

DESIGNS OF TRAWLING GEAR

by

G.K. Kuriyan,
A.V.V. Satyanarayana and
R.S. Nair

Central Institute of Fisheries Technology,
Cochin, Kerala, India

 ABSTRACT

The paper relates to the development of new designs of trawls for shrimps for operation from smaller mechanised boats upto 55 ft in length on the South-West coast of India.

Scofield (1948) while reviewing the trawling gear in California states that "this manner of fishing has shown itself to be very efficient in taking deep water fishes in large quantity at low operating cost". Further according to him the capture of demersal fishes by means of lines and entangling nets "require more men, working longer hours for a smaller catch". Trawling is an important fishing method in the Pacific and Atlantic Oceans. (Knake and White Leather, 1945; Bullis, 1951, 1955; Scharfe, 1960; O'Grady, 1956; Symonds, 1947 and Saito, 1954). This method of fish capture is, however, not very common amongst the indigenous methods in vogue on the Indian sub-continent. Horneall in his classical works on the fishing methods of the Madras Presidency (1925; 1938) describes only the "Thuri valai"

of the Coromandel coast as a trawl gear. Introduction of improved trawling technique received considerable attention by the Bombay (Chidambaram, 1952) and Madras (Raj, 1931) Governments as early as the turn of this century. The establishment of the Deep Sea Fishing Station and a private fishing company at Bombay gave further impetus to these attempts. The vessels employed by all these agencies were of a fairly large class beyond the reach of small operators. In the year 1956, however, attempts made on the Kerala and Mysore coasts (John, *et al.* 1959) showed that small boat trawling is possible and profitable. In subsequent years many new small trawlers were built and were being operated successfully on these coasts.

Ever since the introduction of trawling on the West Coast of India, systematic investigations were being conducted for the improvement of the gear and the methods of operation. The two previous communications (Satyana-rayana *et. al.*, 1962) embodied descriptions of the designs of

trawl nets and otter boards initially introduced. The present communication, which is a continuation of the earlier works, describes the gear and accessories evolved subsequently. The sizes of the nets and boards and the boats from which they are operated are shown in Table I.

TABLE I

Size of Trawl net	Type	Specifications of Otter Board		Specification of boat	
		Length x Breadth in in.	Weight in lb.	Length in ft.	Horse power of Engine
47 ft	Four seam	42 x 24	70-80	30	30
60 ft 6 in.	Four seam	45 x 25	80-90	32	40
70 ft	Four seam	55 x 25	100-120	36	60
75 ft	Two seam	55 x 25	120-140	50	90
85 ft	Four seam	60 x 30	175-200	55	120

Designs of Nets:

The designs and constructional details of nets and otter boards are indicated below:

47 ft Four seam trawl net

i) Main dimensions:

Head rope:

47 $\frac{1}{2}$ ft, 6 ft at the bosom,
11 $\frac{1}{2}$ ft at the jibs and 9 ft
at the wings.

Foot-rope:

52 ft, 4 ft at the bosom,
7 $\frac{1}{2}$ ft at the jibs and 16 $\frac{1}{2}$
ft at the wings.

ii) Ropes:

Head-rope:

Manila rope of $\frac{1}{2}$ in. dia.

Foot-rope:

Manila rope of $\frac{3}{4}$ in. dia.
Both ropes extend 9 ft on either
side as legs;
Bloch-line; Manila rope of $\frac{1}{4}$ in. dia.

iii) Floats and Sinkers:

9 aluminium floats of 5 in. dia. having total buoyancy of 16 lb.; 50 numbers of lead weights each weighing $\frac{1}{2}$ lb.

iv) Otter boards;

Flat rectangular boards of size 42 in. x 24 in. and weight 70-80 lb each. (Satyanarayana et al., 1962).

The improvements incorporated in this design while compared with 45 ft four seam net earlier suggested (Satyanarayana et al. 1962) are:

- (a) Reduction in resistance by increasing the mesh size of wings, upper jib and square.
- (b) Increase in height of wings and
- (c) More tapering to the bag.

