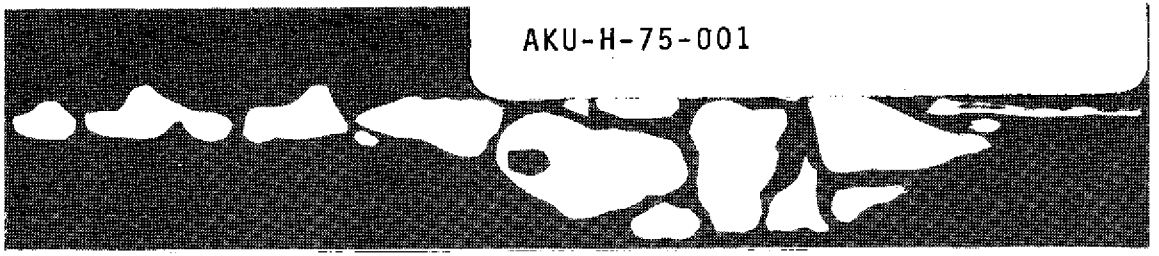

Operation and Construction of the Plumb Staff Beam Trawl

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Operation and Construction of the Plumb Staff Beam Trawl

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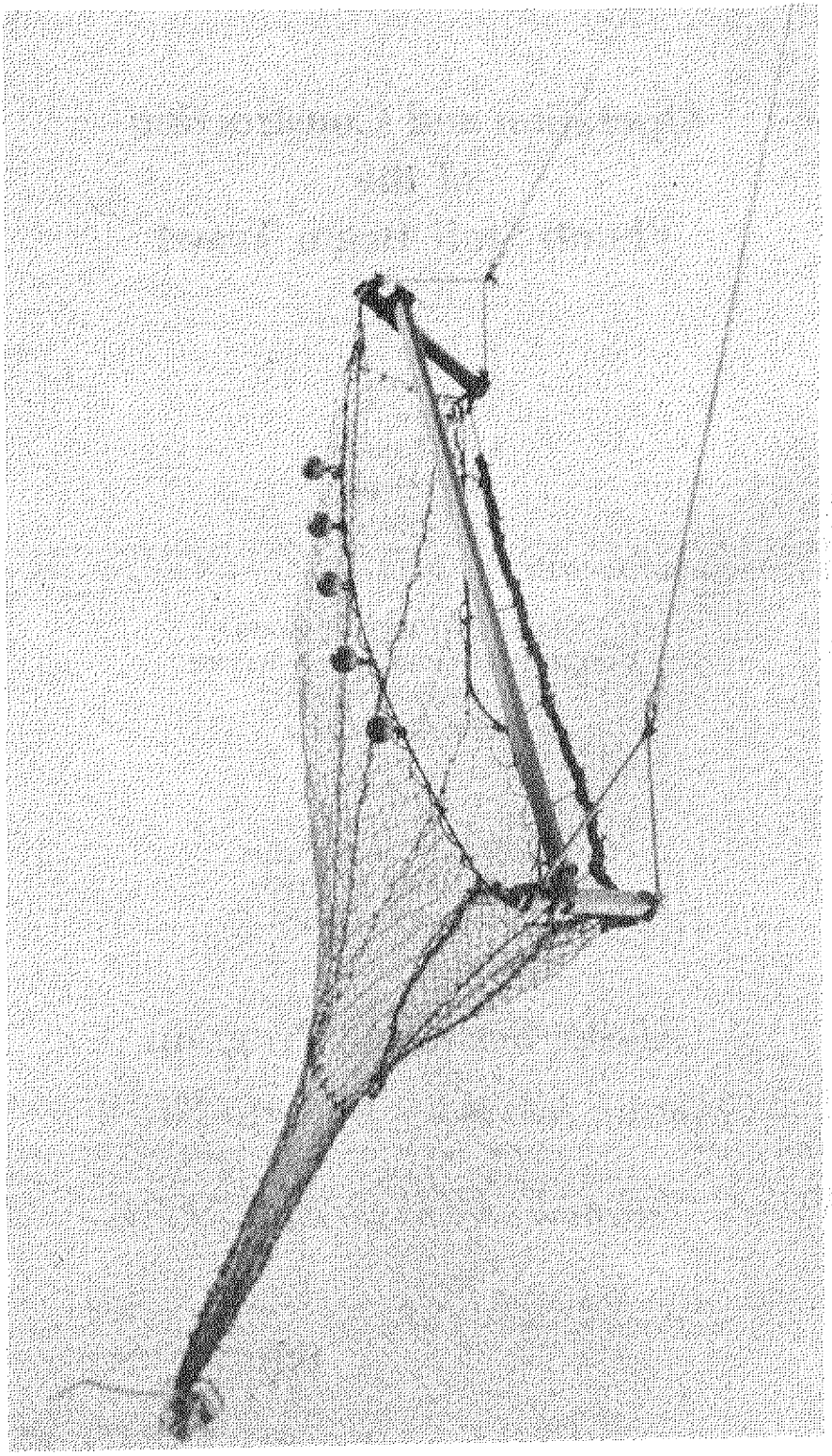


Operation and Construction of the Plumb Staff Beam Trawl

INTRODUCTION

The fishing gear and method here to be described is called a "Plumb Staff" type Beam Trawl. It differs from the conventional beam trawl in several respects, and mainly so because it employs a *detachable beam.*

Of Japanese origin, the plumb staff trawl was brought from Japan to British Columbia, Canada, several years ago, and has been in use there ever since. Rumors of its efficiency drifted, eventually, up to Alaska, where the **Exploratory Fishing and Gear Research Base,** Bureau of Commercial Fisheries (now National Marine Fisheries Service) at Juneau, Alaska, decided to test the gear in Alaskan waters. So, during the winter of 1967 two trawl-nets were built, one of Japanese design; the other was designed at the EF&GR Base, Juneau.

The initial test-fishing of these nets was done in Thomas Bay, near Petersburg, Alaska, in August, 1967, using a chartered gillnet boat. Twenty tows were made, with catches averaging slightly below 100 pounds of shrimp per tow. In addition to the shrimp, each tow yielded fairly large quantities of bottom-fish and tanner crabs, indicating that the mud rope was hung incorrectly and/or was too heavy, causing the net to 'dig' too much. It appeared, also, that some minor changes in the hanging might be desirable.

Test fishing was resumed during the latter part of July, 1968, from the BCF vessel SABLEFISH, stationed in Kasitsna Bay in lower Cook Inlet. For these tests the mud rope was re-constructed, a few minor changes were made in the hangings of the two nets, and the beam was shortened from 32 to 30 feet.

