging arrangements are shown in figures 4, 4a and 4b.

All the vessels existing fishing gear was removed apart from the trawl doors. The doors used were 6' standard 'V' doors.

Two 15 fathom warp extention wires (compatable with the vessels existing main warps, 14mm) were connected into the end of each warp by-way of swivels. These four extention wires formed the outer connections from the main warp to the trawl doors, and the inner towing connections to the central sledge. The warp extentions were connected to 5 fathom single sweeps of 2½" combination by independant chains (3/8" mild steel, short link), fitted with swivels and double recessed links at the fore end, and swivels and single recessed links at the aft end.

The swivels and double recessed links served as the towing point connection for the doors on the two outside extensions, and for the front chains of the sledge, on the inner extentions. The recessed links in the aft end of the independant chains formed the connection for the door backstraps and rear chains from the sledge by way of 'G' links.

All wires were of equal length, independant chains were all equal, and it had to be ensured that the distance from the towing point on the doors to the end of the door backstraps was the same as the distance from the front chains of the sledge to the rear chains of the sledge. This enabled the gear to be towed all level.

The single sweeps were then connected to the split 5 fathom bridles by 'G' hook and recessed link arrangements. The recessed links being at the split bridle end. The split bridles consisted of 1½" combination top legs and 2½" combination lower legs fitted with swivels for attachment at the net end.

The 'G' hook/flat, recessed link connection between single sweeps and split bridles formed the splitting point of the gear during hauling and shooting. It was at this point that the gear was connected to the inhaulers on the net drum. From this point on, the gear was taken onto the net drum.

All backstraps for the trawl doors and central sledge were constructed of 3/8" mild steel, short link chain.

The central sledge, which replaced the chain weight normally used in this situation was constructed of mild steel plate. The base plate dimensions were 36" x 18" x 1". The sledge was designed with a vertical keel plate to aid stability. The base plate was drilled to take four additional ballast weights, providing the facility of addition or removal of weight, as required. The overall weight of the sledge was approximately 125kg. Each ballast weight, weighed 9 kgs. The heads of securing bolts were protected from seabed abrasion by the addition of 'scrubbing pads'.

The leading edge of the sledge was radiused to enable the sledge to traverse the seabed without excessive 'digging-in'.

Full details of the sledge construction are given in figure (b) and in the photographs appended to this report.

4.2 The Twin-Rig Operation

The following is a description of the shooting and hauling procedures carried out for the double-rig operation.

When the nets and gear were initially put aboard the trials vessel, the nets were stowed on the deck, one either side of the net drum at the transom. The nets were connected to the net drum by way of inhaulers connected into the 5 fathom split bridles.

The split bridles were fitted with swivels plus two recessed flat links. The single sweeps were connected to the splits by way of 'G' links into the recessed flat links. The reason for having two recessed flat links was to make the job of disconnecting the single sweeps, and connecting up to the net drum, easier during the hauling process, (see figure [4b]).

The central sledge weight was secured out-board over the transom rail on a chain and slip-hook arrangement. The arrangement allowed easier handling of the sledge during hauling and shooting.

4.2.1 The Shooting Operation

For the initial shot, the nets were shot straight from their stowed position on the deck. The nets were put over the stern and streamed off until they came tight to the net drum inhaulers.

The net drum onboard the 'Laura Eve' was powered by a wire run from the main winch. For this operation, the starboard side single sweeps were connected into the net drum wire for this purpose.

At this stage of the shooting operation the nets are shot upto the point of the split 5 fathom bridles which are connected to the net drum. The net drum being reversed under the control of the drum wire connected to the main winch by the starboard side single sweeps, (see figure [4c]).

At this point in the procedure, the portside single sweeps are passed through the leads from the winch, through the gallows block, to be connected up to the split bridles at the 2nd recessed link, (as described in figure [4c]). In order to connect up the starboard side single sweeps, the starboard side wing ends are stoppered off at the ships rail. This allows the starboard side single sweeps to be disconnected from the net drum, and passed via the deck leads and gallows block, and connected up to the wing-ends. Again, 'G' links and recessed flat links are used for the connections. Once the stoppers have been released, the nets are ready for shooting away.

The single sweeps are run off the winch until the independant chains reach the gallows blocks. It is essential throughout this operation, to ensure that the single sweeps, independant chains and split warp bridles are clearly marked. It must be ensured that the wires from the outside wing of the net are connected up to the independant chain going to the trawl door, and that the inside wires are connected to the chain going to the central sledge. For this reason it was found advantageous to mark 'G' links and corresponding recessed links with coloured twine. As an extra precaution, the wires were spread apart by hand, (whenever possible), during shooting.

As the independant chains go through the gallows blocks, the outside ones are connected up, firstly to the door backstrap chain, and then to the door itself. The inner independant chain being connected up firstly to the longer backstrap from the rear of the sledge and finally

to the short chain from the front of the sledge. By connecting up the door side first, it allows the inside independant chain to be pulled across the transom of the vessel to make clipping up of the front sledge chains that much easier.

The chains from the back of the sledge must be long enough to reach from the sledge's stowed position on the sliphook, to the gallows block. This enables the chain to be clipped up as the independant chain clears the gallows block. As a consequence, it is this chain length that governs the length of the independant chains. These independant chains are made up to correspond with the total length of the front and back chains on the sledge, plus the length of the sledge (see diagram [1]).

Once all the chains are clipped up, the weight of the gear is being held on the doors (on the door chains), and on the central sledge hanging on its securing chain. The central sledge is then slipped from its chain and the door chains removed in preparation for shooting.

The gear is then shot away up to a point approximately half way down the warp bridles. At this point a rope with one end attached to the front end of the sledge, has it's other end made secure on one of the inside warp bridles. This rope is used during hauling to bring the sledge up to it's securing point on the stern. Shooting then continues until the connection of the warp bridles and main warp are reached. At this point the gear is checked, and any turns that may be in the wires are removed at the joining swivels. The warp is then shot

away to the required warp: depth ratio (in this case approximately 3:1).

The gear was towed from towing strops secured at the centre of the towing gantry.

4.2.2 **THE HAULING OPERATION**

Once the towing strops are removed from the warps, hauling commences. The gear is hauled back to the point of the warp bridles. Hauling ceases at this point to remove any turns that may have appeared during hauling. Hauling then continues until the rope attached to the inside warp bridle can be reached. This rope, connected to the sledge, is then taken to the whipping barrel on the main winch. Hauling again continues until the sledge comes out of the water. At this point, because of the angle of the wires across the stern of the vessel, the sledge can not be hauled any further by the main winch. The sledge is now hauled the rest of the way to its securing position, by the rope to the whipping drum. When the sledge has been made secure on the sliphook arrangement, the front chains are disconnected from the independant chains. The warps are then hauled up further until the doors can be secured on the door chains. The doors are unclipped, hauling continues until the weight comes off the door backstraps and also off the chains at the back of the sledge. Both doors and sledge can then be disconnected completely. The gear is then hauled up to the point of the connection of the single sweeps and split bridles.

At this point, the portside net is connected up to the net drum at the double recessed link arrangement. The starboard side net is stoppered off at the rail in order that the single sweeps can be disconnected and re-connected to the net drum wire. Once the starboard side net has been connected up to the drum, the net is taken onto the drum, powered from the wire connected to the single sweeps on the starboard main winch barrel. This procedure is just a reversal of the shooting procedure.

Both nets are taken onto the drum as far as the sleeves. The bag ropes are then lead to the port side whipping drum and the cod ends brought aboard into the port side pound one at a time using a normal gilson arrangement.

5 TRIALS PROGRAMME & NARRATIVE

These trials were primarily a handling exercise in order to establish if this type of trawling equipment could be handled without too many problems on this class of vessel. A brief outline of the trials programme, as was intended, is given below:

Day 1 Intention to steam to fishing grounds and select clear area of ground in order to shoot gear to iron-out any handling problems that may arise during initial hauling and shooting.

Carry out short tows and establish if gear is fishing correctly.

Return to port and make any alterations or adjustments to gear, as required.

Day 2 Fit SCANMAR monitoring equipment to establish; headline heights, door spreads, wing end spreads, towing speeds and also warp tensions.

Carry out various tows with monitoring equipment fitted.

Day 3 Undertake normal fishing operations on clear ground to assess performance of the twin-rig system. Short tows to familiarise crew with the handling of the gear. Aim to establish easiest handling procedures.

Day 4&5 Undertake normal fishing operations and comparative fishing if conditions allow.

Removal of gear and equipment.

Details of the day to day trials operattions are given in the log sheets

at the end of this report and are discussed in the observations section.
The initial charter period as described was for 5 days, due to commence on 2/3/87. The vessels own fishing gear was removed, and the twin-rig system fitted onboard the 'Laura Eve' on the morning of the 2/3/87. However, due to adverse weather conditions, the actual trials programme did not commence until Thursday 5/3/87.

During the first day's trial on 5/3/87 it was apparent that insufficient spread was being attained with the gear. The gear was hauled in order to make the necessary alterations. It was du ring this first haul that a hydraulic breakdown on the main winch necessitated the vessels return to North Shields for repairs.

The onset of bad weather during the course of the following day caused a further postponment of the trials to 22/3/87.

6 OBSERVATIONS AND DISCUSSION

The limited door spread achieved on the first trial on the 5/3/87 indicated that alterations should be made to the rig. It was thought that one of the reasons for the less than expected spread at the doors, was that the short split bridles and single sweeps were restricting the opening of the doors.

The single sweep length was increased from 5 fathoms to 20 fathoms by the addition of 15 fathom lengths. The towing points on the trawl doors were also adjusted to increase the angle of attack, to increase the door spread.

7 FLUME TANK TRIALS

The less than expected door spread (and net spread) achieved during the gear trials, indicated that modifications to the existing rigging arrangement should be investigated.

In order to aid the solving of these problems a scale model of the double-rig system was subsequently examined in the Flume tank at the IDU in Hull.

Three main parameters were examined in relation to the problems experienced:

1. The length of the warp bridles. The possibility that the 15 fathom warp bridles were not of sufficient length to allow the doors to spread.

2. The possibility that the central sledge was too heavy resulting in excessive weight being applied to the warp bridle and thus restricting door spread.

3. The effect of varying the sweep lengths in relation to door spread and wing-end spread.

Various rigging arrangements were tried. The results obtained indicated that the main cause of the underspreading of the gear was due to the length of the warp bridles.

The warp bridles were extended to 30 fathoms in order to achieve the door spread expected with this gear. The

sweep lengths were maintained at 20 fathoms of singles plus 5 fathoms of split bridles. The weight of the central sledge was reduced, only to produce adverse effects. At half the original weight, the sledge was "flying" off the sea bed resulting in the sweeps and wing-ends having very light sea bed contact. An increased wing-end spread (but with a reduced door spread) was achieved by shortening the single sweeps up to 5 fathoms. However, as expected, this produced a very light ground contact with both sweeps and wing ends of the net. This could quite easily be counteracted by the addition of weights at the wing ends and at the joining point of the single sweeps and split bridles, or by using chain sweeps or sweeps covered with rubber discs.

These results indicate that this rig could be varied dependant on the species being fished. If Nephrops for example are the target species, then by using shorter, but heavier sweeps a slightly greater net spread can be achieved but at the expense of 'herding' effect, lost by reduced door spread and sweeps length. If white fish are the main quarry then it would probably be more advantagious to increase the swept area of ground by maintaining the greater door spread and sweep length.

The Flume Tank experiments seemed to indicate that the sledge weight of 125kg was adequate for the gear under examination.

It is envisaged that, with any future work involving this system, then 30 fathom warp bridles would be used with the 125kg sledge and various combinations of sweep length and types for further assessment.

8 CONCLUSIONS

The multi-rig trawl concept has been proved to be effective in a variety of fisheries worldwide.

Considering the application examined and the work done by Seafish utilising the two-warp system, insufficient information has, as yet, been gained in order to give this particular system a fair evaluation.

From the handling point of view, the initial trials have shown that the two wire system can be adopted by vessels without major vessel or gear modifications. The twin trawl system posed no major handling problems. There was however a slight increase in the time taken for the hauling and shooting operation as compared with a single net operation. This factor could be reduced as crews gain experience and become more familiar with the gear.

9 FURTHER WORK

Further work is necessary by Seafish to fully evaluate the two-wire, double rig system.

Underwater observation, and further instrumentation trials are to be carried out during summer 1987. It is hoped that some valuable information can be gained from these operations with regard to optimising the rigging and catching efficiency of this system following the Flume Tank experiments.

It is hoped that the information gathered from the observation and instrumention trials can be used to optimise the efficiency of the twin rig system which can later be further evaluated in a commercial fishing exercise. It is envisaged that the commercial fishing trials would take place in the North East coast Nephrops fishery in the Autumn 1987.

FISHING LOGS

MFV 'LAURA EVE'

TWIN-RIG TRAWLING TRIALS

(MARCH 1987)

TWIN-RIG TRIALS

FISHING LOG M.F.V. LAURA EVE (SN. 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME HRS.	DECCA POSITION SHOOTING Gr.	SHOOTING P.	HAULING Gr.	HAULING P.	TOW SPEED REVS.	DEPTH M	WARP FATHMS.	WEATHER	NOTES.	CATCH	COMMENTS
22/3.	1	0945		2	H 44·1	G 79·1			1200 ↓	59.	125	S.W 3-4	INCREASING REVS. JUST PRIOR TO HAULING.	1 BOX C/LINGS ½ BOX PRAWNS	POOR FISHING HAULING/ SHOOTING TIME VARYING FROM 40 MNS. TO 60 MNS. TIME MUST BE TAKEN TO ENSURE ALL BACKSTRAPS ETC. ARE CONNECTED UP TO THE CORRECT LEGS TO AVOID SHOOTING FOUL GEAR.
			1145				H 37·6	G 57·2	1250	67.		SW 3-4			
		1245			H 35·7	H 60·3			1200 ↓	65.	125.	S.W 3.	ALL GEAR HANDLING WELL.	½ BOX PRAWNS 1 BOX MIXED FLATS AND C/LINGS.	
			1340	2.			H 40·0	G 54·4	1250	58.		SW 2-3.			

TWIN RIG TRIALS.

FISHING LOG M.F.V. 'LAURA EVE' (SN 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	38 CHNA DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED REV.	DEPTH	WARP FTHM.	WEATHER	NOTES	CATCH	COMMENTS
5/3/87	1.	10 00	1100	1 HR.	45·4	79·8	47·5	79·2	1210	62 m. 81 m.	125	S TO SE 2-3 TOWING AGAINST TIDE.	INSUFFICIENT SPREAD HAULING TO MAKE ADJUSTMENTS TO GEAR – MAY REQUIRE LONGER SWEEP LENGTH TO ALLOW GEAR TO SPREAD. NO BALLAST WEIGHTS ON SLEDGE. SLEDGE HANDLED REASONABLY WELL FOR FIRST SHOT. NORMAL TOWING REVS FOR PRAWN TRAWL (24 FTHM.) ARE 1150 TO 1200.		SPREAD – 8" AT THE 1 FATHOM MARK. GEAR VERY MUCH UNDER-SPREAD. HYDRAULIC BREAKDOWN ON WINCH (PUMP) OCCURRED DURING HAULING. RETURNED N. SHIELDS.

FRIDAY – 6/8/87
TRIALS POSTPONED DUE TO ADVERSE WEATHER
S.SE. 6–7 INCREASING

TWIN-RIG TRIALS. FISHING LOG M.F.V. LAURA EVE (SN. 54).

SCANMAR TRIAL.