60 $\frac{1}{2}$ ft Four seam trawl neti) Main dimensions:

Head-rope:

60 $\frac{1}{2}$ ft; 9 $\frac{1}{2}$ ft at the bosom, 16 $\frac{1}{2}$ ft at the jibs and 9 $\frac{1}{2}$ ft at the wings.

Foot-rope:

68 $\frac{1}{2}$ ft; 8 $\frac{1}{2}$ ft at the bosom, 13 $\frac{1}{2}$ ft at the jibs and 17 ft at the wings.

ii) Ropes:

Head-rope:

Manila rope $\frac{1}{2}$ in. dia.

Foot-rope:

Manila rope of $\frac{3}{4}$ in. dia. Both ropes extend 12 ft as legs. Bloch-line; Manila rope of $\frac{1}{4}$ in. dia.

iii) Floats and Sinkers:

11 aluminium alloy floats of 5 in. dia. having total buoyancy of 19 lb. and 66 lead weights of $\frac{1}{2}$ lb. each.

iv) Otter boards:

Flat rectangular otter boards of size 45 in. x 25 in. and weight 80-90 lb. each. (Satyanarayana, et al., 1962).

In the earlier paper (Satyanarayana et al. 1962) a 55 ft four seam Nylon trawl was suggested for a 32 ft boat with a 40 h.p. engine. In 60 $\frac{1}{2}$ ft four seam net now described the following are the significant modifications.

- (a) Extra wings of bigger mesh are provided to cover more area.
- (b) The height of the wing is reduced.
- (c) Jibs are made straight and
- (c) The width at bosom is reduced.

70 ft Four seam trawl neti) Main dimensions:

Head-rope:

70 ft; 9 ft at the bosom, 25 ft at the jibs and 5 $\frac{1}{2}$ ft at the wings.

Foot-rope:

85 ft; 11 ft at the bosom,
18 ft at the jibs and 19 ft
at the wings.

ii) Ropes:

Head-rope:

Manila ropes of $\frac{1}{2}$ in. dia.

Foot-rope:

Manila rope of $\frac{3}{4}$ in. dia.
Both ropes extend 14 ft on
either side as legs.
Bloch-line: Manila rope of
 $\frac{1}{4}$ in. dia.

iii) Floats and Sinkers:

14-15 numbers of aluminium
alloy floats of 5 in. dia.
having total buoyancy of
about 25 lb. and 78 Nos. of
lead weights each weighing $\frac{1}{2}$
in. lb.

iv) Otter boards:

Flat rectangular doors of
size 55 in. x 25 in. and
weight 100-120 lb. each.
(Satyanarayana et al., 1962).

The 56 ft four seam net
described in the earlier work
(Satyanarayana et.al. 1962) is a
modified Norwegian design. The
present design (70 ft four seam
net) has been made following on
similar principles adopted for
the 47 ft and $60\frac{1}{2}$ ft nets.

75 ft Two seam trawl neti) Main dimensions:

Head-rope:

75 ft; 6 ft at the bosom,
 $14\frac{1}{2}$ ft at the jibs and 20 ft
at the wings.

Foot-rope:

92 ft; 4 ft at the bosom,
15 ft at the jibs and 29 ft
at the wings.

ii) Ropes:

Manila ropes of $\frac{3}{4}$ in. dia.
both for the Head and Foot
ropes. The ropes extend 15
ft on either side to serve
as legs. Bloch-lines for
the upper and lower webbings
are Manila ropes of $\frac{1}{2}$ in.
and $\frac{3}{8}$ in. dia. respectively.

iii) Floats and Sinkers:

15-16 Nos. of aluminium alloy
floats of 5 in. dia. having
total buoyancy of about 27 lb.
and 110-120 Nos. of lead
weights each weighing $\frac{1}{2}$ lb.

iv) Otter boards:

Flat rectangular otter boards
of size 55 in. x 25 in. and
having weight 120-140 lb.
each (Satyanarayana et.al.
1962).