Sixteen tows were made, eight with each net. The BCF-type net was fished for a total of 3 hours and 40 minutes, yielding a total of 2,900 pounds of shrimp, or 790 pounds per hour of towing. The Japanese-type net was fished for a total of 3 hours, 20 minutes; total catch was 1,250 pounds of shrimp, or 375 pounds per hour of towing. In addition, an average of 13 crabs — of mixed sizes and species — plus 70 pounds of fin-fishes, mostly soles, was caught per tow.

Incomplete — too short — as these two test-periods were, the results appear to be promising. Further tests and a bit of experimenting would, no doubt, result in a still better and more efficient net. Such experimenting will be the business of the individual fishermen using the net in future years.

Judging by the numbers of bottom-fishes caught in the test-hauls, a fin-fish trawl of this type should do rather well, especially on flat fishes—flounders and soles. Therefore, a diagram for a fin-fish trawl has been added.

OPERATING THE PLUMB STAFF TRAWL

Before explaining the mechanics of the use of a plumb staff trawl it may be well to emphasize that this type of trawl is designed, strictly, as a "one-man" piece of fishing gear, to be operated from a one-man boat equipped with a net-reel. A net-reel may be mounted on boats of various sizes and shapes, of course — but at a cost, mind you. A proper net-reel properly mounted and driven does not come cheap. A *"Mickey-Mouse"* reel, poorly made and/or improperly installed and driven will be more costly still, in the long run. A gillnet boat, however, is already equipped with such a reel, hence this type of trawl is of particular interest to gillnet boat owners.

In certain areas of the Pacific Coast — such as the coast of British Columbia, Canada — salmon gillnet fishermen have put the plumb staff trawl to good use, fishing for shrimp for the fresh fish market. Shrimp caught in the forenoon, cooked in the afternoon, and brought to market the following morning (less than 24 hours after capture) must of necessity be a first-rate product, bringing prices far and away over what is being paid for shrimp caught by large vessels and held on board for several days. Therefore, the day-fisherman's catch need not be measured in tons in order for his fishing operations to show a profit.

Size of boat is not important; neither is horse-power — the plumb staff trawl is easy to tow. The net-reel, on the other hand, is very important. It must be solidly anchored, have a dependable drive (whether mechanical or hydraulic), and also have an extra strong (reinforced) core. There may be a considerable amount of strain on the warp during the recovery of the net; a nylon line, put on the reel under strain when wet will shrink as it dries. Hence, it may crush an ordinary (single-wall) reel-core like an eggshell. So be sure that your reel is of proper strength *before* you lay your warp onto it! Also, a brake must be supplied, in order to prevent the reel from turning too fast when setting the net and warp.

Warning: Boats not equipped with net-reel should not attempt to fish the plumbstaff trawl. Tests have shown that hauling the warp by means of a gypsy-head (or winch) and recovering the net by 'block 'n tackle' require *at least* two men. Also, this method of fishing is much too slow; loss of time between hauls is large enough to prohibit a profitable operation. On the other hand, for the well appointed gillnet boat the plumb staff trawl offers an excellent opportunity for a profitable one-man fishing operation.

Warp

A rope warp, Nylon or Polypropylene, will serve, but a 3/8" wire rope (often called "cable") is much to be preferred. The wire rope must be long lay (soft), galvanized, or aluminum dipped. A stainless steel wire rope makes the best possible warp. Stainless steel being much stronger than ordinary wire rope, its size can be cut from 3/8" to 5/16". Stainless steel rope is costly; but every so often one may find such rope on sale at prices comparable to ordinary wire rope. Distributors sometimes

offer stainless steel wire rope at very attractive prices. Thus, it pays to investigate before buying.

Whether of fibre rope or wire rope, warp should be marked before being laid onto the reel. Markings are made by sticking or splicing in a short strand of rope (or wire, if wire rope) at the appointed place: 1 marker for 25 fathoms, two markers—about six inches apart—for 50 fathoms; one for 75 fathoms —two for one hundred fathoms, and so forth. Be sure to anchor your marker so that it won't work itself loose; re-marking the warp is a time-killer. Also be sure to fasten "the bitter end" securely to the core of the reel when starting to lay your warp on the reel for the first time.

If a rope warp is used, give a scope of 3:1 — 150 fathoms of warp in 50 fathoms of water. On shallow water, (25 fathoms or less) a 4-to-1 scope is recommended. With a wire rope warp, scope may be cut to 2 to 1—3 to 1, respectively.

The bridle connecting the warp to the plumb staffs is eight fathoms long, with a 3/8-inch swivel at its apex; the warp is spliced into one loop of the swivel. The port leg of the bridle is spliced into the other loop of the swivel; the starboard leg of the bridle connects to the swivel by means of a snap-hook, as it must be disconnected when net is recovered.

A weight of 40 to 50 pounds, equipped with a snap-hook, is hooked onto the apex of the bridle when setting, and unhooked when hauling, before the net goes onto the reel. Let this weight hang three to four feet below the apex—on a stout rope—so that the weight may ride on the ocean floor without taking the apex (the bridle/warp connection) all the way down. Similar weights are fastened to the lower end of each plumb staff; these may be stationary or removable, according to personal preference. Also, the plumb staff weights may be cut down (made lighter) when plumb staffs and beam become waterlogged, Old chain, or old worn-out lead line will serve well as weights.

The towing bridle, as well as the short bridles between the towing bridle and the plumb staffs (see Fig. 10& 11) are best made of 1/2-inch hard lay (or braided) nylon rope.

Setting the trawl

First check your cod-end and make certain that the cod-end knot is properly tied! Go ahead at slow speed, throw cod-end overboard, and let the net run off the reel until the tips of the wings reach the stern roller. Now the reel is stopped, and the first end of the beam is hooked onto snap-hook in the starboard plumb staff. The port side wing-tip is made fast to a stern cleat while the rest of the trawl (headrope and footrope) runs out with the starboard wing pulling the net and beam aft and downward. The net will be standing somewhat crosswise until the last end of the beam reaches the stern roller, where it is attached to the port wing-tip (plumb staff) which has been untied from the stern cleat. As the port side half of the bridle is paid out, the net squares itself in the water and assumes its proper shape. The warp is

paid out—not too fast—as the boat goes ahead at a moderate rate of speed. The reel brake must be applied in order to keep proper strain on the warp; insufficient strain on the warp may cause the trawl to foul on itself—cause the cod end to drift forward and lodge on the beam, for instance. So a reasonable strain must be maintained until the net is on the bottom.

Towing

Towing by the reel should be avoided, as this places the pressure point too far abaft of center of the keel, and makes proper steering of the boat difficult, even impossible, at times.