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME HRS.	DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED (KTS.)	DEPTH M.	WARP FTHMS.	WEATHER TIDE.	WARP OUT F.	DOOR F.	H/LINE F.	WARP P. TONS.	TENSION STBD.	CATCH	COMMENTS
23/3/	1	1045		3.	H45.1	G.77.8			(1150) 2.4 k.	59	125	CALM V. LIGHT WINDS.	5.9 6.1	16.3	0.8	0.8	0.6		5FTHM. SALTS 20 FTHM. SINGLE SWEEPS 15 FTHM. WARP BRIDLES.
			1345				H45.3	G.76.1	(1200) 2.6 K. 2.56k.			SLACK WATER.	7.0 7.8	18.6 19.6	0.8 0.8	0.7 0.73	0.7 0.7		TENSIONS EVENED OUT AT 1200 REVS. DOORS ON MAX. SPREAD ASTION.
									(1260) 2.75k. (1250) 2.75k.				8.4 7.3	20.1 19.1	0.8 0.8	0.8 0.8	0.76 0.74		LOST DOOR SIGNAL AT
									(1200) 2.6 k. (1250) 2.74k	62 m			6.9 6.6 7.1	18.1 17.9 18.6	0.8 0.8 0.8	0.73 0.75 0.8	0.71 0.73. 0.78.		1300 REVS. DIRECTIONAL PROBLEMS.
									(1250) 3.17 K. 3.5 K. (1250) 2.7k.	54m.		EBB TIDE.	8.3 8.0 5.3	17.9 18.3 15.6	0.8 0.8 0.8	0.65 0.62 0.75	0.80 0.80 0.76		TURNING TO PORT - MONITORING GEAR DURING TURN. READINGS AT STAGES THROUGH- OUT TURN. TOWING ACROSS T.I.X.
																		1 BOX FLUKE 2 BOX PRAWNS	GEAR STILL UNDERSPREAD

TWIN-RIG TRIALS FISHING LOG M.F.V. 'LAURA EVE' (SN 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	38. DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED R.P.M.	DEPTH M	WARP FTHMS	WEATHER	NOTES.	CATCH	COMMENTS
23/3	1	1045			H45·1	G.77·8			1250	59		NO WIND FLAT	DOORS ON POSITION OF MAX. SPREAD.	1 BOX OF C/LINGS.	TURNS APPARENT IN STBD. SIDE WARP BRIDLES DURING HAULING
				3.							125	CALM.			ALL SWIVELS CHECKED — RETSON UNKNOWN
			1345				H45·3	G.76·1		54.			MORE BULK IN PORT-SIDE NET.	½ BOX OF PRAWNS.	ALL TURNS REMOVED.
													SLEDGE POLISHED WELL, EVENLY OVER ALL BASE PLATE.	FISHING V. POOR.	RETURNED N/SHIELD TO REMOVE SCANMAR GEAR/EQUIPMENT.
													GEAR STILL NOT SPREAD TO REQUIRED DEGREE.	REPORTS FROM OTHER VESSELS ALSO POOR.	

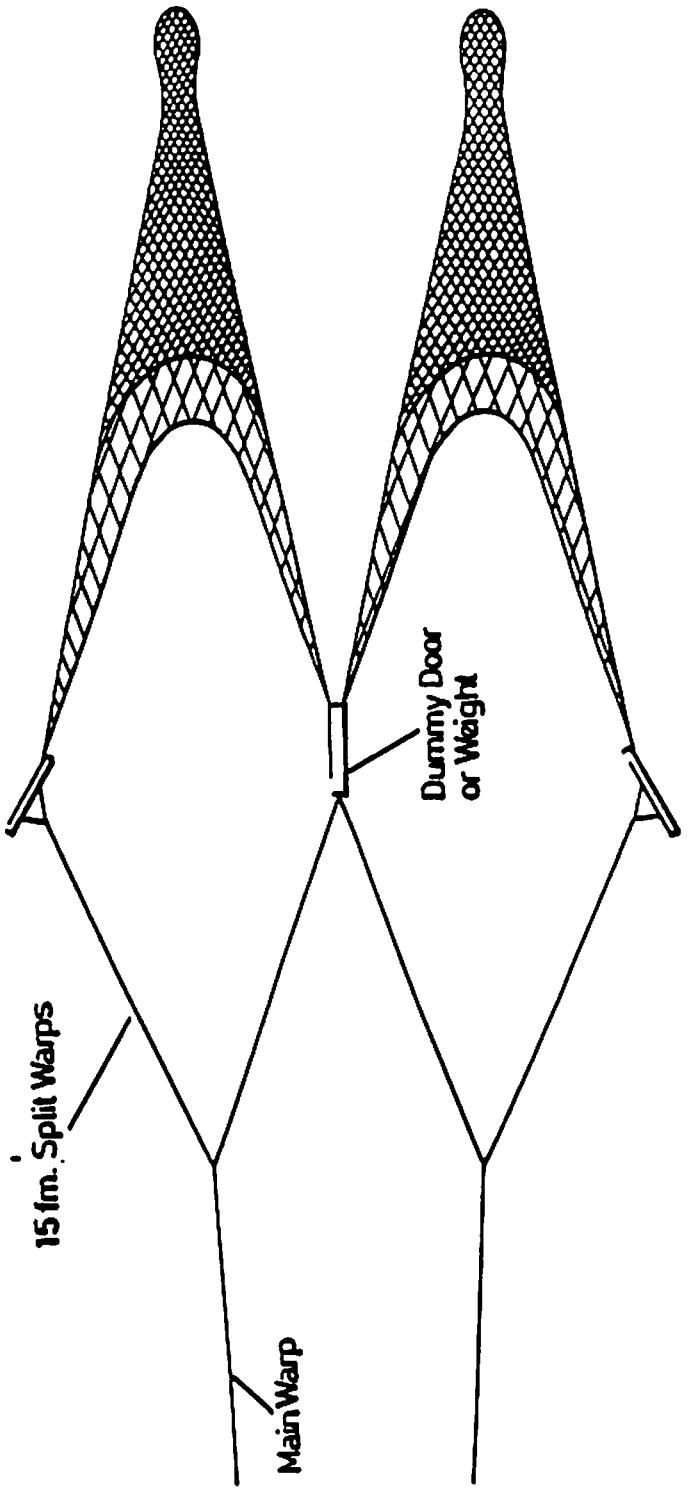
TWIN-RIG TRIALS. FISHING LOG M.F.V. LAURA LEE (SN. 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME HRS.	DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED R.P.M.	DEPTH M.	WARP FTHM.	WEATHER	NOTES.	CATCH	COMMENTS
24/3/	1.	0945	1200	3¼	H47·0	G. 74·6	I 38·2	G. 61·8	1100	58M. 47M.	100	NE. 3. NE. 2-3.	REDUCED SPREAD.? NETS SHOWING INDICATIONS OF TAKING BOTTOM WELL BOTH NETS REQUIRE ATTENTION TO F/LINES F/LINES REQUIRE RE-SETTING ON RUBBERS TO REDUCE LARGE BIGHTS - LOOSING PRAWNS. TOWING FROM TOWING STROPS.	VERY FEW PRAWNS ½ BOX OF COOLINGS + FEW FLATS. BOTTOM DEBRIS INDICATING NETS TAKING BOTTOM WELL ENOUGH. BIGHTS IN F/LINE. NET REQUIRES RE-SETTING ON GROUND GEAR. 2ND. HAUL STBD. SIDE BLANK - NET HAS BEEN FOUL - REASON UNKNOWN. PORT SIDE NET 1 BOX COOLINGS + MIXED FLATS ½ BOX PRAWNS	SAILED 0700 N.E. 3 FRESHENING FLOOD T.DE. SPREAD 10"-12" AT 1 FATHOM FROM 100 F'THM. OF WARP. POSSIBILITY THAT SLEDGE MAY BE TOO HEAVY. REPORTS MIXED, VESSELS WORKING OFF HEATLEADOL FISHING GENERALLY POOR - VERY FEW PRAWNS. RANGING FROM 2-3 BOXES TO 8-10 BOXES FOR 4 HRS. RETURNED N/ SINGLES AFTER 2ND. TOW.
	2.	1250	1615	3½	I 38·1	G. 62·0	H 46·2 G. 72·9		1100 1150	46 M. 53m. 49 m.	100	NE 2-3 VEERING S.E. S.E. 2-3.			

TWIN RIG TRIALS.

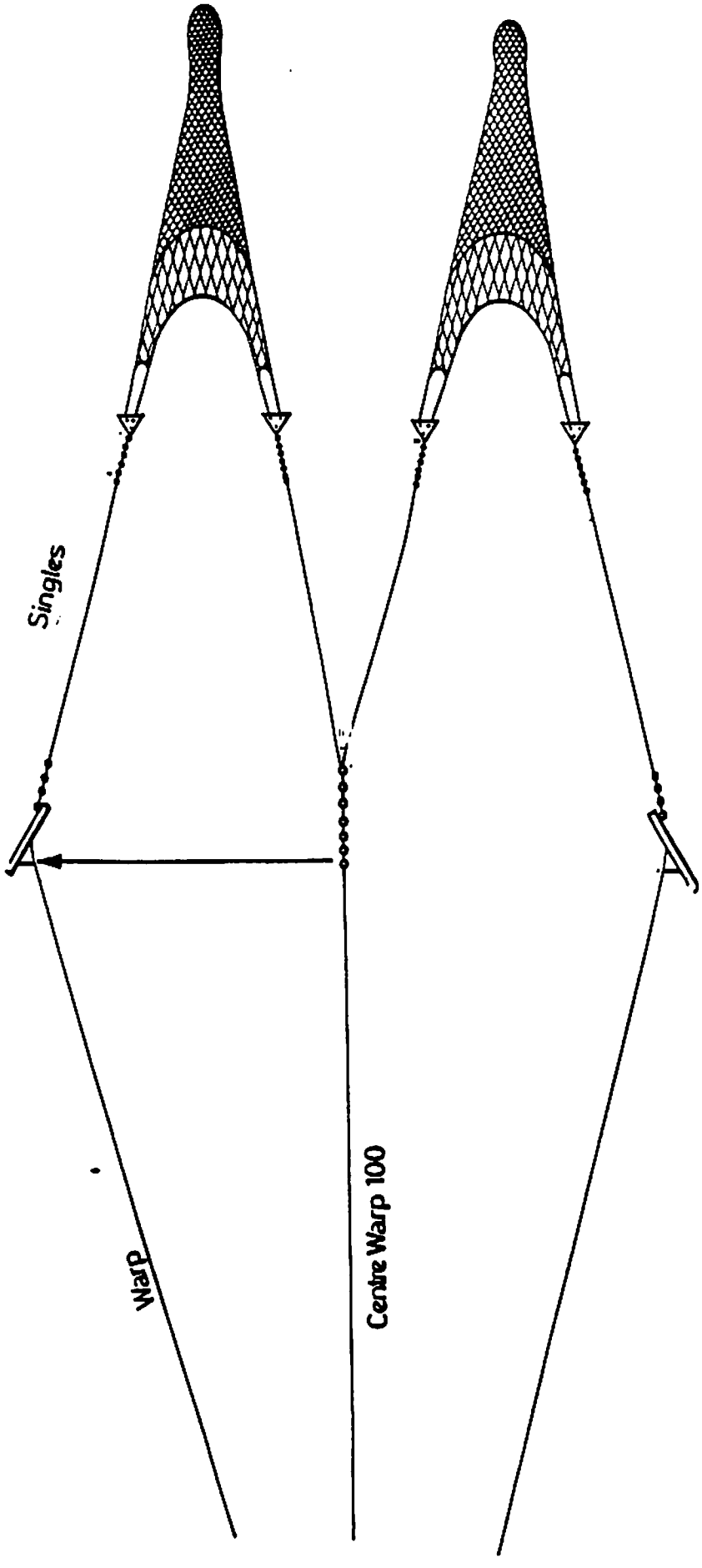
FISHING LOG M.F.V LAURA LVC. (LN 514)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	DECCA POSITION SHOOTING G.	SHOOTING P	HAULING G.	HAULING P.	TOW SPEED REV.	DEPTH M.	WARP FTHMS	WEATHER	NOTES.	CATCH	COMMENTS
25/3/	1.	0915			H 44·4	G 77·7			1100	56	125	S'LY 2-3. MODERATE SWELL. HEAVY RAIN REDUCED VISIBILITY. WIND VEERING N.WLY. FRESHENED 3-4 N.W. THEN 4-5 SEA STATE 3-4 MODERATE SWELL. FREIGHTING STEADILY	PORTSIDE NET FOUL - LARGE OIL DRUM AND OTHER DEBRIS FOULING F/ROPE NET BLANK. GEAR HANDLING WELL - HAULING/ SHOOTING TIME 45 MINS. SLEDGE HANDLING WELL USING ROPE TO WHIPPING DRUM. GEAR APPEARS TO TURN WELL IF TAKEN ROUND SLOWLY & STEADILY.	2 BOXES OF MOULINGS TO GUT.	TOWING FROM DAVITS & BLOCKS. MODERATE TO DEEP SWELL ADVERSELY AFFECTING FISHING. TIDES 'MAKING' VERY FEW PRAWNS ON THE GROUNDS. POOR REPORTS FROM OTHER VESSELS.
			1315	4HR.			H 45·0	G 77·6	1100	56					



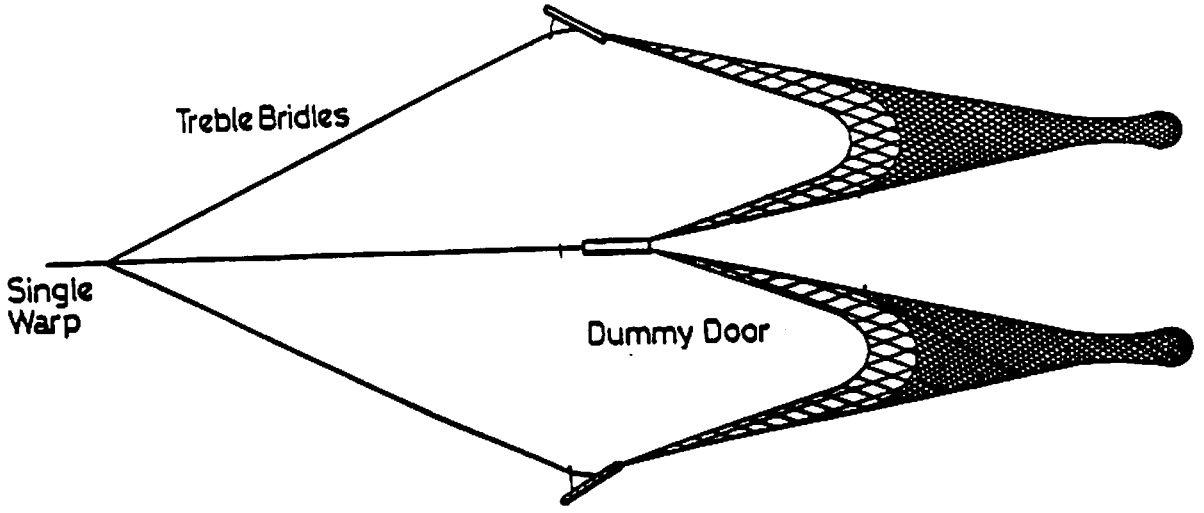
2 Warp Rig

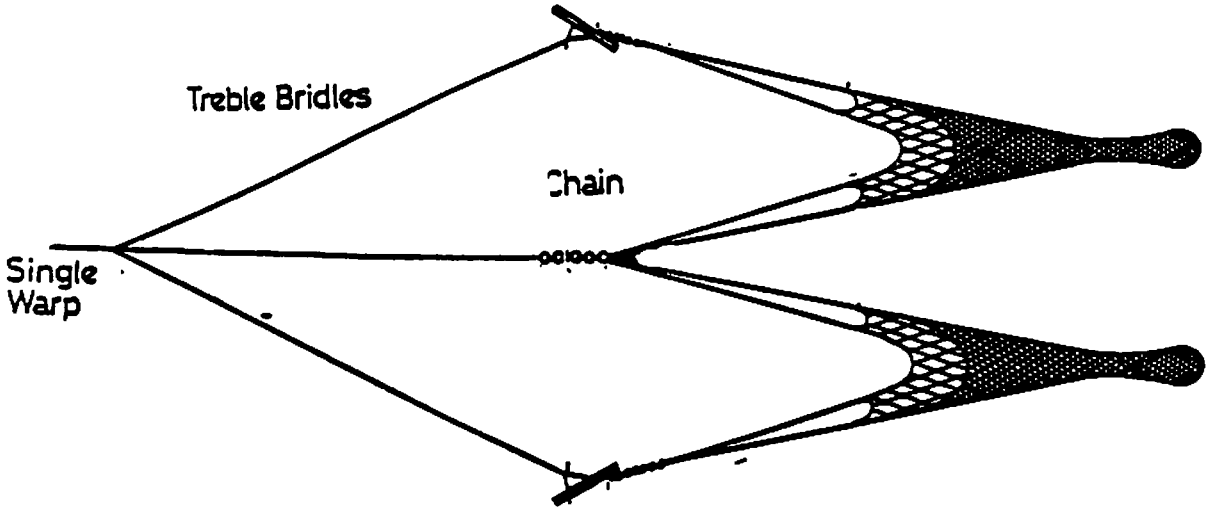
Fig. 1



3 Warp Rig

Fig. 2





1 Warp Rig

Fig. 3

FIG. 4. DIAGRAM SHOWING TWIN-RIG ARRANGEMENT.