The net is a new design.

85 ft Four seam trawl neti) Main dimensions:

Head-rope:

85 ft; 15 ft at the bosom,
25 ft at the jibs and 10 ft
at the wings.

Foot rope:

95 ft, 15 ft at the bosom,
20 ft at the jibs and 20 ft
at the wings.

ii) Ropes:**Head-rope:**

Manila rope $\frac{3}{4}$ in. dia.

Foot-rope:

Manila rope $\frac{3}{4}$ in. dia.
Both ropes extend 16 ft on
either side as legs.

Bloch line:

Manila rope $\frac{1}{4}$ in. dia. for
the upper part and the same
 $\frac{3}{8}$ in. dia. for the lower
part.

iii) Floats and Sinkers:

15-17 numbers of aluminium
alloy floats of 5 in. dia.
having total buoyancy of about
30 lb. and about 145 numbers
of lead sinkers each weighing
 $\frac{1}{2}$ lb.

iv) Otter Boards:

Flat rectangular otter boards
of size 60 in. x 30 in. and
weight 175-200 lb. each.

The net and otter boards are
new designs.

Method of trawling: Stern trawl-
ing technique is followed by all
the boats. The open and half
decked and some of the decked
boats, since they are not provided

with winches, resort to manual
operation of the gear. Thick
Manila, sisal or coir ropes are
provided as warps for the net.
These warps are tied while
towing to two wooden bollards
fitted on either stern quarter.
Each bollard is about 5 in.
square in dimensions and suitably
long for fixing firmly to string-
ers or floors. A similar rig-
ging has been described by Desh-
pande (1960).

Stern rollers: In some of the
boats of the 30 ft class, the
trawling warps are guided through
stern rollers (Fig. 7). This
device can be advantageously used
particularly in very small decked
boats to avoid heavy weights high
above the deck. The rollers are
fitted over the stern gunwale.

Gallows: Though various patterns
of gallows are in vogue, mainly
three types are at present com-
monly being used for stern trawl-
ing and the details of which are
shown in Figs. 8, 9 and 10. In
all these, the arrangement is to
take the otter board straight to
the gallow head clear of the deck
of the boat, which facilitates
easy handling of the net.

**(i) Single-gallow (Norwegian
type)**

In this type, the warp
leading pulleys are suspended
in an oval shaped strong frame
fitted at the head of the gallow,
which itself is fixed firmly
to the stern deck as shown in
Fig. 8(a). The method of hanging
the pulleys and the constructional
details of the pulleys are represented

in Fig. 8(b).

(ii) Single gallow (CIPT design)

This gallow is essentially similar in construction to the Norwegian type, but instead of the complicated oval head, a flat plate with arrangement to hang the warp leading pulleys is welded on top. The general constructional details of the gallow and its fixing to the boat is shown in Fig. 9(a), while the arrangement of the gallow head is shown in Fig. 9(b).

(iii) Double gallows

Two gallows, the constructional details of which are as

shown in Fig. 10, are provided on either side of the stern deck of the boat. To each of the gallow head, a pulley for leading the warp is hung, as shown in the figure.

The single gallow system is more popular with the 32 ft and 36 ft class trawlers.

Prototypes of net designs fabricated with cotton twines were tried in the fishing grounds between Cochin and Alleppey at depths ranging from 7-15 fathoms. The warp released was five times the depth of operation.

The catch details for these trial operations are presented in Table II.