If there is no winch or other solid fastening somewhere near amidships, make a strap of stout rope and put it as a choker around the base of the mast; when the proper amount of warp has been paid out, stop the boat for a minute while you fasten the warp temporarily to a stern cleat, unroll enough warp to reach the strap, and fasten the bight of the warp onto the choker-strap with a sheetbend knot. Untie warp from cleat; the strain will now be on the choker-strap as you resume towing speed. Now hook your boom-tackle onto the warp and hoist it up enough to clear the sides of the reel. When this is done you have full control of your boat, and may steer her on any course desired.

Hauling

The warp is hauled in until the bridle apex is inside the stern roller. The starboard side half of the bridle is unhooked from the swivel and made fast to a cleat. The reel is started again, causing the net to be lifted—somewhat "sidewise"—by the port side half of the bridle until the port end of the beam reaches the stern roller. Now the reel is stopped, the net is made fast to stern cleat, and the reel is turned back until the apex of the bridle is cleared, the port side half of the bridle being allowed to coil itself on the floor of the cockpit. Now the starboard side bridle is hooked back onto the swivel at the apex, and the reel is started. The pull on starboard side wing causes the beam to shoot up out of the water, while it is leaning against the stern roller, and pointing forward. When the beam has come about half-way in, and the point of balance has been reached, the beam will fall forward over the top of the pilot house, and nestle into its cradle. The rest of the net is now taken up on the reel, until the cod end comes up to the stern and can be lifted—or brailed—on board.

Try to avoid "hang-ups"—that is, bottom where your mud-rope may get caught in a rock—as a hang-up may break your beam. If you do hang-up, disengage the clutch at once, and start taking the net back. You will have to "kick 'er ahead" once in awhile in order to prevent a possible contract between your warp and your propeller, but do not go ahead any more than you have to before your net is lifted clear off the bottom. As soon as you are certain that your net is off the

bottom, go ahead slow speed until you get the net on the water.

If you should wish to fish on rocky bottom—for rockfishes, ling cod and the like, there is a way to do so without running the risk of hanging up and breaking your beam. It is quite possible to 'lift' the trawl high enough to clear the ordinary rocky bottom; this can be done by using drop-chains. Here is how.

Drop-chains.

Drop-chains are short lengths of chain which are fastened to the mud-rope by one end only, so that the chains "drop down" when the net is above the ocean floor.

When drop-chains are to be used, the weights at the plumb staffs—at the ends of the mud-rope—must be removed. The weight of the several drop-chains combined, must be (about) equal to that of the two removed end-weights, and at least heavy enough to take the trawl and beam down to the bottom. The net is then "lifted," by means of extra floats added to the ones already on the head-rope, up to the desired distance above the ocean floor.

The proper number of floats can be determined *only* by the trial and error method—by experimenting. The best place for such experiments is on shallow water, where the bottom is covered with gravel or hard, preferably coarse, sand. Shallow water allows for less time wasted on the experiments, as a shorter warp saves time. Length of drop-chains depends, in some degree, on the size of chain used; if a 5/16-inch, each chain may have to be 8 or even 9 feet long. A heavier chain may be shorter, but the drop-chains should be no less than 6 feet long.

You want your net to travel 5 feet above the bottom of the sea. Your drop-chains are 6 feet long; paint the lower 3 feet of each drop-chain with a cheap, not-too-good paint. The paint will wear off (or show signs of wearing off) when the chain drags on the gravel/sand bottom. If paint has been worn off (or damaged) on 2 feet of chain, your net is traveling only **four** feet from the ocean floor; add two or three floats, and try again. If paint shows no sign of wear at all, you have too many floats on your head-rope, and you know that your net is traveling more than 6 feet up in the water, although you don't know just where. So remove two or three floats and try again. You may have to remove or add floats several times—it's strictly a matter of judgment; no scientific formula can help you here—the "trial and error" method is the only one available. Therefore, you may have to add and subtract and add again, but when you find that one foot-long piece of the chains are dragging on the bottom you know that your net is where you want it to be—just 5 feet above the ocean floor.

Hang one drop-chain at each end of the mud-rope, near the plumb staffs, then divide the rest of the chains evenly between the two. The line used for fastening the chains to the footrope should not be overly strong, double hanging twine will do very nicely; in case of a chain getting caught between two rocks on the bottom, the fastening should break before the strain becomes heavy enough to break your beam.

TO BUILD A TRAWL

A trawl is a most efficient tool for catching fish when working the way it was designed to work. Also, the trawl is a fairly sensitive piece of gear; a mistake in its construction may well kill its efficiency.

Most trawls—in fact, practically all trawls now in use in the commercial fisheries in the North Pacific—are made in commercial net-lofts by well trained web-men, and sold to the fishermen, generally on a "cost-plus" basis (materials plus labor plus a certain percentage of profit to the seller). Commercial fishermen have found this to be the fastest, safest and least expensive way of acquiring a trawl. Naturally so, because the net-loft pays less for the materials than what a private fisherman would have to pay; and, at last but not least, the trawl will be built by experts who rarely, if ever, make a mistake in its construction.

A fisherman who wants to build his own trawl must, first of all, be a competent web-man. But, being a "good" web-man is not sufficient, in this case, because a trawl is created by the joining together of a number of pieces of web of different shape (tapers), and of various mesh-size, too, sometimes. Therefore, the sould-be trawl-builder must know the terminology of trawl-work, know the difference between a 'mesh' and a 'point', between a 'fast' taper and a 'slow' taper, for instance. He must be able to read the diagram—or blue-print—of the net he is about to build, and he must know how to shape each piece of web exactly as called for in the diagram. In order to do so he must know the system, or formula, for shaping web—called "cutting the taper", in the vernacular of the trade.

Does all this sound somewhat frightening? Well, it is not, really. True—building trawls is rather exacting work. But, any competent web-man can learn how to do it—although not overnight. Learning how to cut tapers, and how to sew the different tapers together, properly, require a deal of study, a deal of 'trial-and-error' experimenting, plus a will to turn out a fishable trawl-net.

Tapers may be sewn together by a single "point-to-point to second bar seam", as shown in Figs. 6 & 7. Be aware that, while the first cardinal rule in web-work—"four bars to each mesh" is still in effect, the second cardinal rule of "four bars to each knot" cannot be followed when sewing tapers together, due to the fact that here you are dealing with both points *and* bars, that is, with two-bar knots (points) and also with three-bar knots (bar). Hence the finished seam will show three-bars, four-bars and five-bars knots. This must be so done, in order to follow our first and most important cardinal rule of "four bars to one mesh".