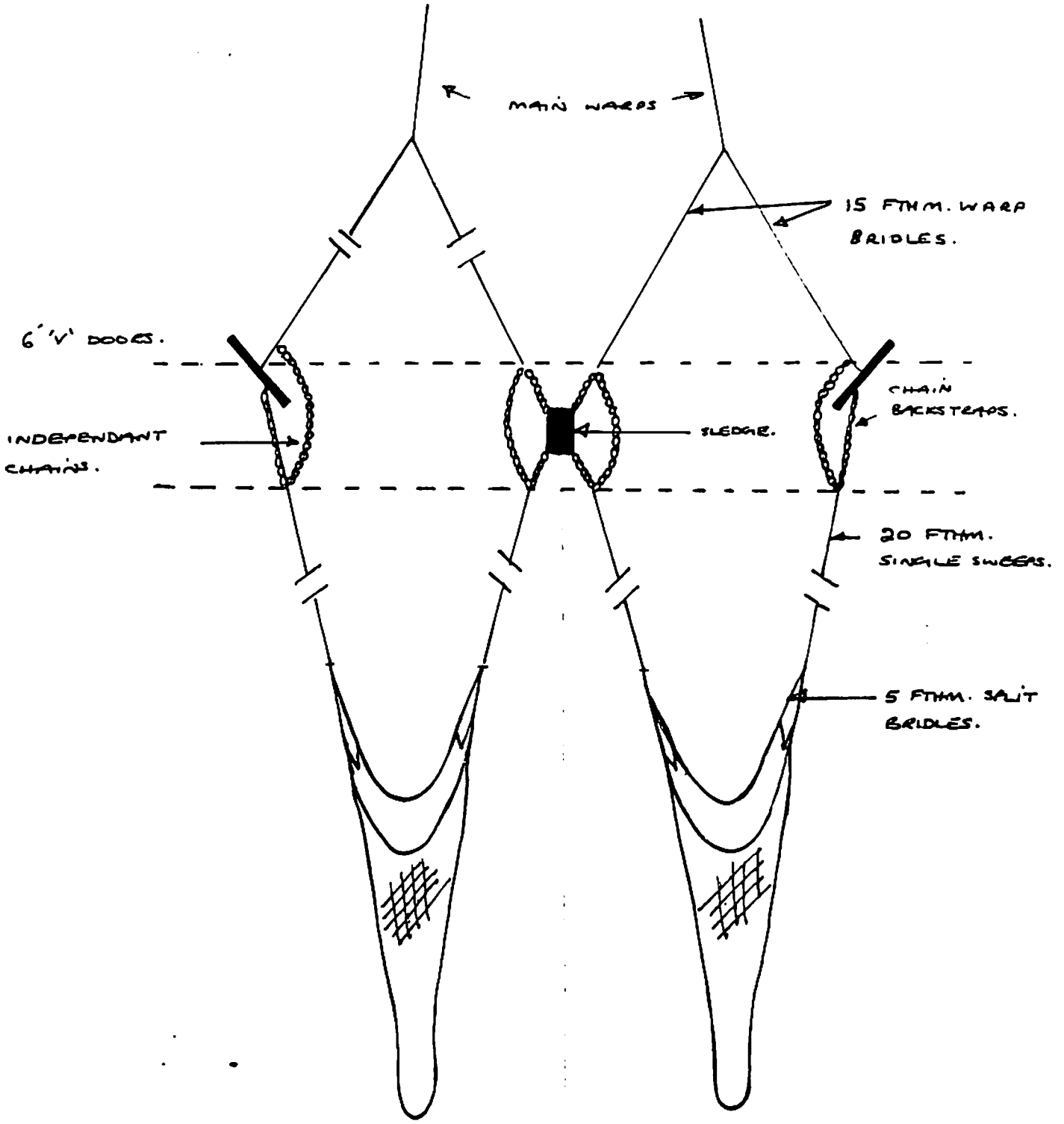


FIG. 4a.

TWIN-RIG — RIGGING ARRANGEMENT

(SHOWING PORT SIDE ONLY.)

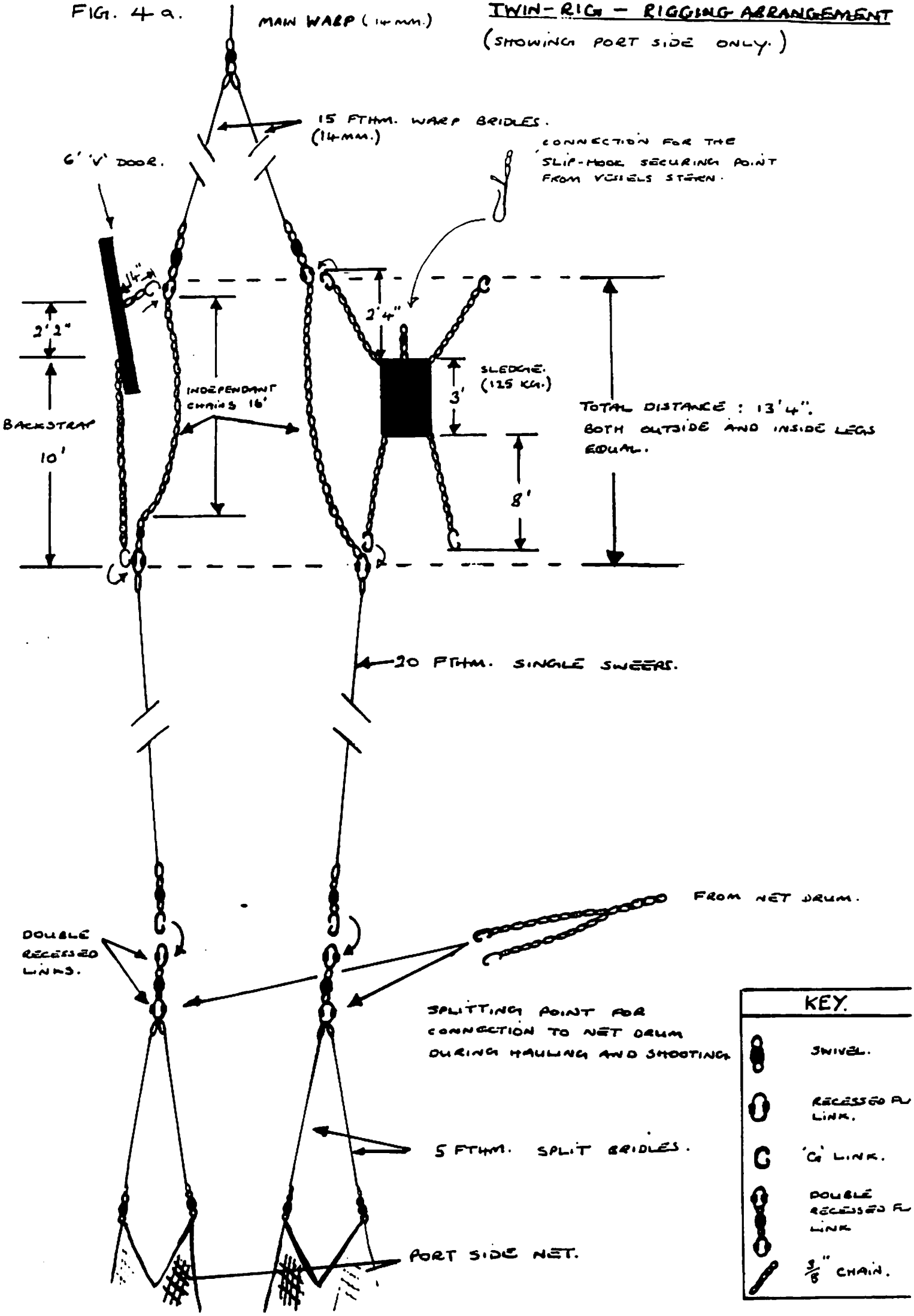


FIG. 4. b.

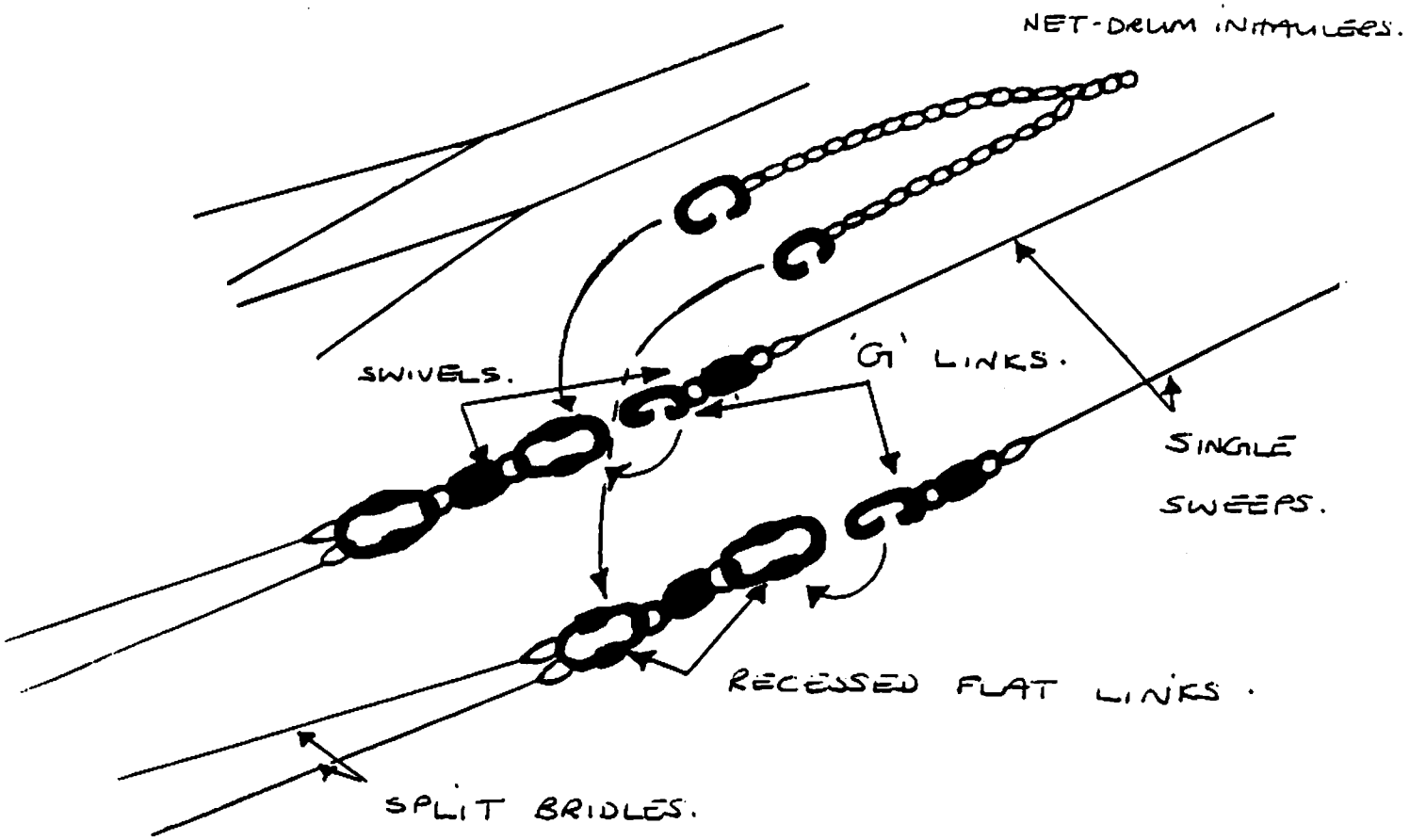
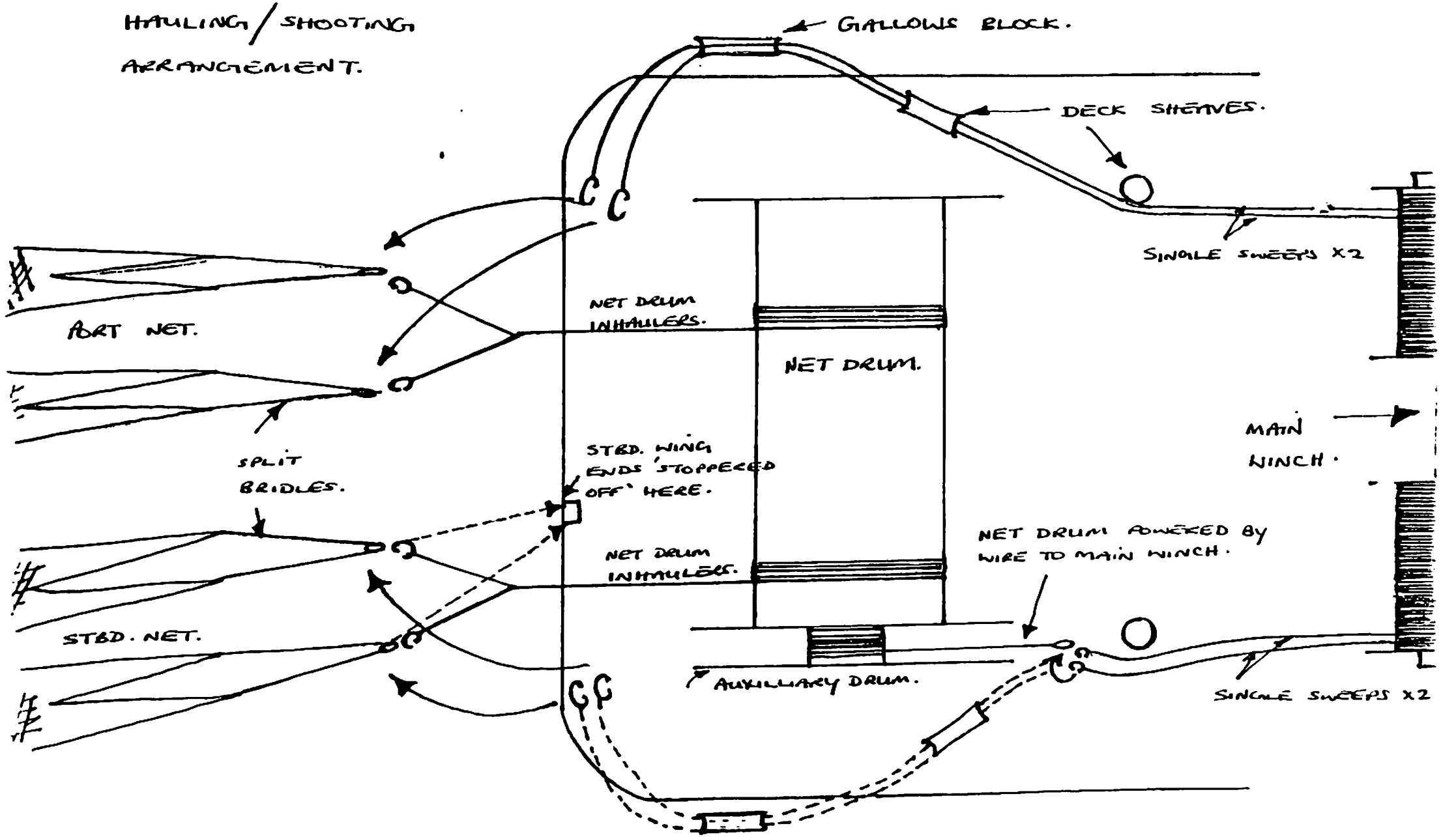
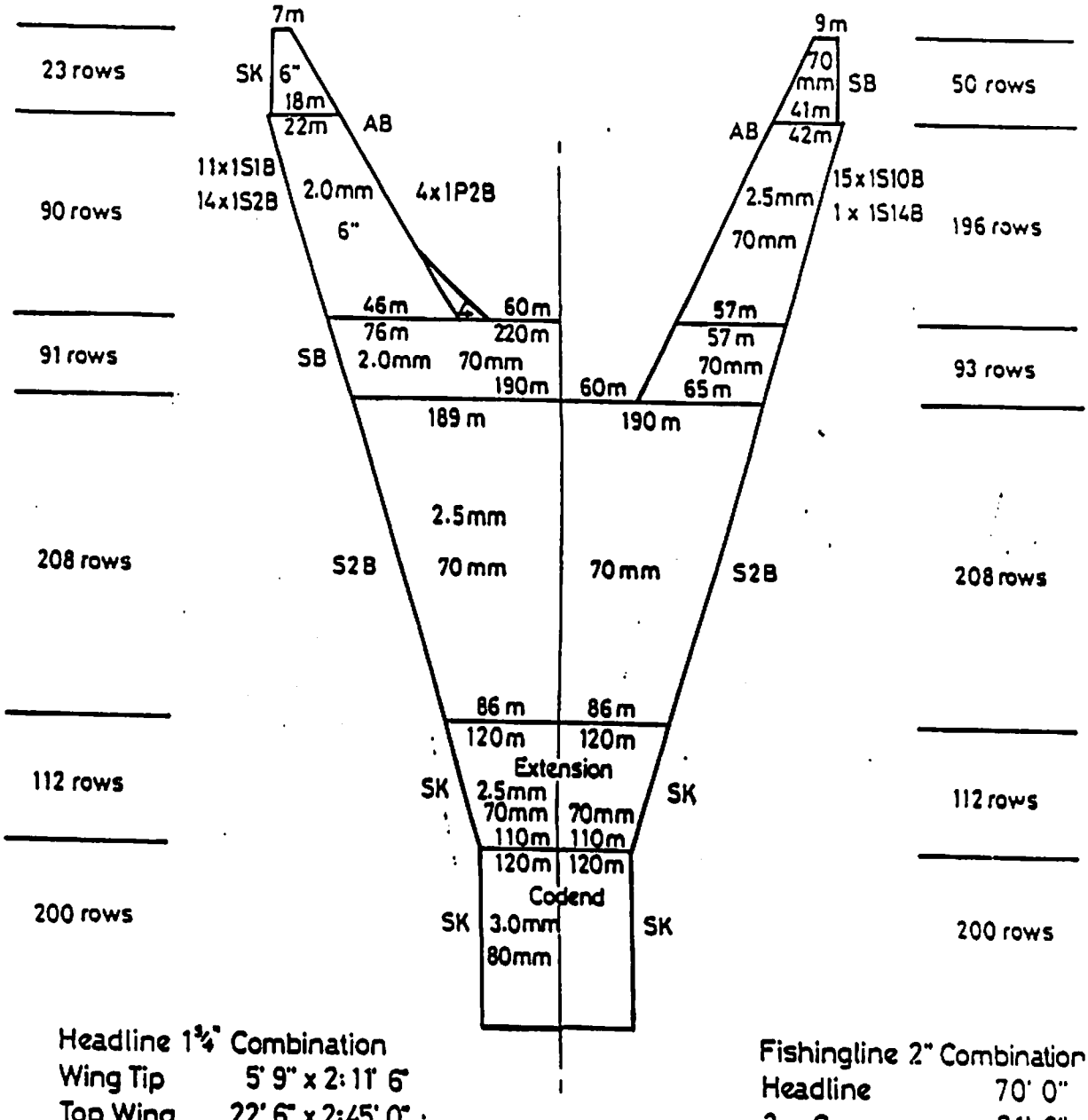

NET-DRUM WARPS.
SWIVELS.
'G' LINKS.
SINGLE SWEEPS.
RECESSED FLAT LINKS.
SPLIT BRIDLES.