TABLE II

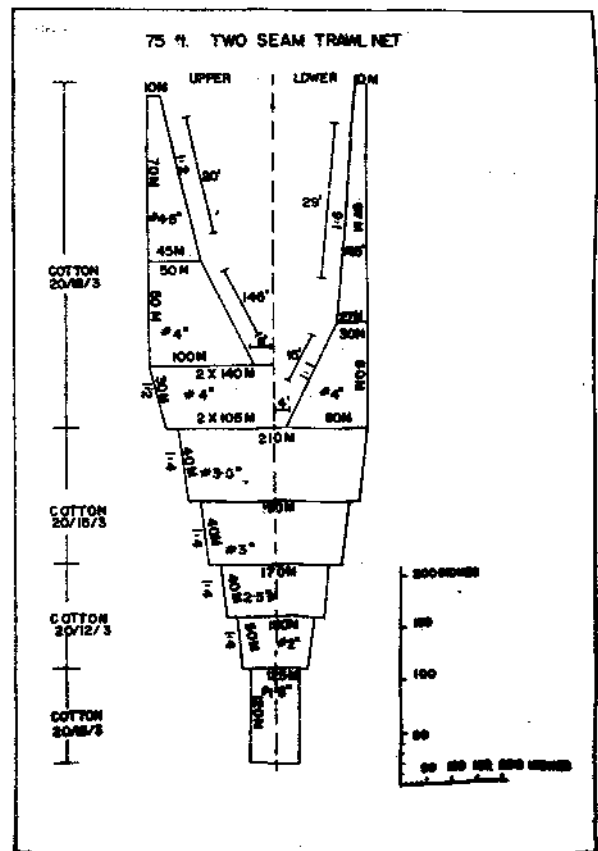
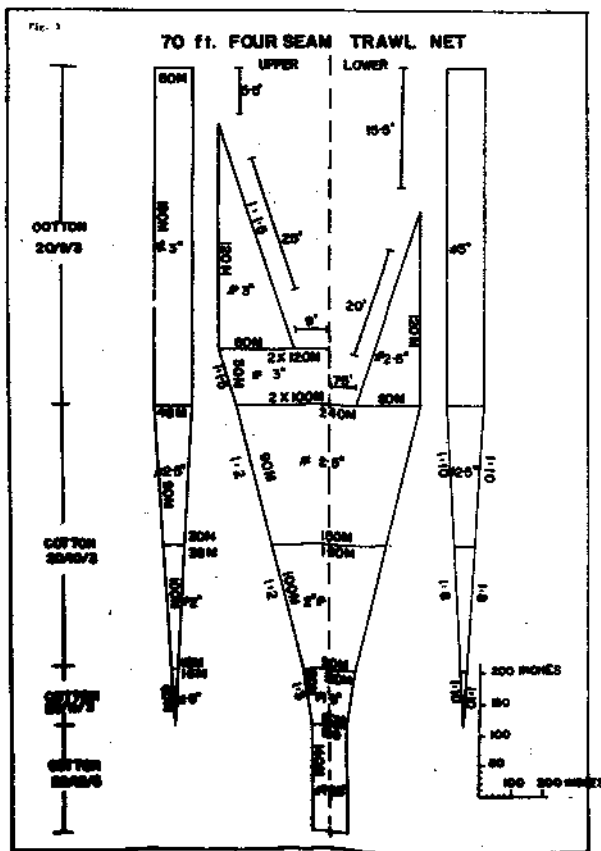
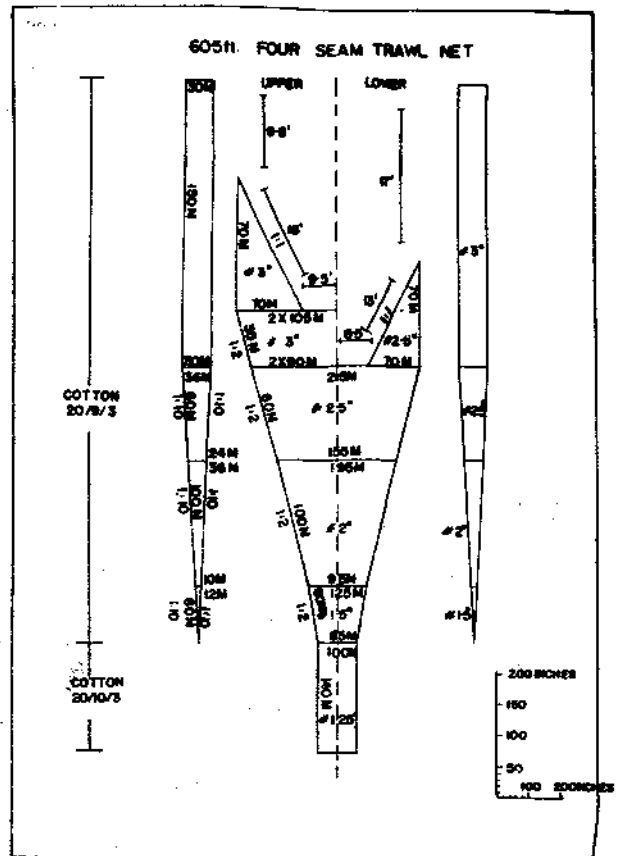
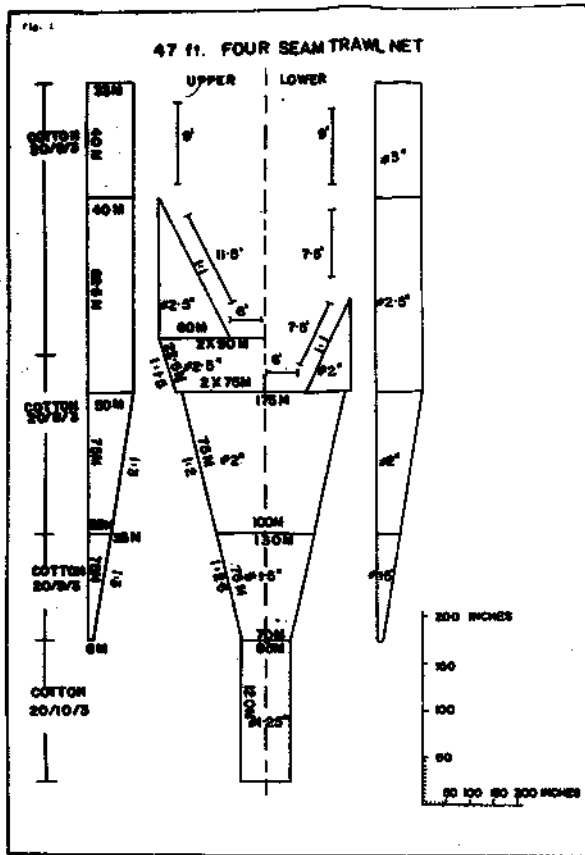
Showing the catch details of the Trawl nets made to the design described in the earlier pages, operated off S.W. coast of India