A somewhat slower, but ever so much stronger method of joining together the tapered sections of a trawl is to use the old "double-seam". Gather 3 (or more) bars in your left hand, tie them together with a single knot; on the next mesh down, take a turn 'round the three bars, then go on down to the next mesh below, where you again make a knot over the three bars. (Fig. 8.) When both sides (tapers) have been so tied, bring the two together—be sure they are even, "mesh-by-mesh" when you

start to sew, and sew them together as shown in Fig. 9, following the system of 'one knot, one turn', as before. This type of seam will give you more work, true; it will also give you a much stronger and more trouble-free net. For a net of plumb staff-trawl size the three-bars seam is sufficiently strong; on larger nets, a five-bars (or more) seam is commonly used.

Note: Three bars equal 1¼ mesh. If the web is tapered on both sides, the seam described above will require three meshes, which must be added to the given number of meshes before you cut the tapers: instead of 400 meshes wide, cut 403.

PLUMB-STAFF SYSTEM BEAM TRAWL (B.C.F. TYPE) SHRIMP TRAWL

The net—with the exception of the cod end, which should be of No. 18 web, 1⅝" stretch mesh (S.M.) — may be made from No. 12 *or* No. 15 Nylon web, 1½ S.M. Wedges (fig. 2) may profitably be cut from 3-inch S.M. , or slightly larger, mesh. (Used salmon-seine web will suit the purpose very well). This will help reduce the amount of mud, trash and small bottom fish going into the net. A center bottom section of large (10-inch) mesh (see fig. 5) will allow still more groundfish to escape. This section, if used, should be hand made, from No. 60 Polypropylene twine, 10-inch mesh, double-knotted.

The net will require about 1300 meshes, 200 meshes deep.

NOTE: if a 1⅝-inch mesh is used instead of the suggested 1½-inch, the net will be 50 inches (4 feet, 2 inches) longer on both head-rope and foot-rope. Seams (two types) for joining the various pieces of web together are described in section "To Build a Trawl"

For the headrope, 1/2-inch diameter Polypropylene, preferably solid braid, is recommended. For the footrope, use 1/2-inch Nylon, hardlaid. Lanyards (for attaching mud-rope) may be made from 1/4-inch Nylon, Polypropylene, or Polyethylene.

An excellent mud rope may be made from discarded gillnet (Nylon) web by twisting the web into a rope 2 to 3 inches in diameter and wrapping it (solid wrap) with 12 or 15-thread Manila or Polypropylene rope. If gillnet web is not available, four (4) parts of 15-thread Manila rope may be substituted, wrapped as above. *The mud rope should be 18 to 20 inches shorter than the footrope.* If Manila, or some other shrinkable material is used, mud rope and foot rope should be of *almost* equal length.

Hanging the net

The head-rope is 38 feet long (exclusive of the loops that go onto the plumb staffs). Hangings should be 3.5 inches apart, 130 hangings in all. Three (3) meshes per hanging will absorb 390 meshes. The hood is 400 meshes wide, thus 10 meshes will be left. In order to utilize these 10 meshes, hang four (4) meshes to each hanging on 10 hangings, five (5) on each side of the head-rope.

The *foot-rope* will be 42-43 feet long, loops excluded. Hang stretched mesh on 3-inch hangings, except the center piece which should be 'hung in' 20 - 25 per cent, or 2½ to 2¾ meshes per 3 inches of rope.

Breast ropes, of ½-inch (or ⅝-inch) Polypropylene should be 30 inches long between the head-rope and the foot-rope. The ends of the breast ropes may be spliced into the lines, top and bottom, or loops may be made for hooking onto the plumb staffs. The former method is recommended.

The *mud rope,* as described, is attached to the foot-rope by means of short (approximately 18 - 20 inches) pieces of Nylon or Polypropylene line, ¼-inch diameter. These lines (lanyards) are placed 30 - 36 inches apart; they should be connected to the mud rope in such a manner that there will be not less than 6 inches clearance between the mud rope and the foot-rope. The ends of the mud rope are lashed to the foot-rope adjoining the plumb staffs. Weights of 30 to 40 pounds—chain, or worn-out leadline—are found around the mud rope adjacent to the plumb staffs on both sides of the net.

Plumb Staffs, one at each wing of the net, as shown in fig 10 and 11, should be made of oak, 36 inches by 2½ X 2½ inches. If made of soft wood (spruce, hemlock, fir), diameter should be increased to 3 X 3 inches (instead of 2½ X 2½ inches). Two ¾-inch holes are drilled at points P and P 1 through which loops M and N are forced. Approximately 1 foot (12 inches) from the top a snap-hook is fastened to the plumb staff to which a wire or rope grommet (R), rove through a hole in the beam, will be attached.

The *beam,* 30 feet long, 3½ X 3½ inches, is tapered slightly towards its ends and has two holes drilled on each end to receive grommet (R) as shown in fig. 10. The beam is detached from the plumb staff when the net is recovered; beam and net are brought onboard separately. Spruce, hemlock or fir may be used; a very useable beam may be made by laminating four (4) 1" X 4" boards together, if a good grade galvanized nail is employed.

During a series of test hauls made in Kachemak Bay, in July, 1968, experiments were made with beams of different lengths, from 32 to 27 feet. Hauls made with the shortest length (27 feet) gave the best results; this would indicate that a somewhat shorter spread, with the resulting higher roof (larger vertical opening) is the most effective.

This indication should, however, be subjected to further tests. By making the beam 30 feet long, and drilling holes for connecting-eyes (grommets) at 12, 24 and 36 inches from each end, the working length of the beam may be adjusted downward, 2 feet at a time, without cuttting the beam.

On grounds where the shrimp hug the bottom and may be partly buried in the mud, the wider spread would be the most effective. On grounds where the shrimp keep *off* the ocean floor, the higher vertical opening would give the better results.

BEAM TRAWL. (B.C.F.) PLUMB STAFF SYSTEM.