FIG. 4. C.

HAULING / SHOOTING ARRANGEMENT.





Headline 1¾" Combination

Wing Tip	5' 9" x 2: 11' 6"
Top Wing	22' 6" x 2: 45' 0"
Stretch in Wing	1' 0" x 2: 2' 0"
Bosom	5' 0" = 5' 0"
No. Net	3' 3" x 2: 6' 6"
Headline	70' 0"

Drop Meshes = 4 x 1P2B = 5 Spaces @ 1
Every 4.8": Stretch ⅓ of Bar

Fishingline 2" Combination

Headline	70' 0"
2 x Cover	21' 0"
+ 6" Stretch in Bunts	1' 0"
Fishingline	92' 0"

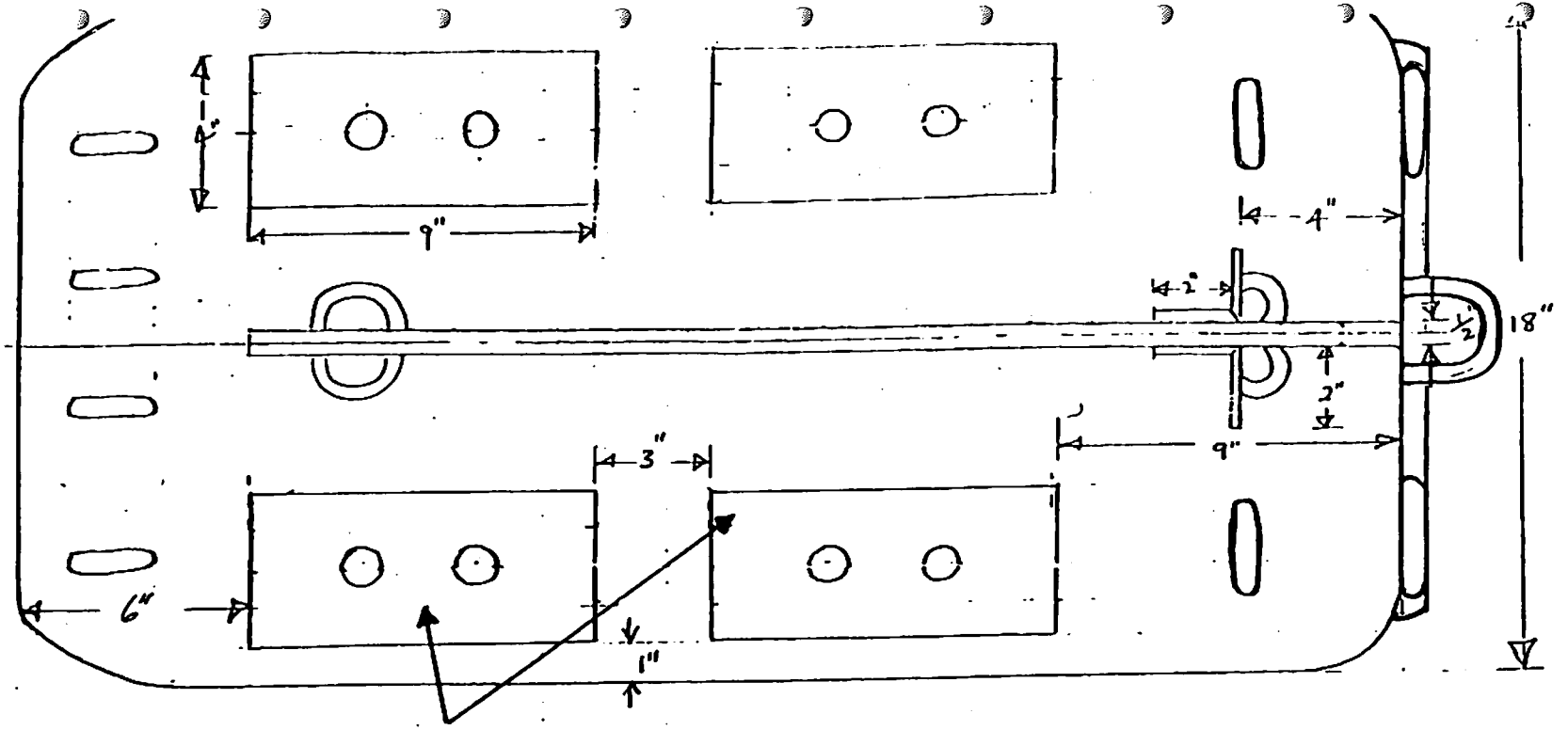
Footrope 14mm Wire
Length for Length with
Fishingline
2½" Rubbers with Ring

380 x 70mm Dual Purpose

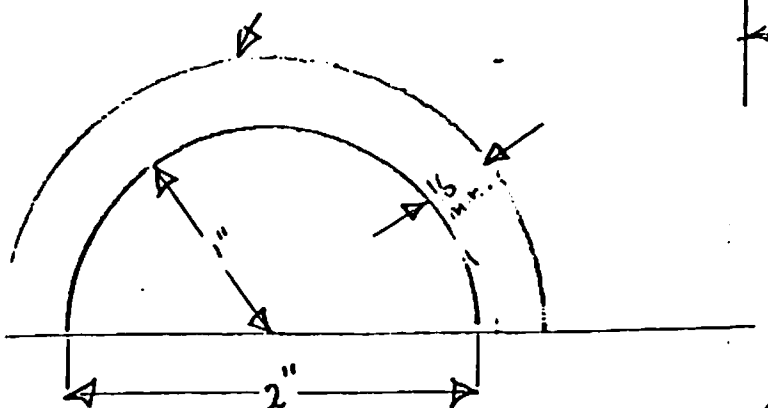
Fig. 5

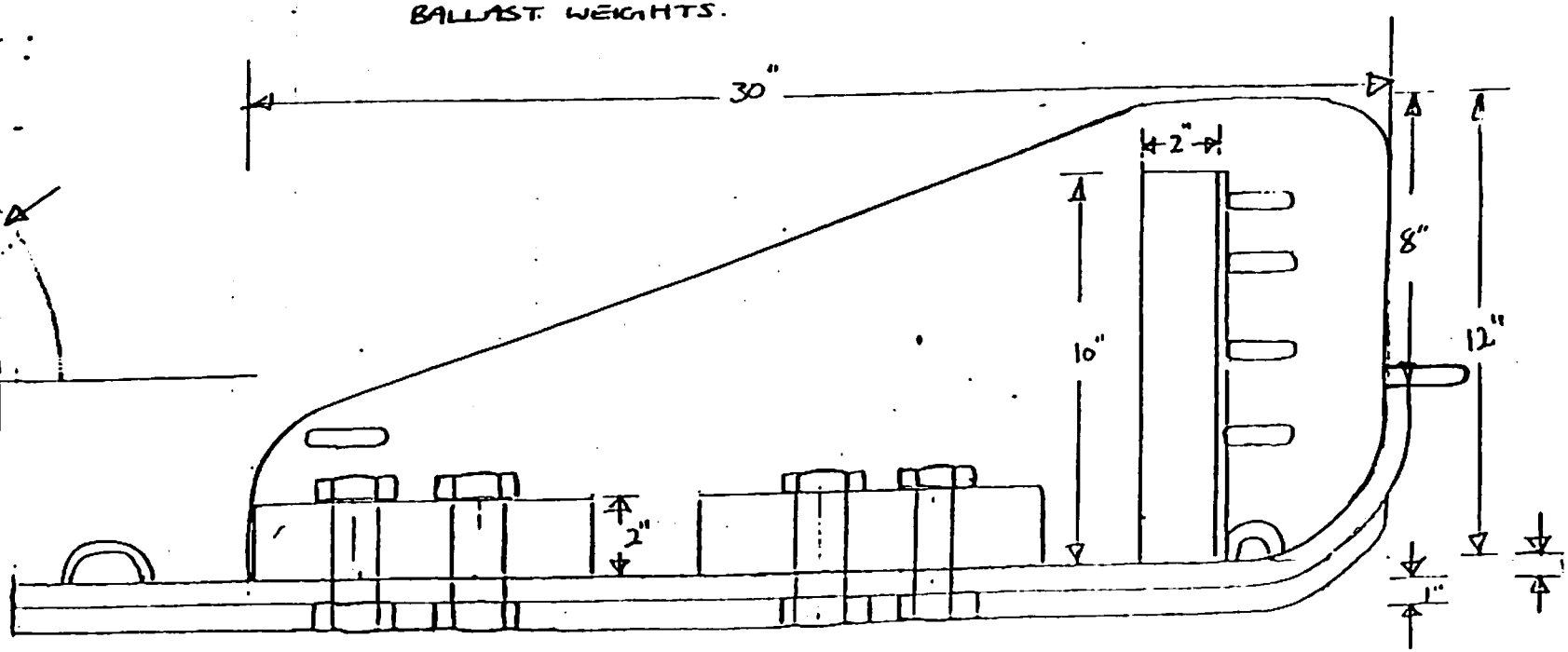
FIG. 6
DETAILS OF CENTRAL SLEDGE.

SCALE.
APPROX: 1 CM. : 2".



ALL RING BOLTS :





FISHING LOGS

MFV 'LAURA EVE'

TWIN-RIG TRAWLING TRIALS

(MARCH 1987)

TWIN-RIG TRIALS

FISHING LOG M.F.V. LAURA EVE (SN. 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME Hrs.	DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED REVS.	DEPTH M.	WARP FTMS.	WEATHER	NOTES.	CATCH	COMMENTS
22/3.	1	0945		2	H 44·1	G 79·1			1200 ↓	59.	125	S.W 3-4	INCREASING REVS. JUST PRIOR TO HAULING.	1 BOX C/LINGS	POOR FISHING
			1145				H 37·6	G 58·2	1250	67.		SW 3-4		½ BOX PRAWNS	HAULING/ SHOOTING TIME VARYING FROM 40 MNS. TO 60 MNS.
		1245			H 35·7	H 60·3			1200 ↓	65.	125.	S.W 3.	ALL GEAR HANDLING WELL.		TIME MUST BE TAKEN TO ENSURE ALL BACKSTRAPS ETC. ARE CONNECTED UP TO THE CORRECT LEGS TO AVOID SHOOTING FOUL GEAR.
				2.										½ BOX PRAWNS	
			1340				H·40·0	G 54·4	1250	58.		SW 2-3.		1 BOX MIXED FLATS AND C/LINGS.	

TWIN RIG TRIALS.

FISHING LOG M.F.V. 'LAURA EVE' (SN 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	3B CHAN DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED REQ.	DEPTH	WARP FTHM.	WEATHER	NOTES.	CATCH	COMMENTS
5/3/87	1.	1000	1100	1HR.	45·4	79·8	47·5	79·2	1210	62 m. 81 m.	125	S TO SE 2-3 TOWING AGAINST TIDE.	INSUFFICIENT SPREAD HAULING TO MAKE ADJUSTMENTS TO GEAR – MAY REQUIRE LONGER SWEEP LENGTH TO ALLOW GEAR TO SPREAD. NO BALLAST WEIGHTS ON SLEDGE. SLEDGE HANDLED REASONABLY WELL FOR FIRST SHOT. NORMAL TOWING REQ. FOR PRAWN TRAWL (24 FTHM.) ACE 1150 TO 1200.		SPREAD – 8" AT THE 1 FATHOM MARK. GEAR VERY MUCH UNDER-SPREAD. HYDRAULIC BREAKDOWN ON WINCH (PUMP) OCCURRED DURING HAULING. RETURNED N. SHIELDS.

FRIDAY – 6/3/87
TRIALS POSTPONED DUE
TO ADVERSE WEATHER.
S.S.E. 6–7 INCREASING.

TWIN-RIG TRIALS. FISHING LOG M.F.V. LAURA EVE (SN. 54).

SCANMAR TRIAL.

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME HRS.	DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P	TOW SPEED (REVS.)	DEPTH M.	WARP FTHMS.	WEATHER TIDE.	WIND KTS.	DOOR F.	H/LINE F.	WARP P. TONS.	TENSION STBD.	CATCH	COMMENTS
23/3/	1	1045		3.	H45.1	G.77.8			(1150) 2.4 k.	59	125	CALM V. LIGHT WINDS.	5.9 6.1	16.3	0.8	0.8	0.6		5 FTHM. SPLITS 20 FTHM. SINGLE SWEEPS 15 FTHM. WARP BRIDLES.
			1345				H45.3	G.76.1	(1200) 2.6 K. 2.56 k.			SLACK WATER.	7.0 7.8	18.6 19.6	0.8 0.8	0.7 0.73	0.7 0.7		TENSIONS EVENED OUT AT 1200 REVS. DOORS ON MAX. SPREAD ASITION.
									(1250) 2.75 k. (1250) 2.75 k.				8.4 7.3	20.1 19.1	0.8 0.8	0.8 0.8	0.76 0.74		LOST DOOR SIGNAL AT 1300 REVS.
									(1200) 2.6 K. (1250) 2.74 k	62 m			6.9 6.6 7.1	18.1 17.9 18.6	0.8 0.8 0.8	0.73 0.75 0.8	0.71 0.73. 0.78.		DIRECTIONAL PROBLEMS.
									(1250) 3.17 K. 3.5 K. (1250) 2.7 k.	54m.		EBB TIDE.	8.3 8.0 5.3	17.9 18.3 15.6	0.8 0.8 0.8	0.65 0.62 0.75	0.80 0.80 0.76		TURNING TO PORT - MONITORING GEAR DURING TURN. READINGS AT STAGES THROUGH-OUT TURN. TOWING ACROSS TIDE.
																		1 BOX C/LINGS ½ BSK. PRAWNS	GEAR STILL UNDERSPREAD

TWIN-RIG TRIALS FISHING LOG M.F.V. 'LAURA EVE' (SN 54).

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	3B. DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED R.P.M.	DEPTH M	WARP FTHMS	WEATHER	NOTES.	CATCH	COMMENTS
23/3	1	1045			H45·1	G.77·8			1250	59		NO WIND FLAT	DOORS ON POSITION OF MAK. SPREAD.	1 BOX OF C/LINGS.	TURNS APPEARING IN STBD. SIDE WARP BRIDLES DURING HAULING
				3.							125	CALM.			ALL SWIVELS CHECKED – REASON UNKNOWN.
			1345				H45·3	G.76·1		54.			MORE BULK IN PORT-SIDE NET.	½ BOX OF PRAWNS.	ALL TURNS REMOVED.
													SLEDGE POLISHED WELL, EVENLY OVER ALL BASE PLATE.	FISHING V. POOR.	RETURNED N/SHIELD TO REMOVE SCANMAR GEAR/EQUIPMENT.
													GEAR STILL NOT SPREAD TO REQUIRED DEGREE.	REPORTS FROM OTHER VESSELS ALSO POOR.	