Particulars of the gear	No of days fished	No of hauls made	Average towing speed	Depth of operation	Catches during the period in Kg		Catch/one haul in Kg.		Remarks		
					Prawns	Fish.	Total	Prawns		Fish	Total
47 ft four seam otter trawl	20	73	2.0 knots	7 to 15	3874	3678	7552	53.1	50.4	103.5	Duration of each haul varies from 40-50 min.
60.5 ft four seam otter trawl	25	96	2.0 "	7 to 15	3420	5432	8852	35.6	56.5	92.1	Duration of hauls varies from 40-50 min.
70 ft four seam otter trawl	14	63	2.0 "	7 to 15	1827	5532	7359	29.0	87.7	116.7	Each haul is made for 45 to 60 min.
75 ft two seam otter trawl	20	76	2.0 "	10 to 15	3130	4461	7591	41.1	58.7	99.8	Duration of each haul varies from 45-50 min.
85 ft four seam otter trawl	10	34	2.0 "	10 to 15	3442	4256	7698	101.2	125.1	226.3	Each haul is for 30-40 only.

REFERENCES

- Bullis, R. (1951). Gulf of Mexico shrimp trawl design. Fish. Leaf., 394: 1-16.
- Bullis, R. (1955). Shrimp exploration and gear research in the Gulf of Mexico. IPFC Procs., 6(3): 431-433.
- Chidambaram, K. (1952). The experimental introduction of powered fishing vessels in India and Ceylon. IPFC Procs., 4(2): 225-233.
- Desphande, S.D. (1960). On the fishing experiments conducted with a 10 ft beam trawl. Ind. Jour. Fish., 7(1): 174-186.
- Hornell, J. (1925). The fishing methods of Madras Presidency. Part I Coromandal Coast. Mad. Fish. Bull., 18(1): 59-110.
- Hornell, J. (1938). The fishing methods of Madras Presidency. Part II Malabar coast. Mad. Fish. Bull., 27(1): 1-69.
- John, V., P.I. Chacko, A.T. Shariff and R. Venkataraman (1959). Report of fishing experiments in the inshore waters of the Madras State. Government of Madras Publication, 1959: 1-54.
- Knake, B.O. and R.T. White Leather (1945). Otter trawl nets for small fishing boats. Fish. Leaf., 49: 1-23.
- O'Grady, A. (1956). Australian Prawns. The gear that take them. Fish. Newsl., 15: 2.
- Saito, J. (1954). Trawl fishery. Maruzen, Tokyo, Japan.
- Satyanarayana, A.V., G.K. Kuriyan and R.S. Nair (1962). Commercial prawn trawling gear of Cochin (India). IPFC Procs., 10(2): 226-263.
- Satyanarayana, A.V.V. and R.S. Nair (1962). The designs of otter trawls for shrimps. Ind. Fish. Bull., 9(4): 4-23.
- Scharfe, J. (1959). German Otter trawling gear. Modern Fishing Gear of the World, London, 300-310.

- Scofield, W.L. (1948). Trawling gear in California. Fish. Bull., 72: 1-60.
- Sunderaraj, B. (1931). Report on a systematic survey of Deep sea fishing grounds by S.T. Lady Goshen. Mad. Fish. Bull., 23(3): 153-187.
- Symonds, R.F. (1947). Development of Beam trawling in the North Atlantic. Part I - Trawling methods, machinery and Gear. 55th Ann. Proc. Soc. of Naval Archi. & Mar. Engineers, U.S.A., 359-371.