Fig. 1

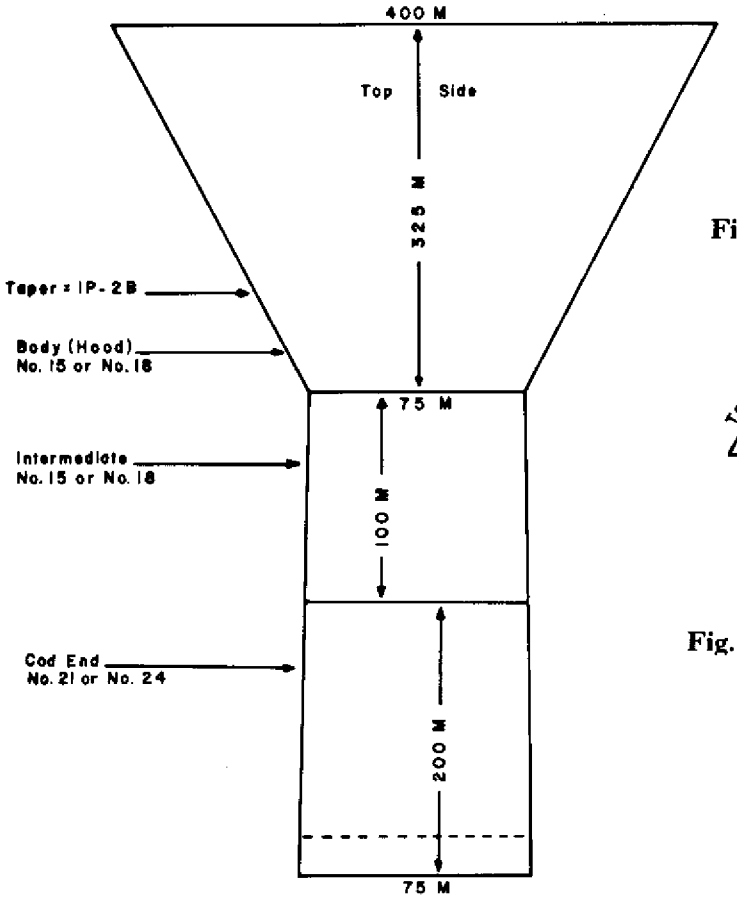


Fig. 3

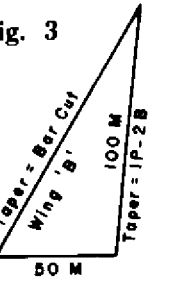
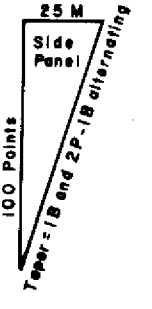
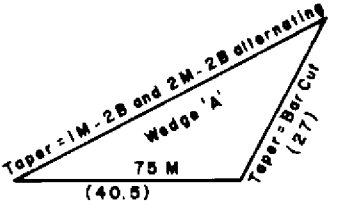


Fig. 4



Not to scale.

Fig. 2



Note: If wedge 'A' is made from 3-inch mesh, use numbers in ( ).

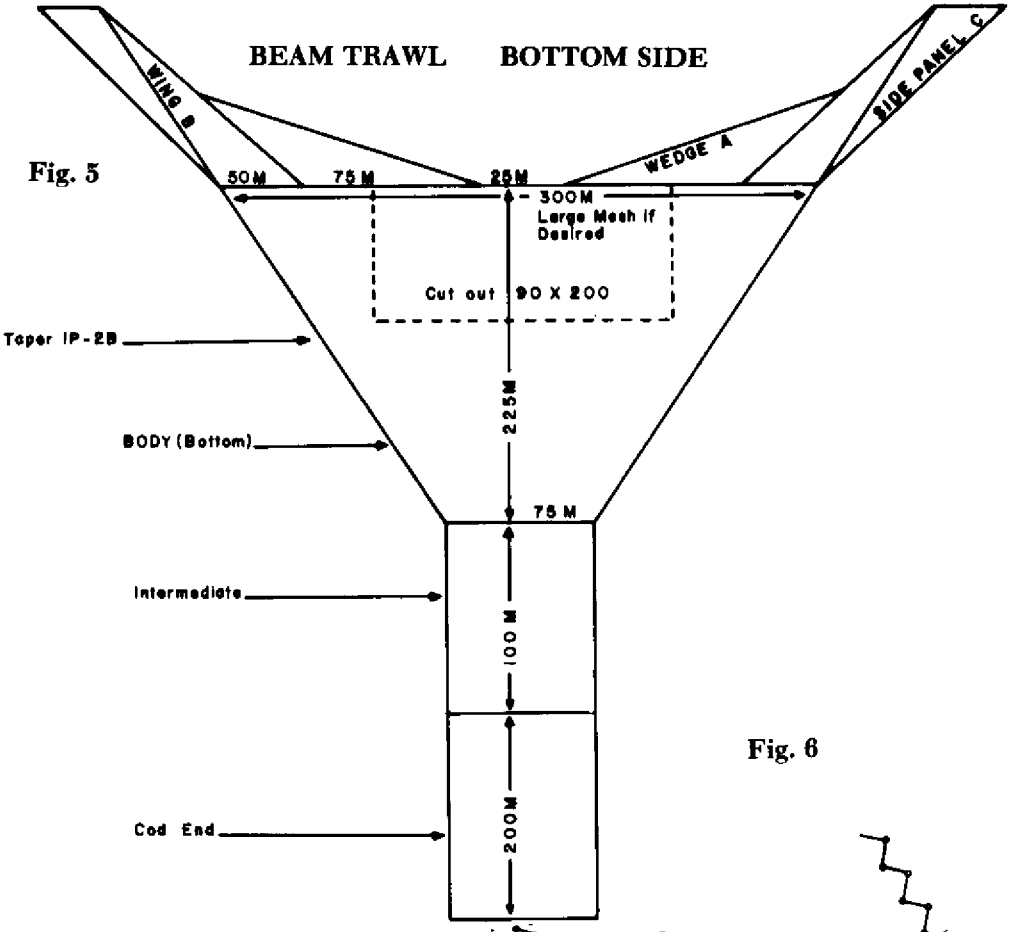
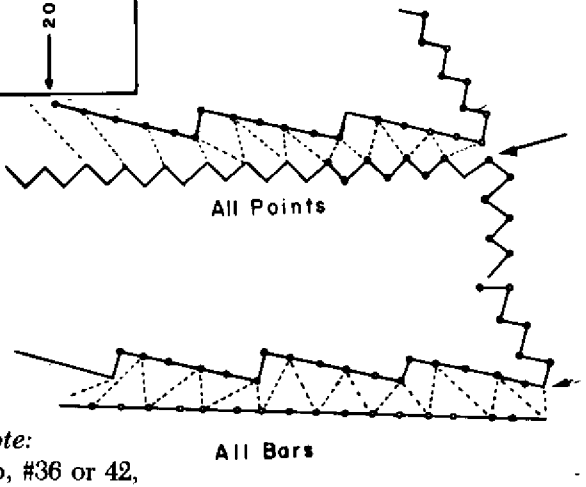