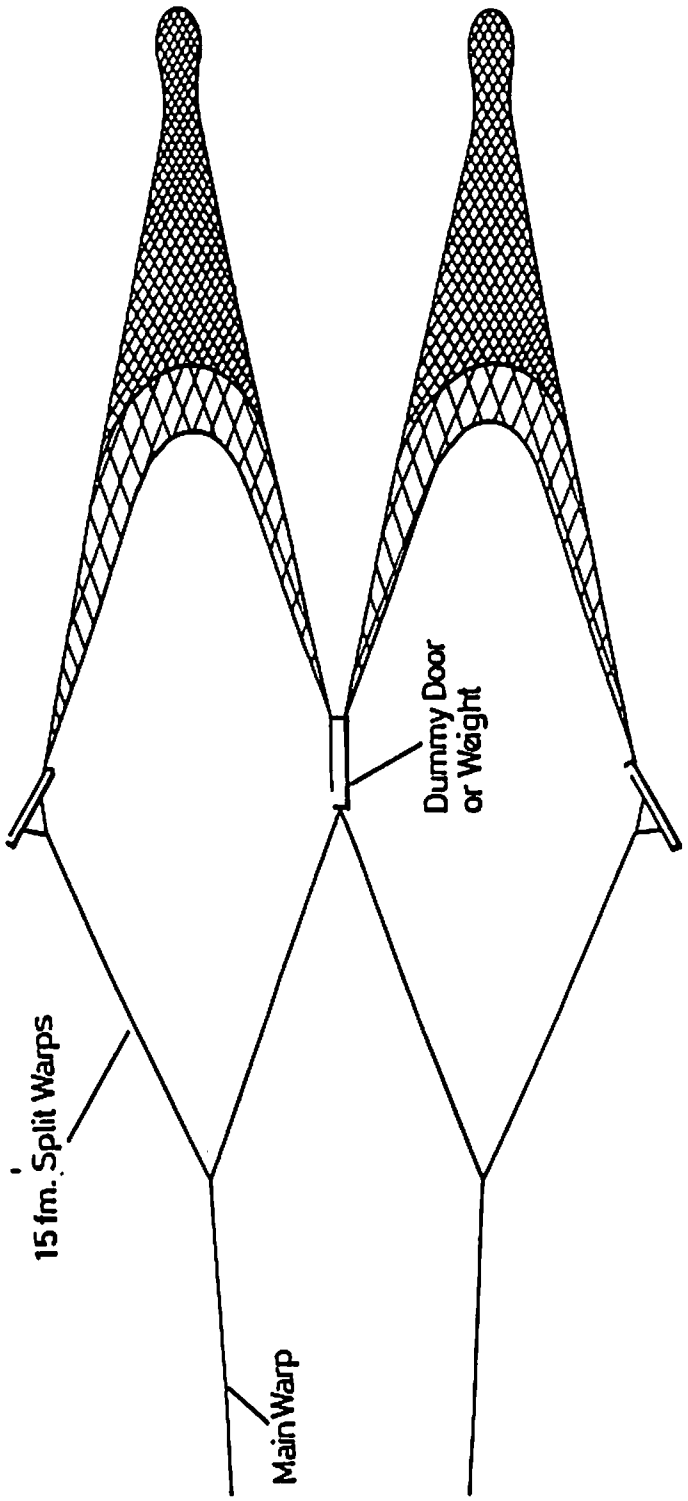
TWIN-RIG TRIALS. FISHING LOG M.F.V. LAURA LEE (SN. 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME HRS.	38. DECCA POSITION SHOOTING G.	SHOOTING P.	HAULING G.	HAULING P.	TOW SPEED R.P.M.	DEPTH M.	WARP FTHM.	WEATHER	NOTES.	CATCH	COMMENTS
24/3/	1.	0945	1200	3¼	H47·0	G.74·6	I 38·2	G.61·8	1100	58M. 47M.	100	NE. 3. NE.2-3.	REDUCED SPREAD.? NETS SHOWING INDICATIONS OF TAKING BOTTOM WELL. BOTH NETS REQUIRE ATTENTION TO F/LINES. F/LINES REQUIRE RE-SETTING ON RUBBERS TO REDUCE LAZINE BIGHTS – LOSING PRAWNS. TOWING FROM TOWING STROPS.	VERY FEW PRAWNS ½ BOX OF CODLINGS + FEW FLATS. BOTTOM DEBRIS INDICATING NETS TAKING BOTTOM WELL ENOUGH. BIGHTS IN F/LINE. NET REQUIRES RE-SETTING ON GROUND GEAR. 2ND. HAUL STBD. SIDE BLANK – NET HAS BEEN FOUL – REASON UNKNOWN. PORTSIDE NET 1 BOX CODLING + MIXED FLATS ½ BOX PRAWNS	SAILED 0700 N.E. 3 FRESHENING FLOOD TIDE. SPREAD 10"-12" AT 1 FATHOM FROM 100 FTHM. OF WARP. POSSIBILITY THAT SLEDGE MAY BE TOO HEAVY. REPORTS MIXED, VESSELS WORKING OFF HARTLEPOOL FISHING GENERALLY POOR – VERY FEW PRAWNS. RANGING FROM 2-3 BOXES TO 8-10 BOXES FOR 4 HRS. RETURNED N/ SHIELDS AFTER 2ND. TOW.
	2.	1250	1615	3½	I 38·1	G. 62·0	H 46·2 G. 72·9		1100 1150	46 M. 53M. 49 M.	100	NE 2-3 VEERING S.E. S.E. 2-3.			

TWIN-RIG TRIALS.

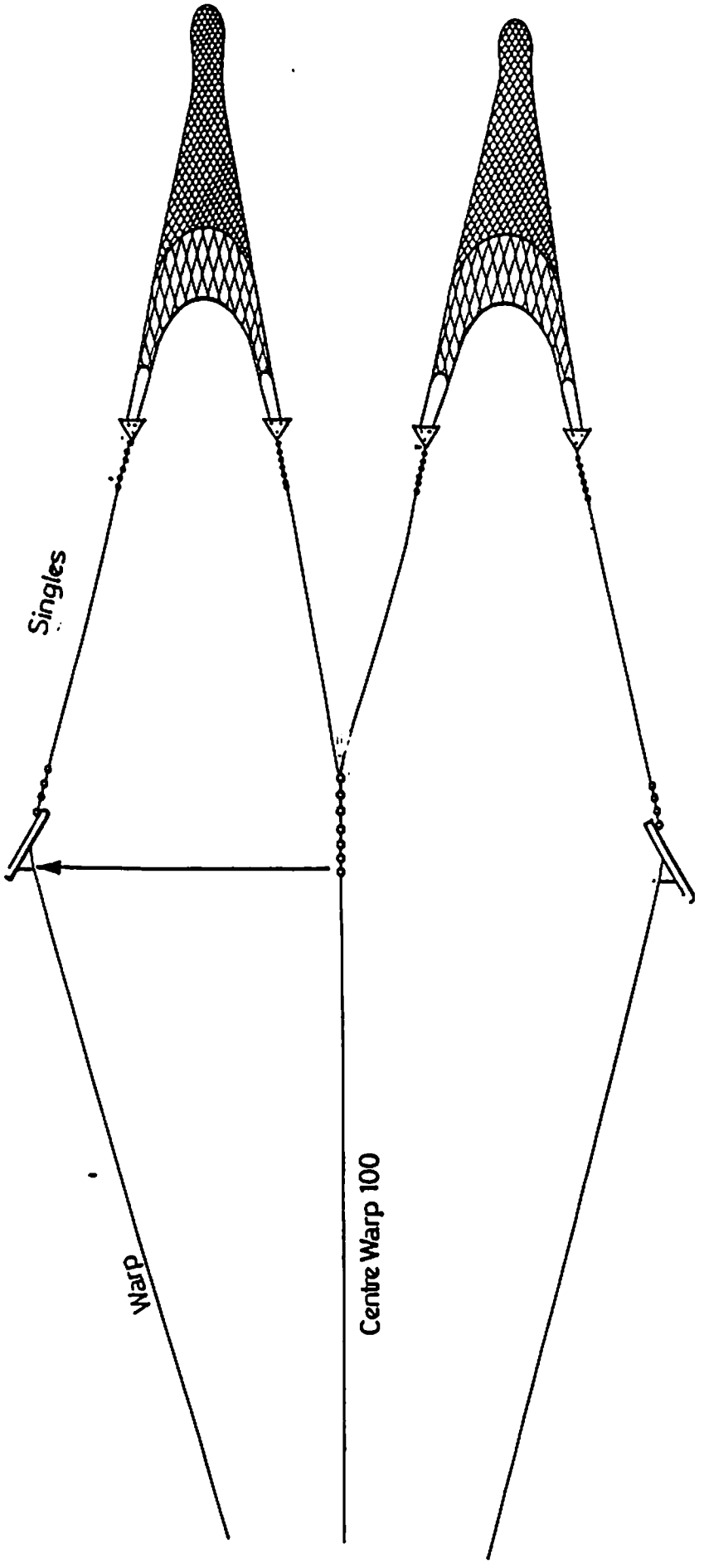
FISHING LOG M.F.V LAURA EVE. (SN. 54)

DATE	HAUL	TIME SHOT	TIME HAUL	TOW TIME	DECCA POSITION SHOOTING G.	SHOOTING P	HAULING G.	HAULING P.	TOW SPEED REV.	DEPTH M.	WARP FTHMS.	WEATHER	NOTES.	CATCH	COMMENTS
25/3/	1.	0915			H 44·4	G. 77·7			1100	56	125	S'LY 2-3. MODERATE SWELL. HEAVY RAIN REDUCED VISIBILITY. WIND VEERING N.WLY. FRESHENED 3-4 N.W. THEN 4-5 SEA STATE 3-4 MODERATE SWELL. FRESHENING STEADILY	PORTSIDE NET FOUL - LARGE OIL DRUM AND OTHER DEBRIS FOULING F/ROPE NET BLANK. GEAR HANDLING WELL - HAULING/ SHOOTING TIME 45MINS. SLEDGE HANDLING WELL USING ROPE TO WHIPPING DRUM. GEAR APPEARED TO TURN WELL IF TAKEN ROUND SLOWLY & STEADILY.	2 BOXES OF MIXED TO GUT.	TOWING FROM GALLOWS BLOCKS. MODERATE TO DEEP SWELL ADVERSELY AFFECTING FISHING. TIDES 'MAKING' VERY FEW PRAWNS ON THE GROUNDS. POOR REPORTS FROM OTHER VESSELS.
			1315	4HRS.			H 45·0	G. 77·6	1100	56					



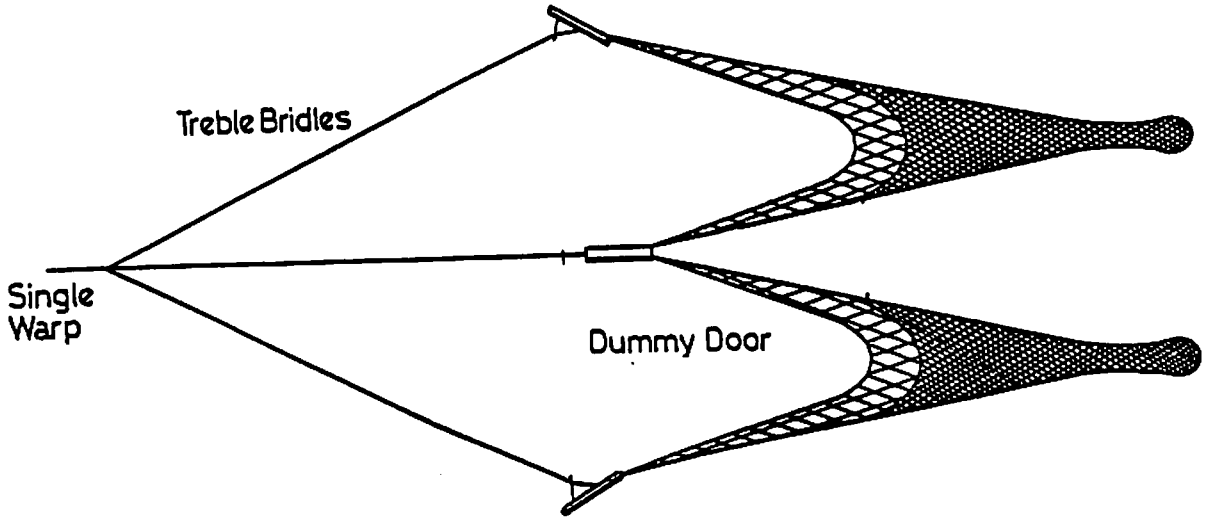
2 Warp Rig

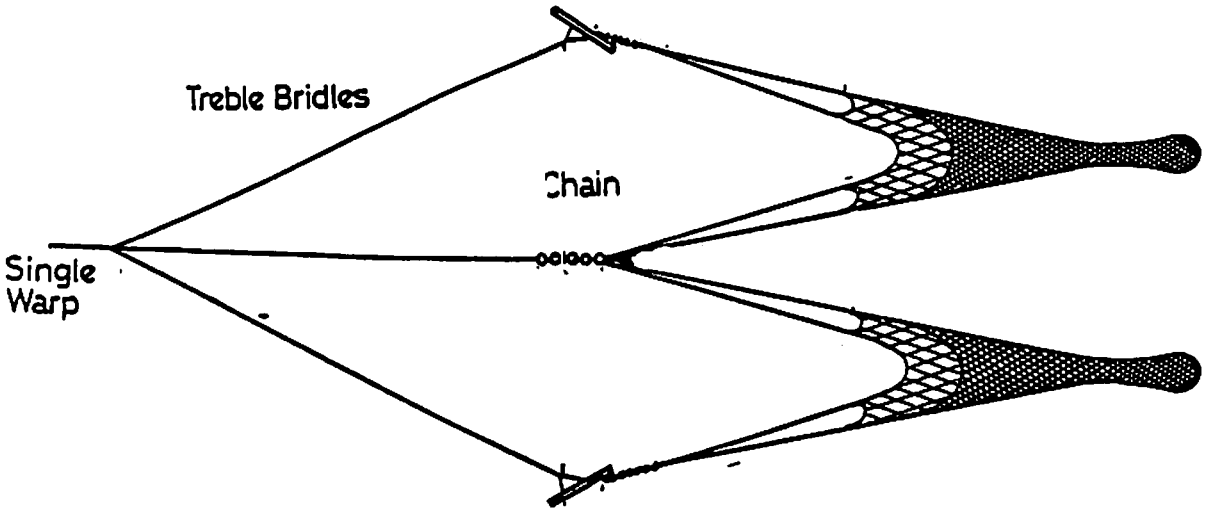
Fig. 1



3 Warp Rig

Fig. 2





1 Warp Rig

Fig. 3

FIG. 4. DIAGRAM SHOWING TWIN-RIG ARRANGEMENT.