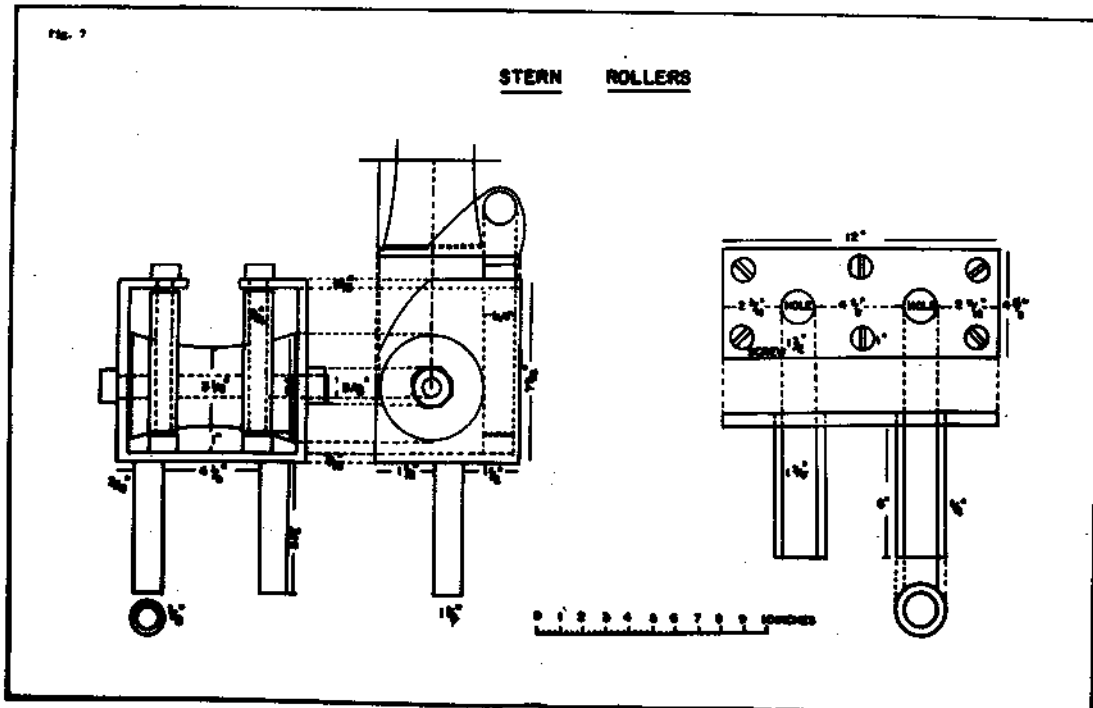
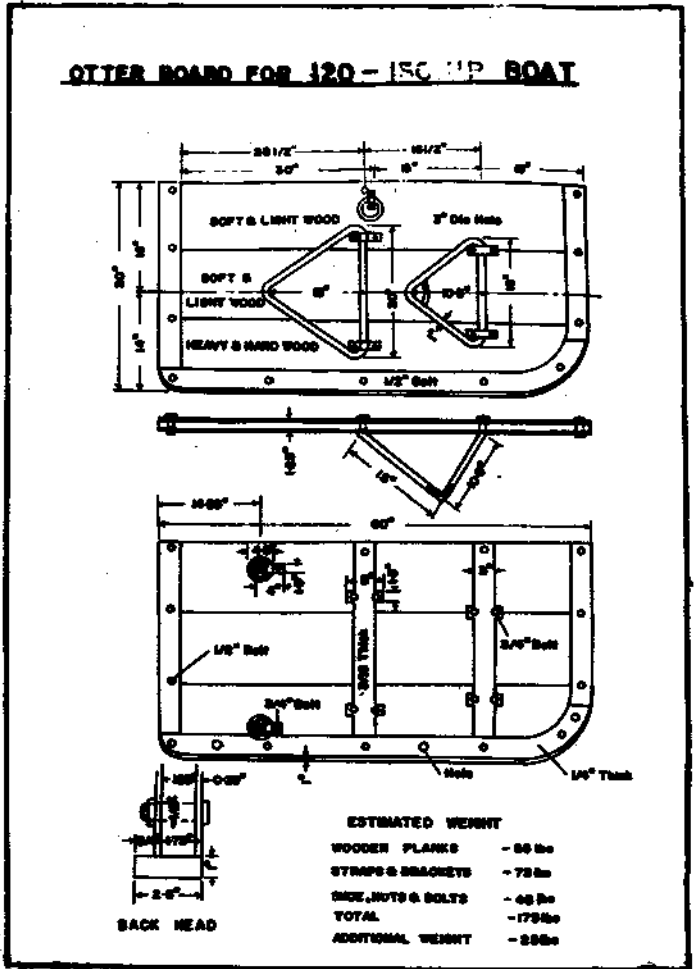