Fig. 5

Fig. 6

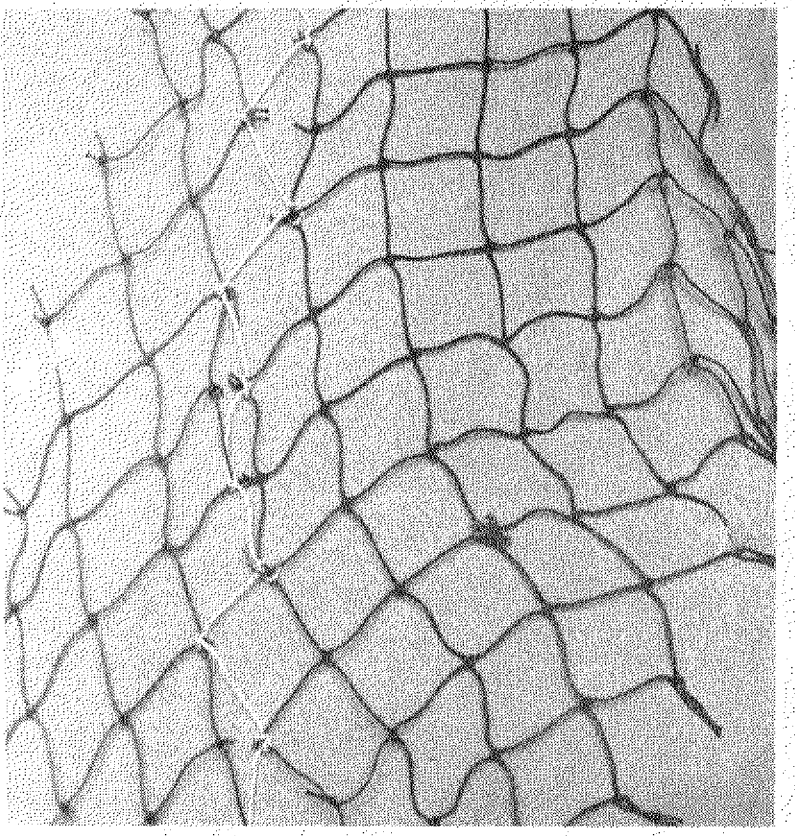


Note:

Wedges 'A' may be cut from 3-inch web, #36 or 42, to help eliminate mud, trash and bottom fish.

Also, a section 90M deep and 200M long may be cut out of the bottom (see fig. 5) and replaced with a large (10-inch) mesh, preferably made of polypropylene twine #60.

Fig. 7



Point-to-point to second bar seam.

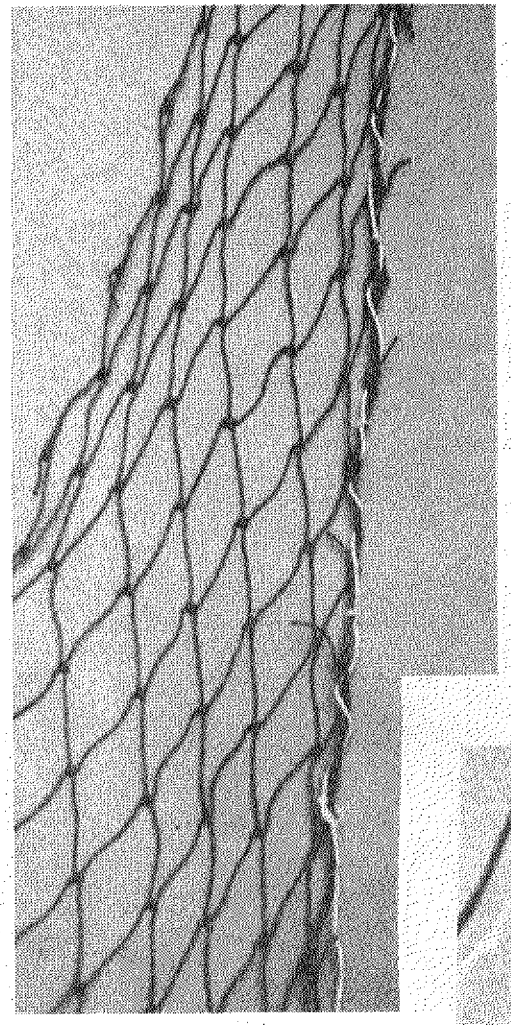


Fig. 8

One-half of 'double seam.'

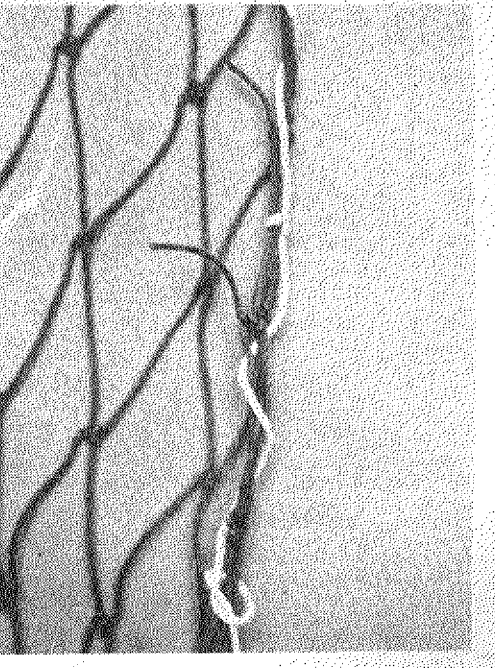
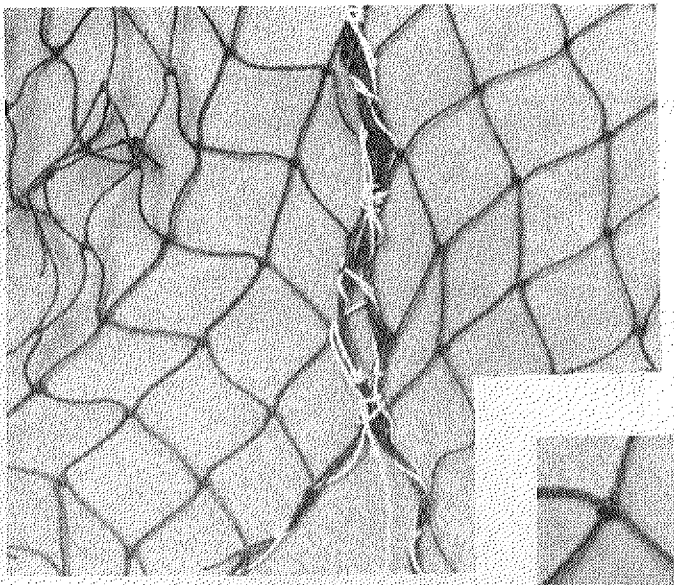


Fig. 8A

Detail of one-half
of 'double seam.'