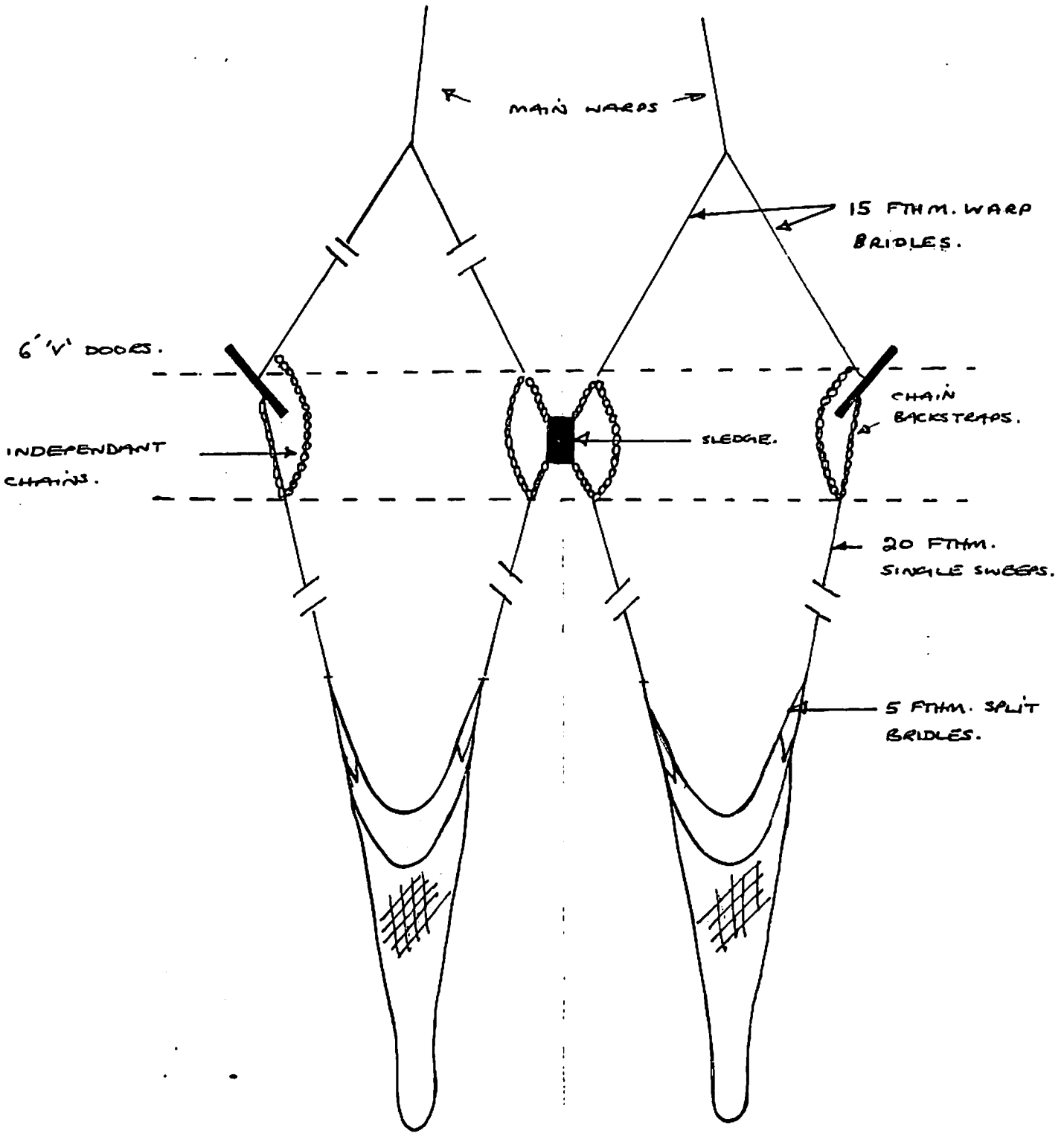
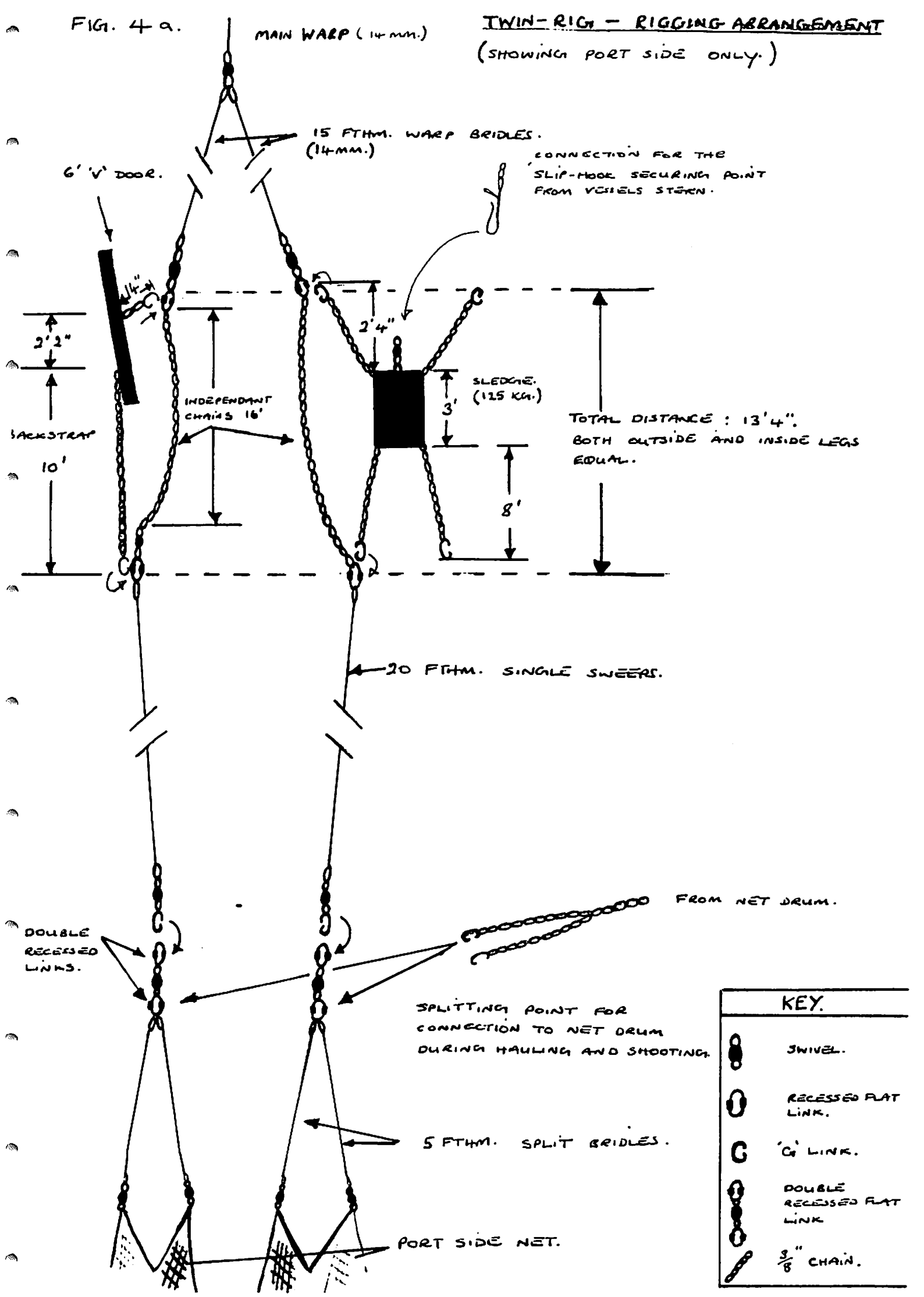


FIG. 4a.

TWIN-RIG – RIGGING ARRANGEMENT

(SHOWING PORT SIDE ONLY.)



KEY.	
	SWIVEL.
	RECESSED FLAT LINK.
C	'C' LINK.
	DOUBLE RECESSED FLAT LINK
	3/8" CHAIN.

FIG. 4. b.

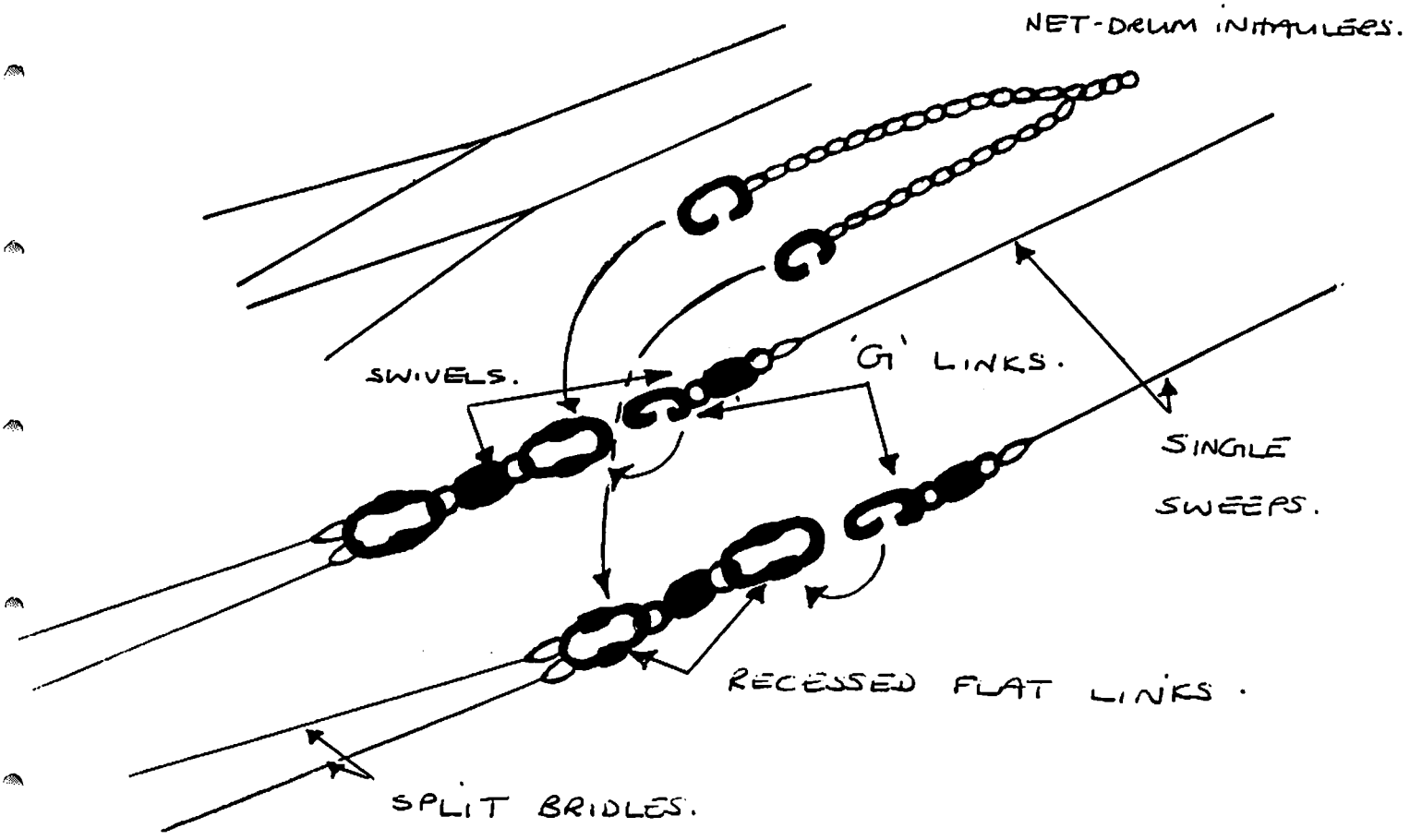

NET-DRUM INTAKE LEGS.
SWIVELS.
'G' LINKS.
SINGLE SWEEPS.
RECESSED FLAT LINKS.
SPLIT BRIDLES.

FIG. 4. C.

HAULING / SHOOTING ARRANGEMENT.

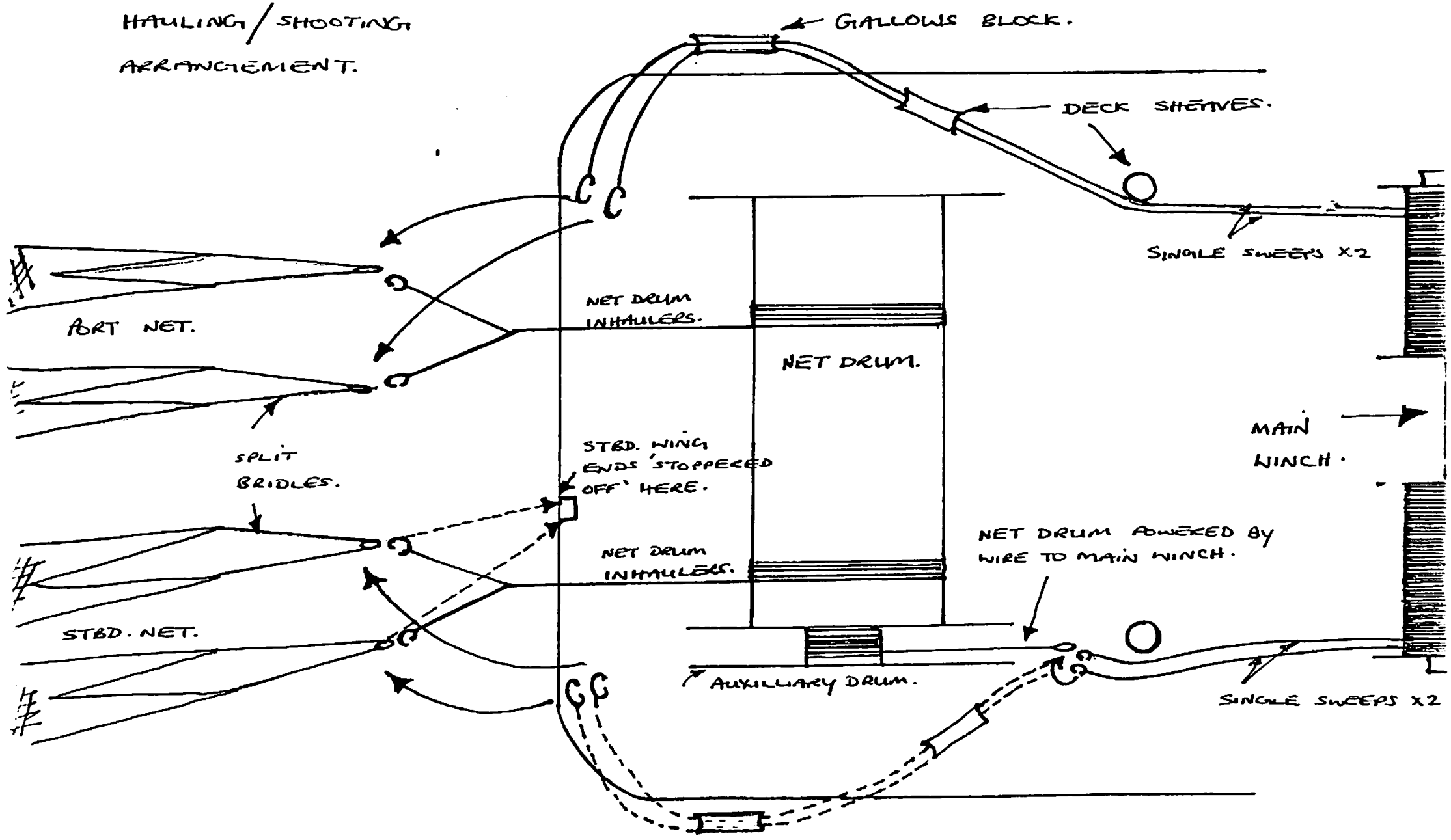
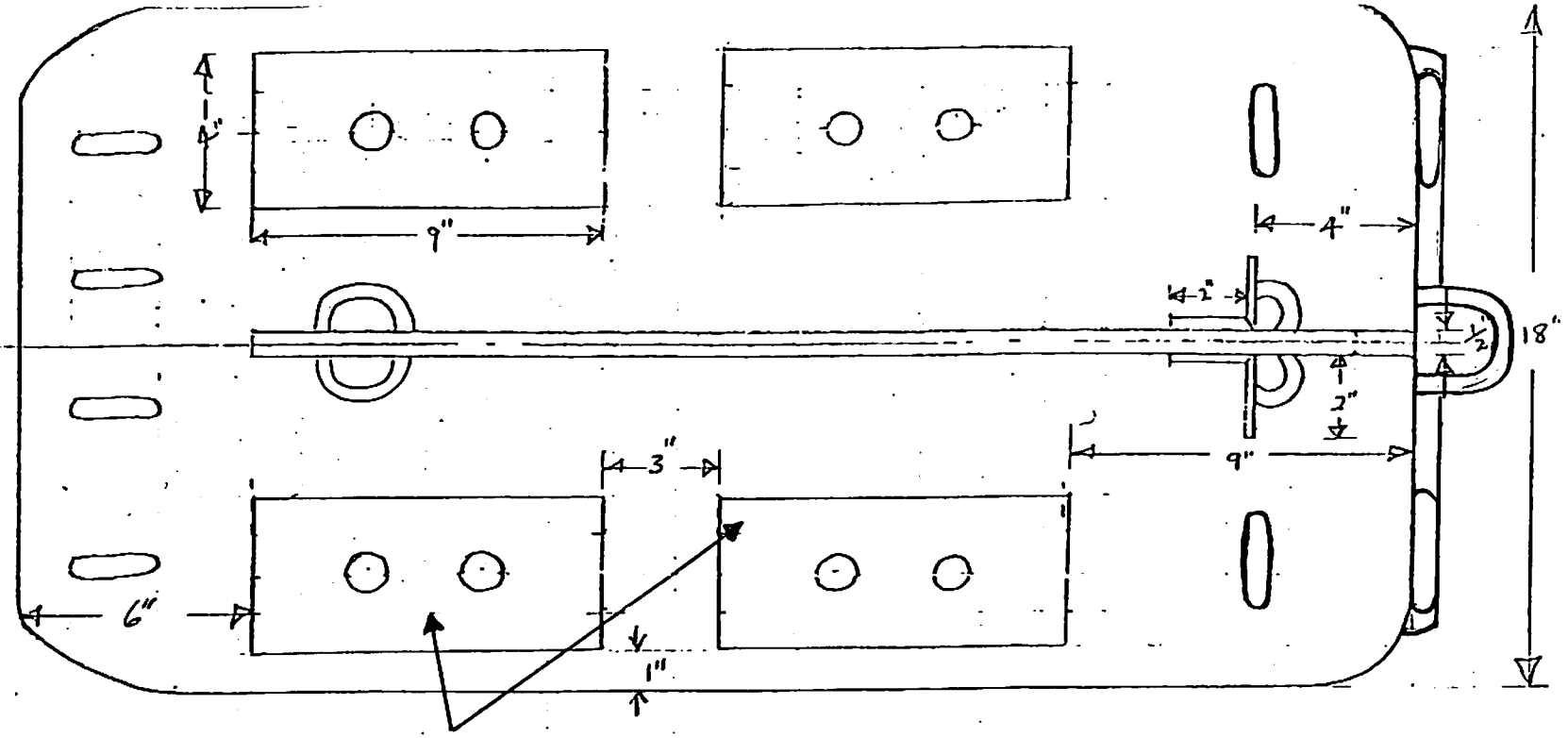
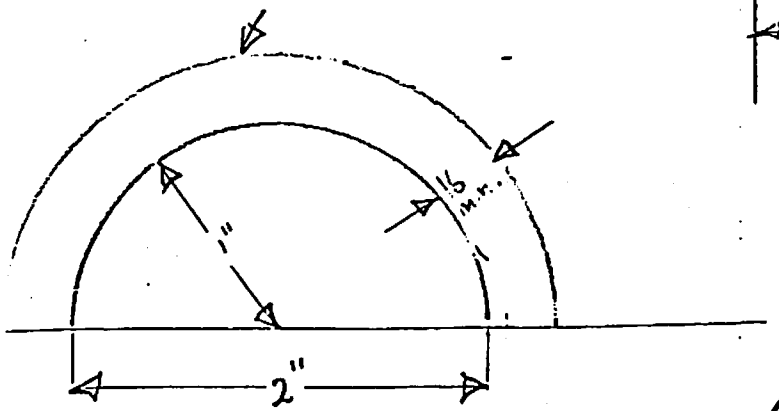