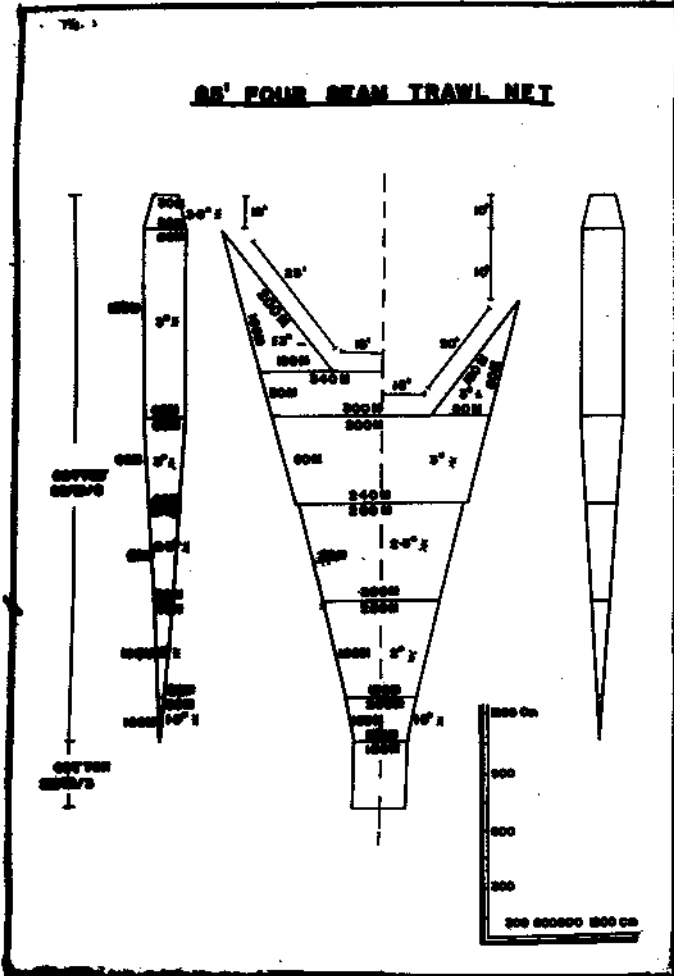