Fig. 9.

Joining the two halves on a 'double seam.'



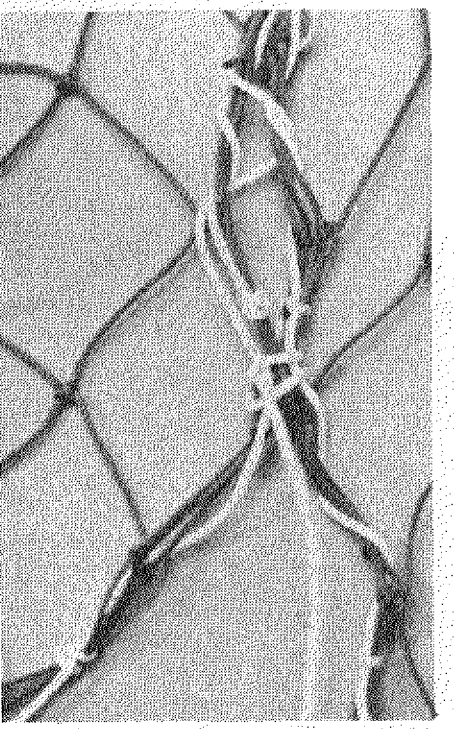


Fig. 9A

Detail of joining the two halves on a 'double seam'.

Fig. 10.

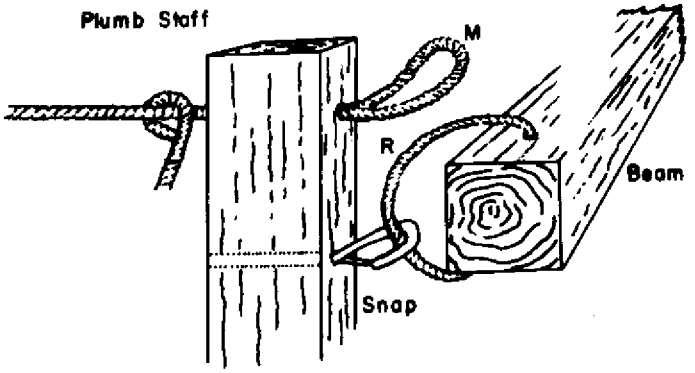
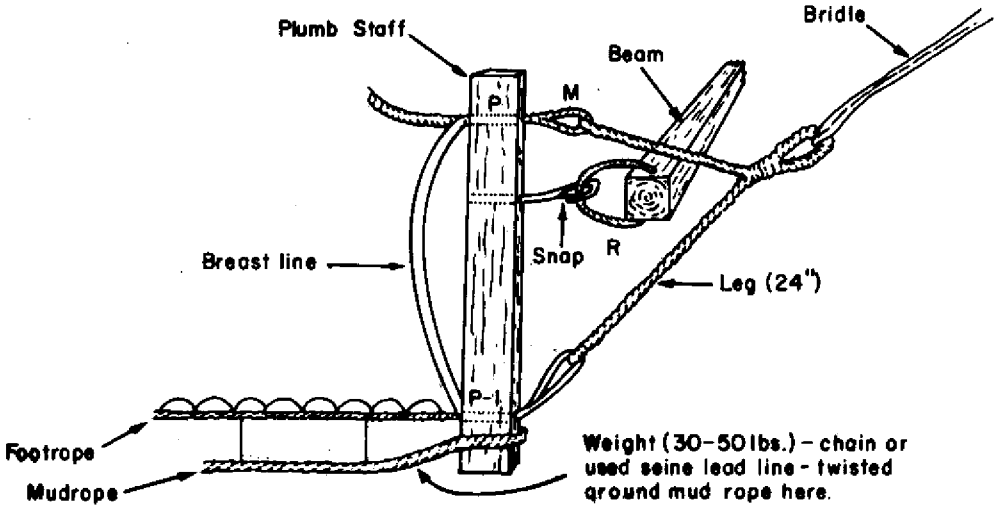

Plumb Staff
M
R
Beam
Snap

Fig. 11.


Plumb Staff
Bridle
Beam
P-1
M
Snap
R
Breast line
Leg (24")
P-1
Footrope
Mudrope
Weight (30-50 lbs.) - chain or used seine lead line - twisted ground mud rope here.

Warp, with 3/8-inch swivel, and apex of towing bridle, showing snap-hook on starboard leg of bridle.

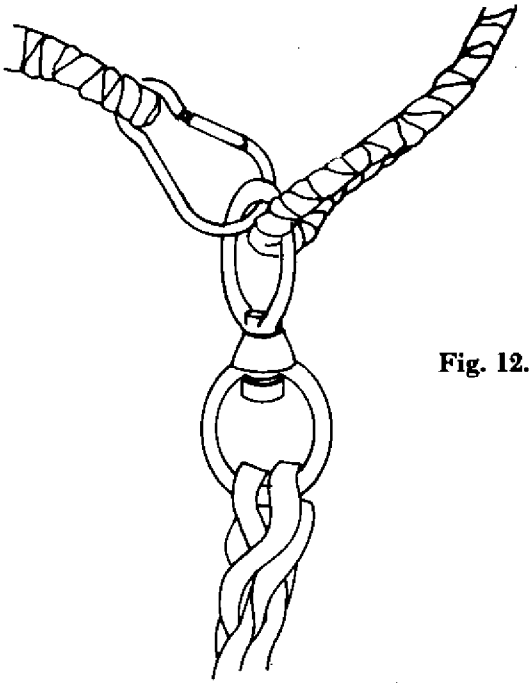


Fig. 12.

Swivel, and two types of snap-hook. Snap-hook on the right is the better of the two.

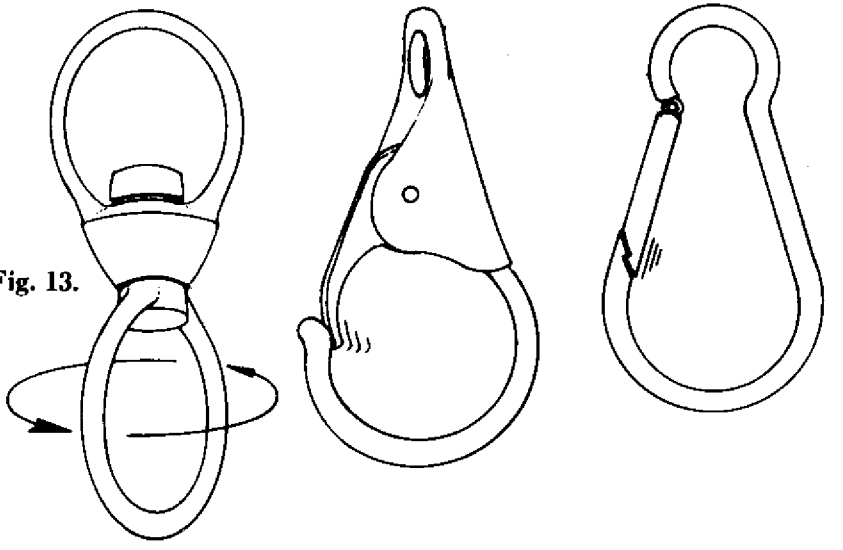


Fig. 13.