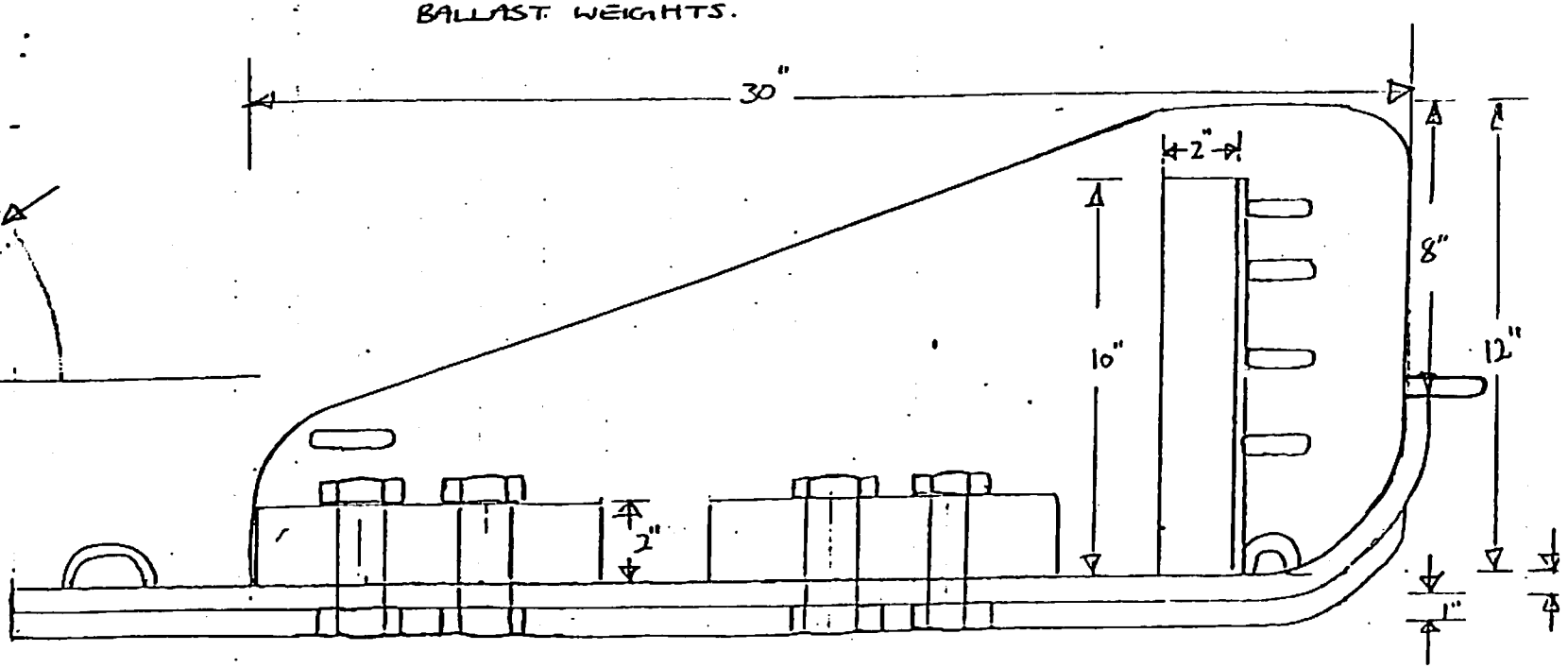
FIG. 6
DETAILS OF CENTRAL SLEDGE.

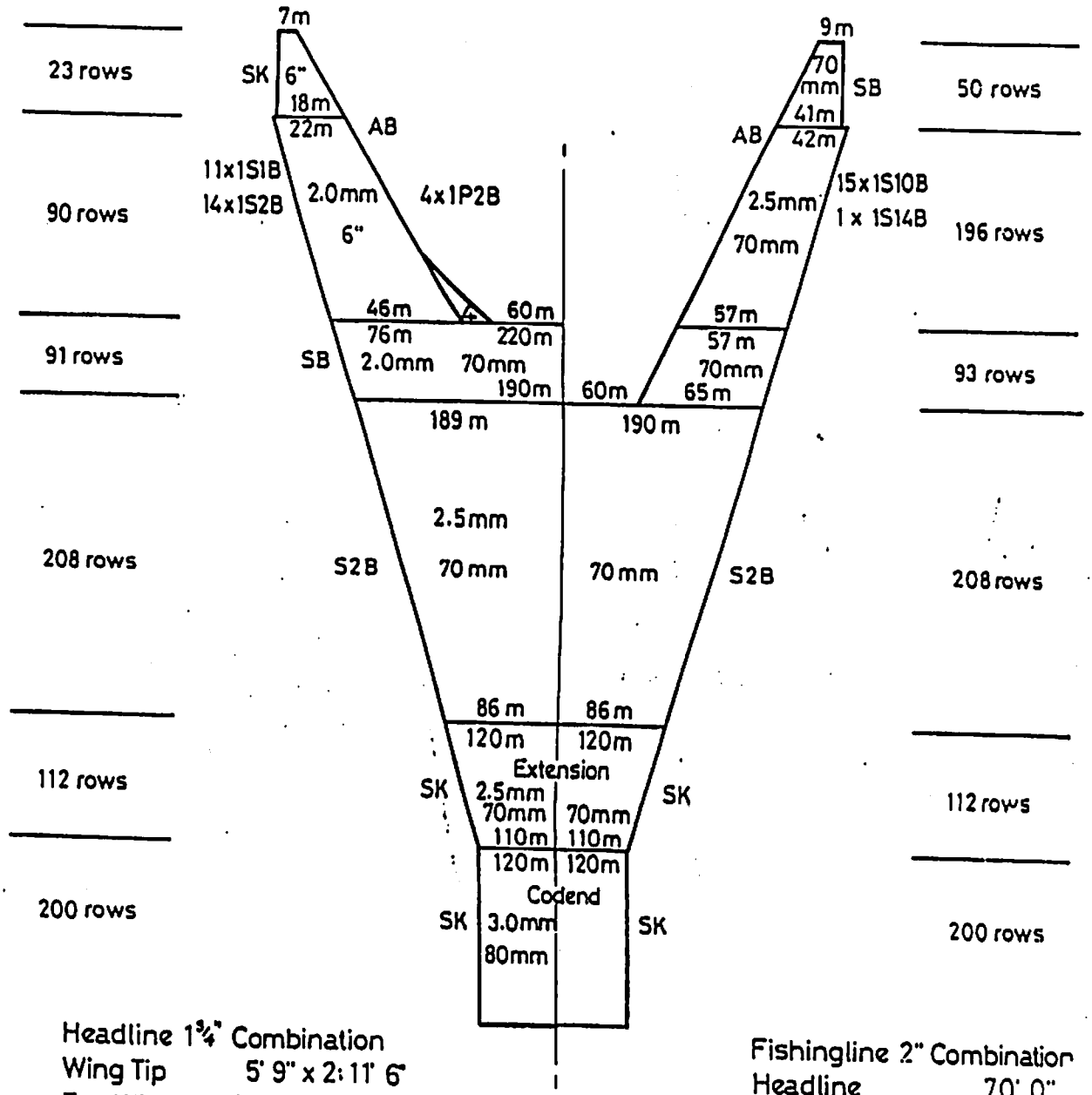
SCALE.
APPROX: 1CM. : 2".



ALL RING BOLTS :







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Stretch in Wing	1' 0" x 2: 2' 0"
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Drop Meshes = 4 x 1P2B = 5 Spaces @ 1
Every 4·8": Stretch ⅓ of Bar

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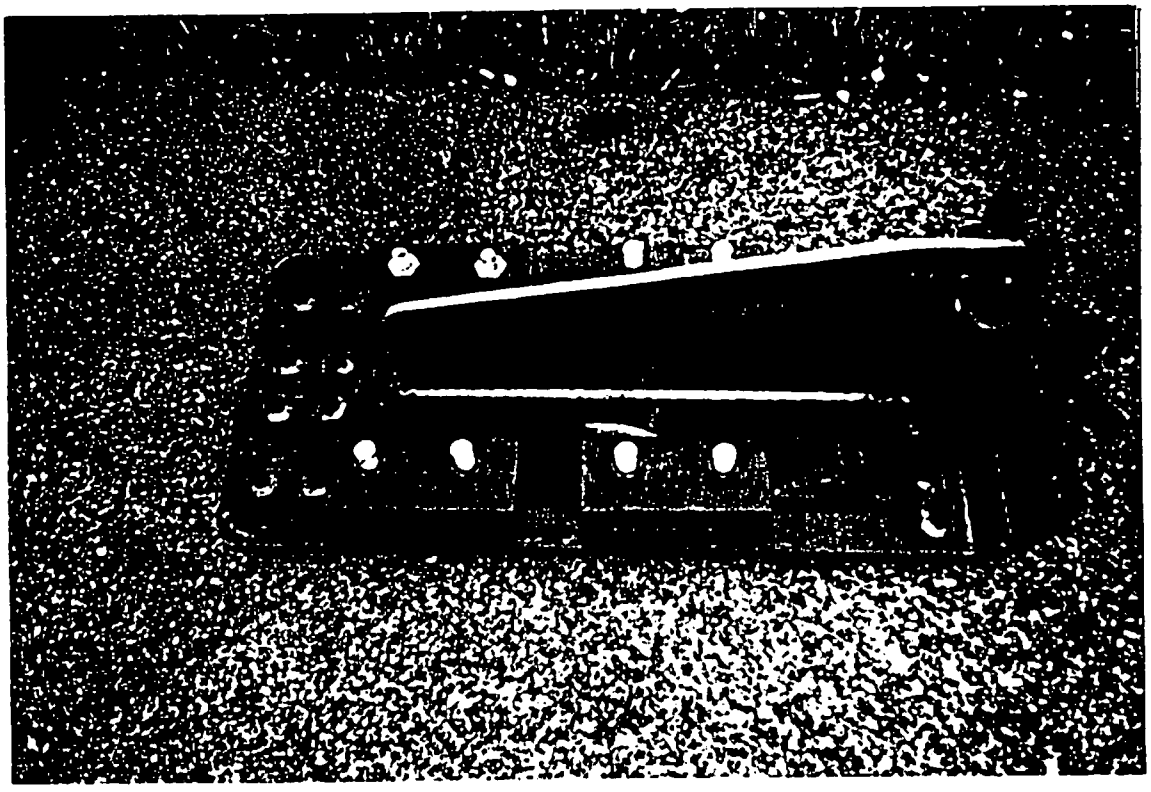
Headline	70' 0"
2 x Cover	21' 0"
+ 6" Stretch in Bunts	1' 0"
Fishingline	92' 0"