Fig. 4a

SINGLE GALLOW (Norwegian type)

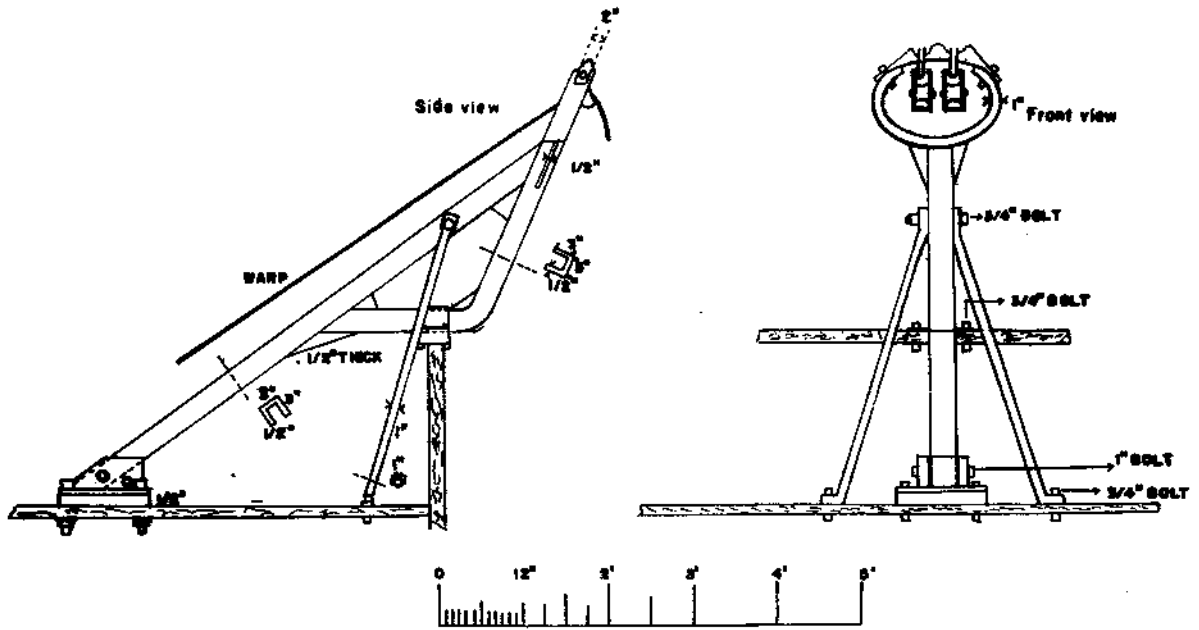


Fig. 4b

GALLOW HEAD AND PULLEY