PLUMB STAFF BEAM TRAWL — Fish.
(B C F type)

Not to scale.

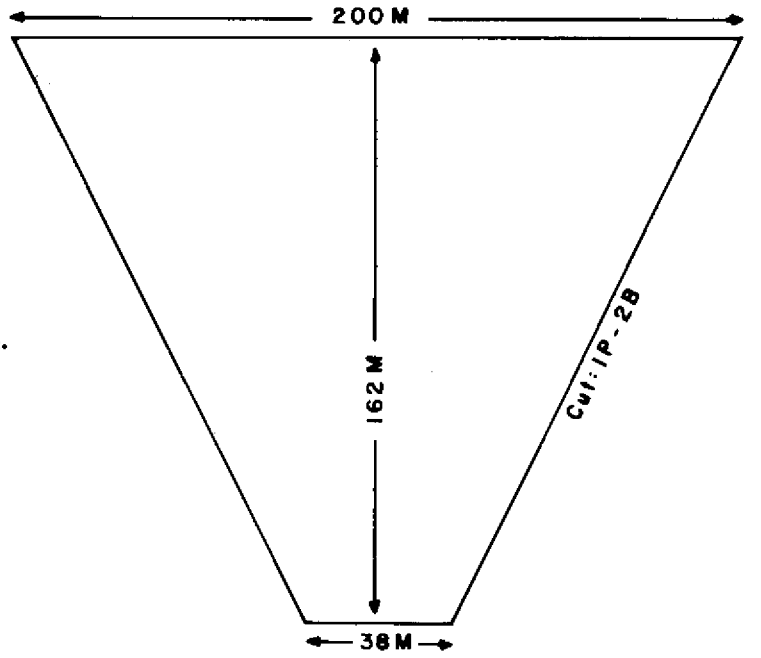


Fig. 14.

Materials: 3½" S M web, # 36 for top, #42 for bottom & wings.
Intermediate, #60, cod end #72. Intermediate may be 100M D or 50 M D, depending upon size of boat.
Cod end should be no less than 50 M D.

Head rope is 5/8" Polypropylene, foot-rope 3/4" Polypropylene.
Mud rope, two (2) feet shorter than foot rope, may be made from discarded gillnet web (nylon) twisted into a rope and wrapped with 3/8" or 1/2" manila rope.
Mud rope should be not less than three (3) inches in diameter.

Hanging. S M width of the top is 58'8"; when hung in 25% the head rope will be 43' 9" exclusive of eyes, each end.
Foot rope will be approximately 50 feet. Start hanging at the center of the net; do not splice 'eye' in either end before the exact length of foot rope is known.
Hang bar cut (wing tips) stretched mesh; hang wedges and bosom in by 20 per cent.
Side panels (c) should be evenly distributed on a 36" breast line, of 5/8" Polypr.

When cutting panels, wings, etc., add three (3) meshes each side to given number, to allow for seam. All tapered seams: gather five (5) bars from each side into a gore, knot on each bar.

Polypropylene or polyethylene web is recommended.

List of materials.
#36 web — 300 meshes long x 100 meshes deep
#42 web — 200 meshes long x 100 meshes deep
#60 web — 80 M L x 100 M D
#72 web — 50 M L x 50 M D

Polyprop. rope: 60 feet 5/8". 60 feet 3/4"

Bottom of Plumb Staff Beam Trawl-Fish.

Not to scale.

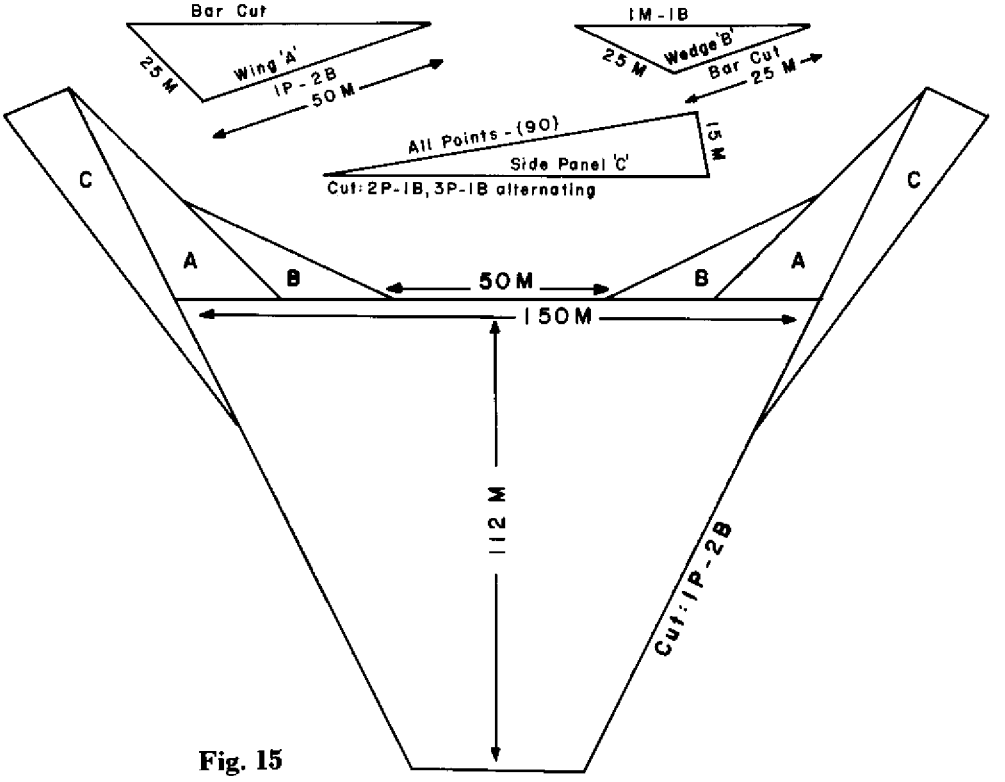


Fig. 15