Footrope 14mm Wire
Length for Length with Fishingline
2½" Rubbers with Ring

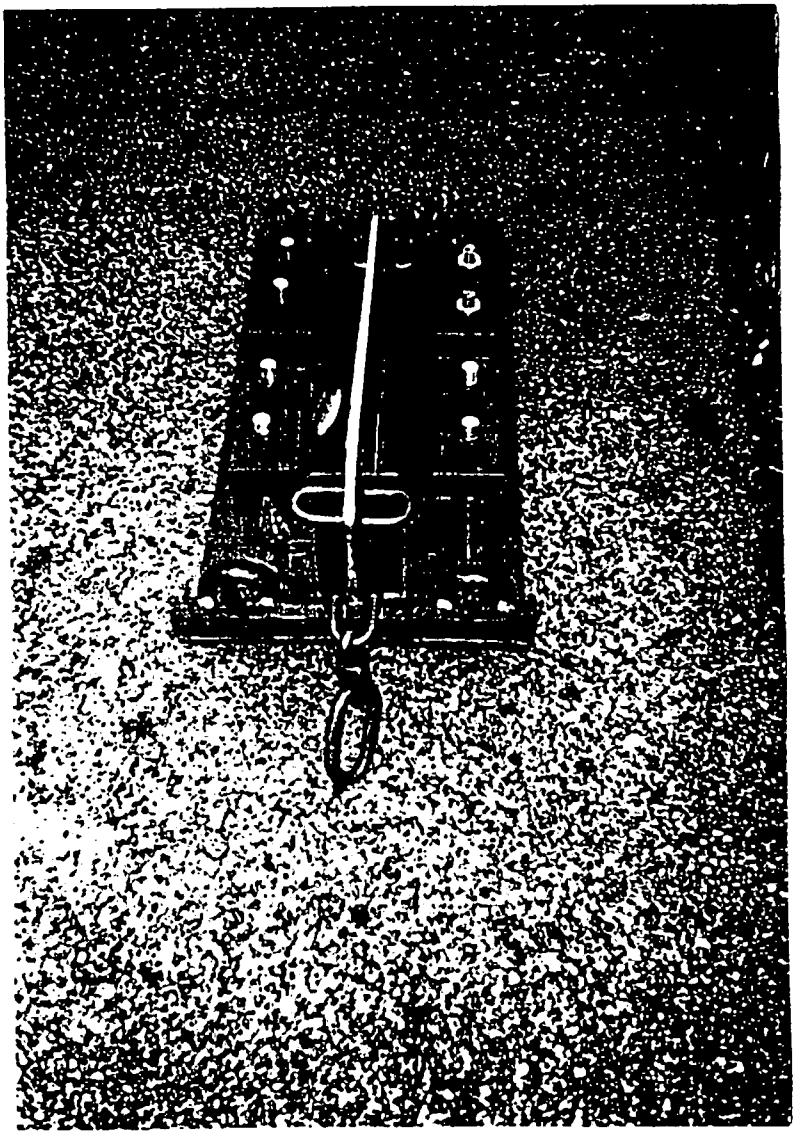
380 x 70mm Dual Purpose

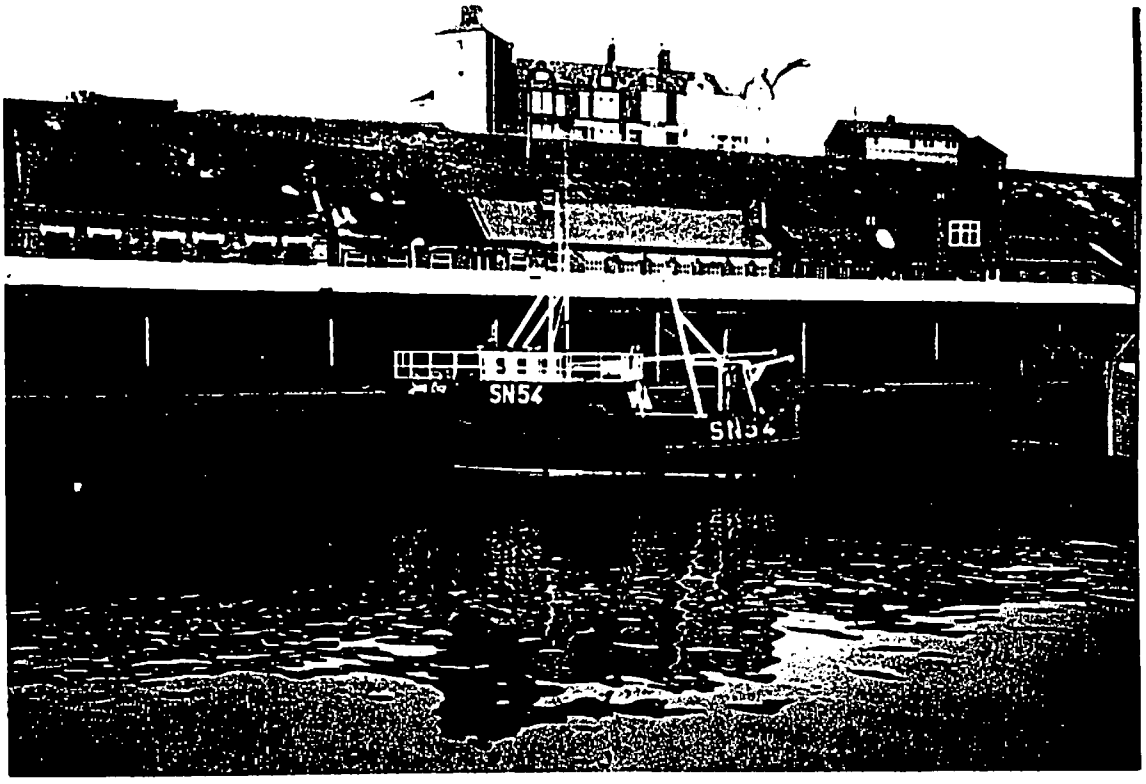
Fig. 4

PHOTOGRAPHS



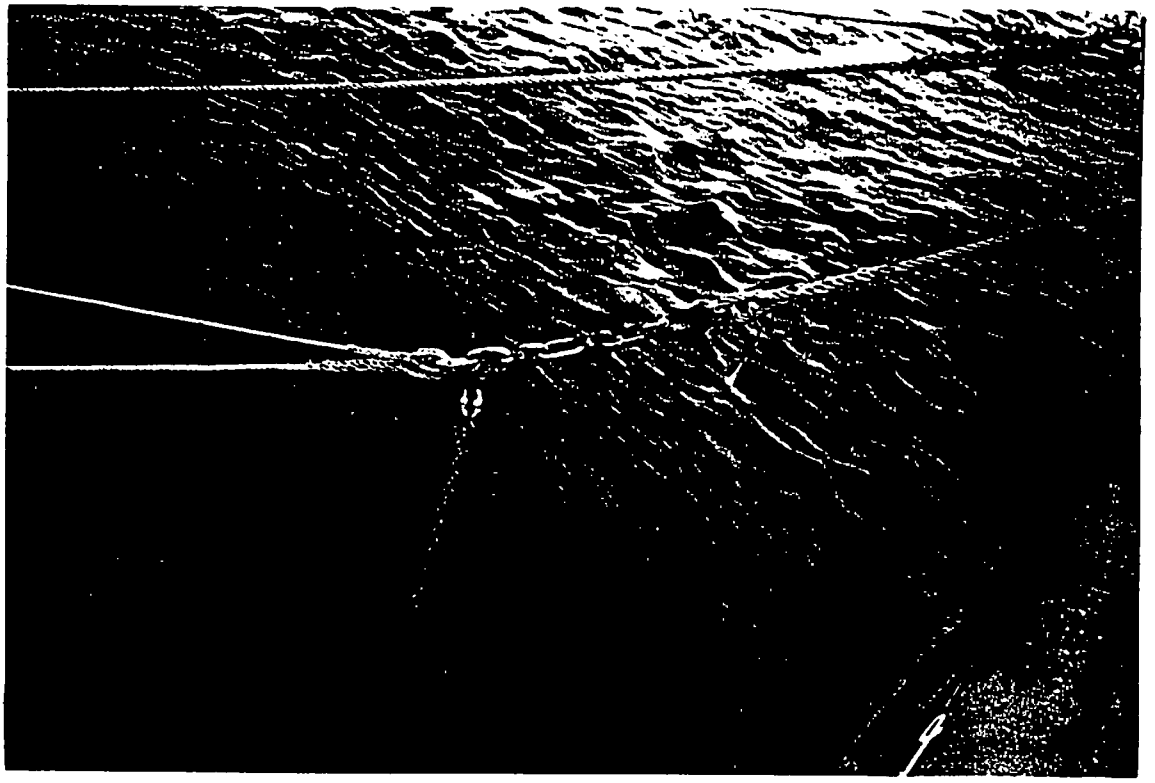
PHOTOGRAPHS SHOWING THE 'SLEDGE' FITTED WITH THE ADDITIONAL WEIGHTS.



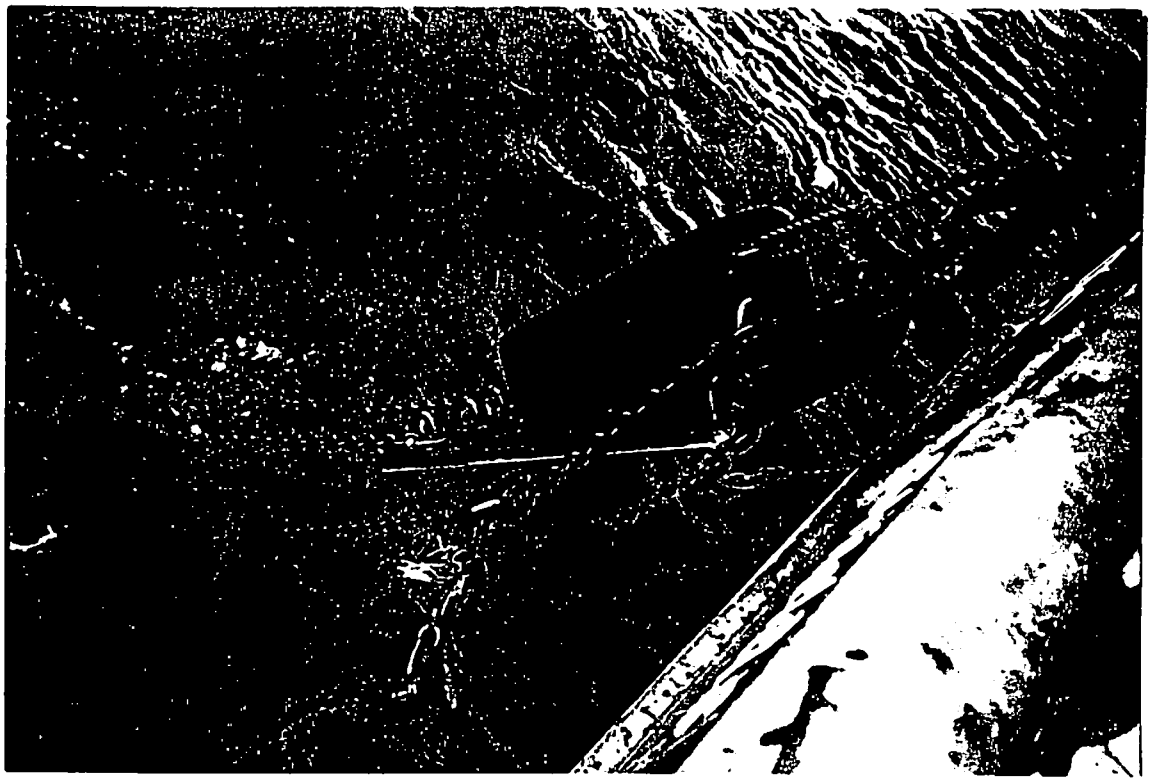


PHOTOGRAPHS SHOWING THE CHARTERED VESSEL 'LAURA EVE' (SN 54).

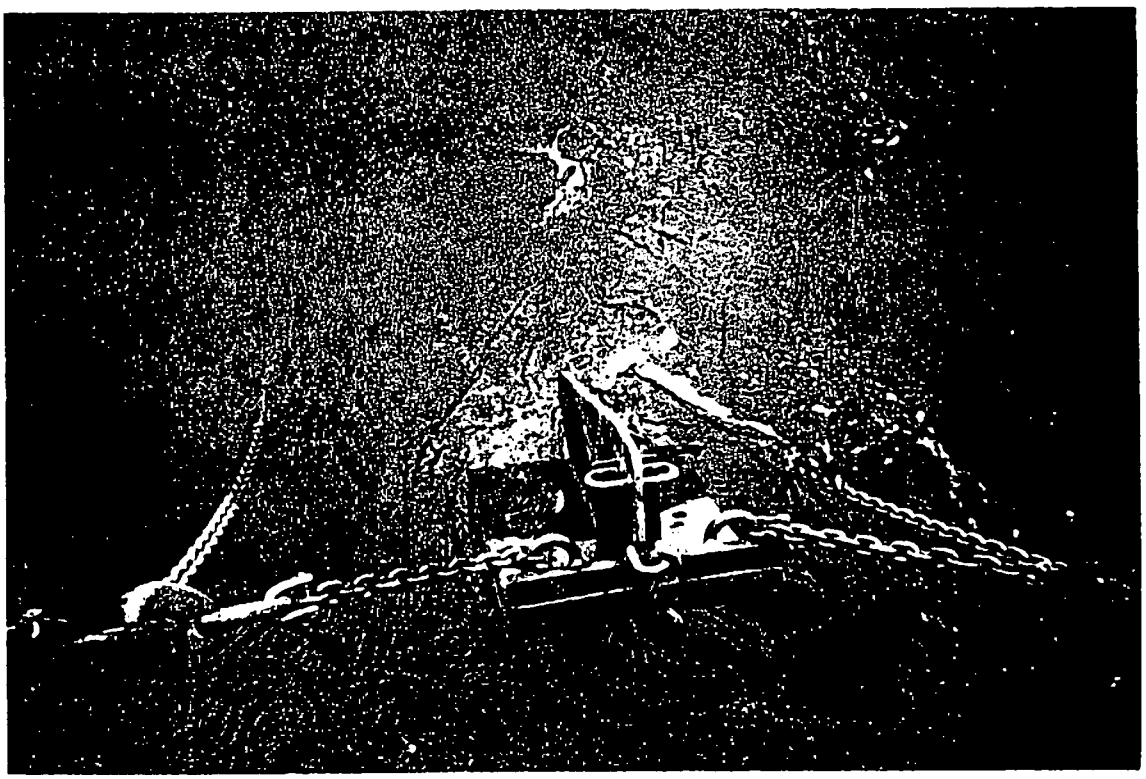
PHOTOGRAPH SHOWING CONNECTION OF SINGLE SWEERS AND SPLIT BRIDLES – SPLITTING POINT FOR CONNECTION TO NET-DRUM INHAULERS.

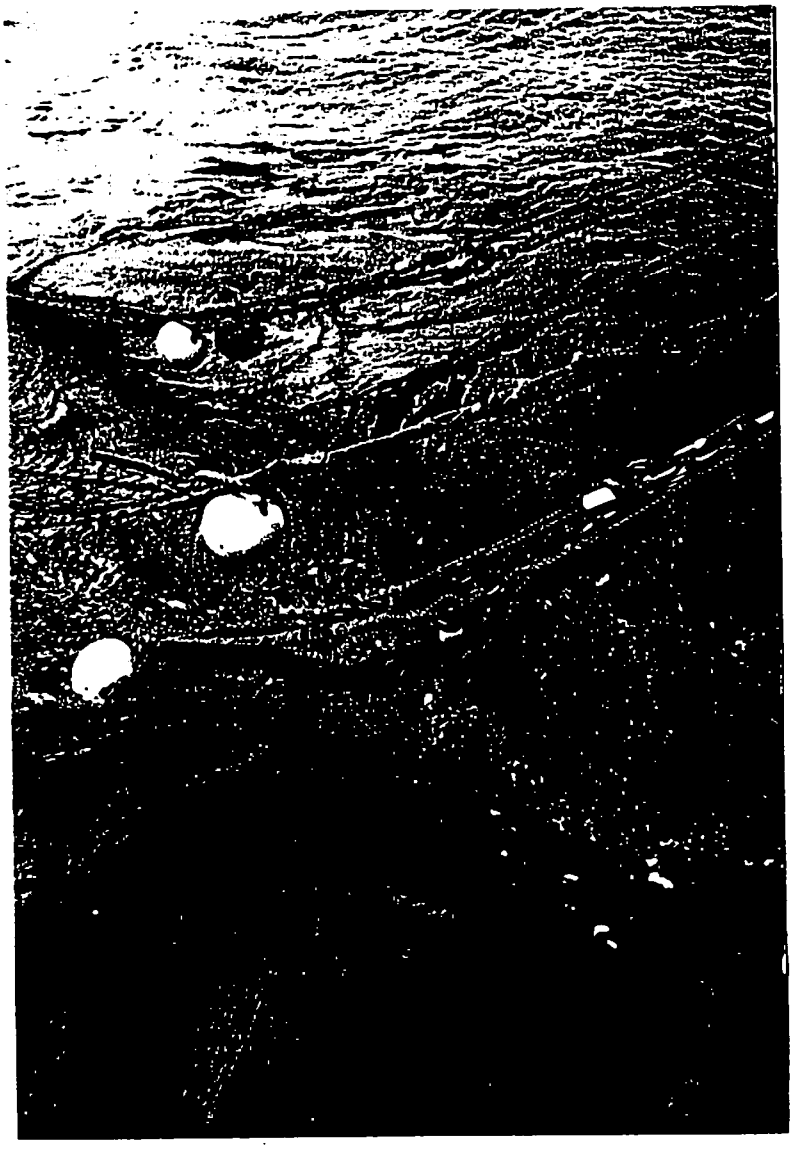


SLEDGE IN SECURED POSITION ON SLIP-HOOK DURING HAULING.

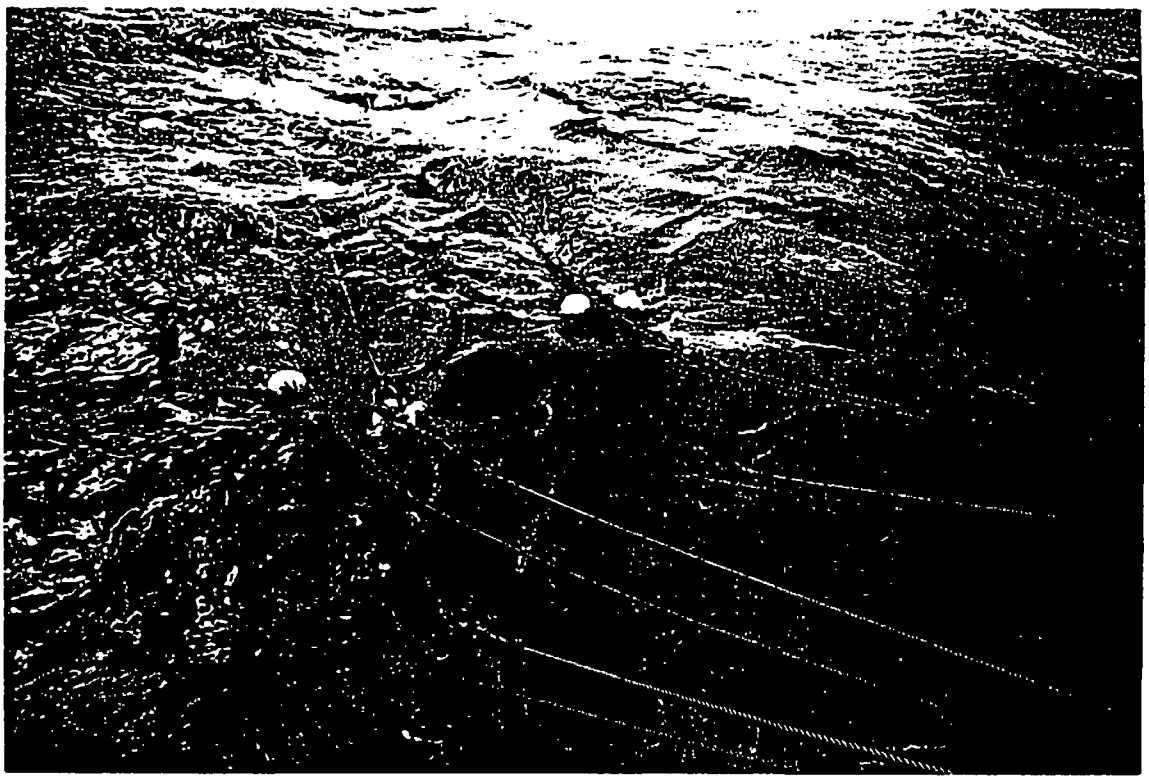


PHOTOGRAPHS SHOWING THE SLEDGE IN SECURED POSITION (ABOVE), AND JUST PRIOR TO SECURING TO THE SLIP-HOOK ARRANGEMENT (BELOW) DURING HAULING OPERATION.





NETS BEING HAULED ONTO NET DRUM.



PHOTOGRAPHS SHOWING PART OF HAULING SEQUENCE —

- BOTH NETS COMING UP TOGETHER SHOWING SPLIT BRIDLES (ABOVE).
- SPLIT BRIDLES CONNECTED TO NET DRUM INHAULERS (CHAIN) JUST PRIOR TO HAULING ONTO NET DRUM. [SINGLE SWEEPS DISCONNECTED ON STBD. SIDE (LEFT OF PHOTO) BUT STILL CONNECTED ON PORT SIDE (RIGHT OF PHOTO.)].