ASD. 2 CASED P0

RESEARCH AND MODEL STUDIES

ON

RANGE ACTION

IN

TABLE BAY HARBOUR,

CAPE TOWN.

VOLUME II

ICONOGRAPHY
(Diagrams and Illustrations)

By

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THESIS

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University of Cape Town

ICONOGRAPHY

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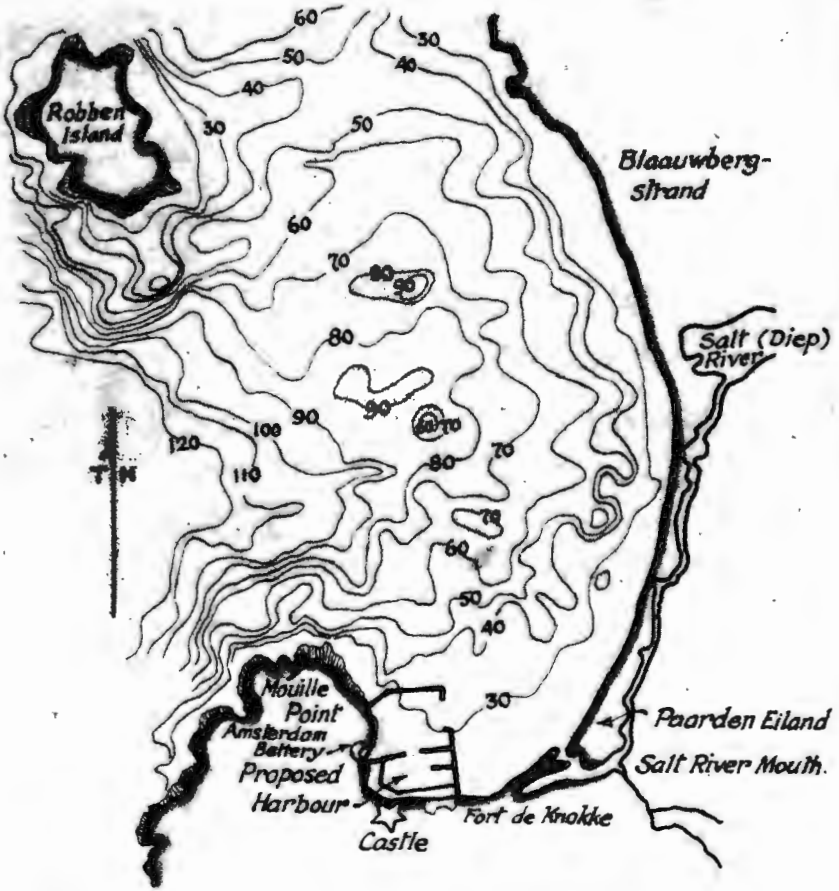


Fig 1 : Sounding Chart for Table Bay as accompanying Capt. Vetch's plan for a Harbour (1856)

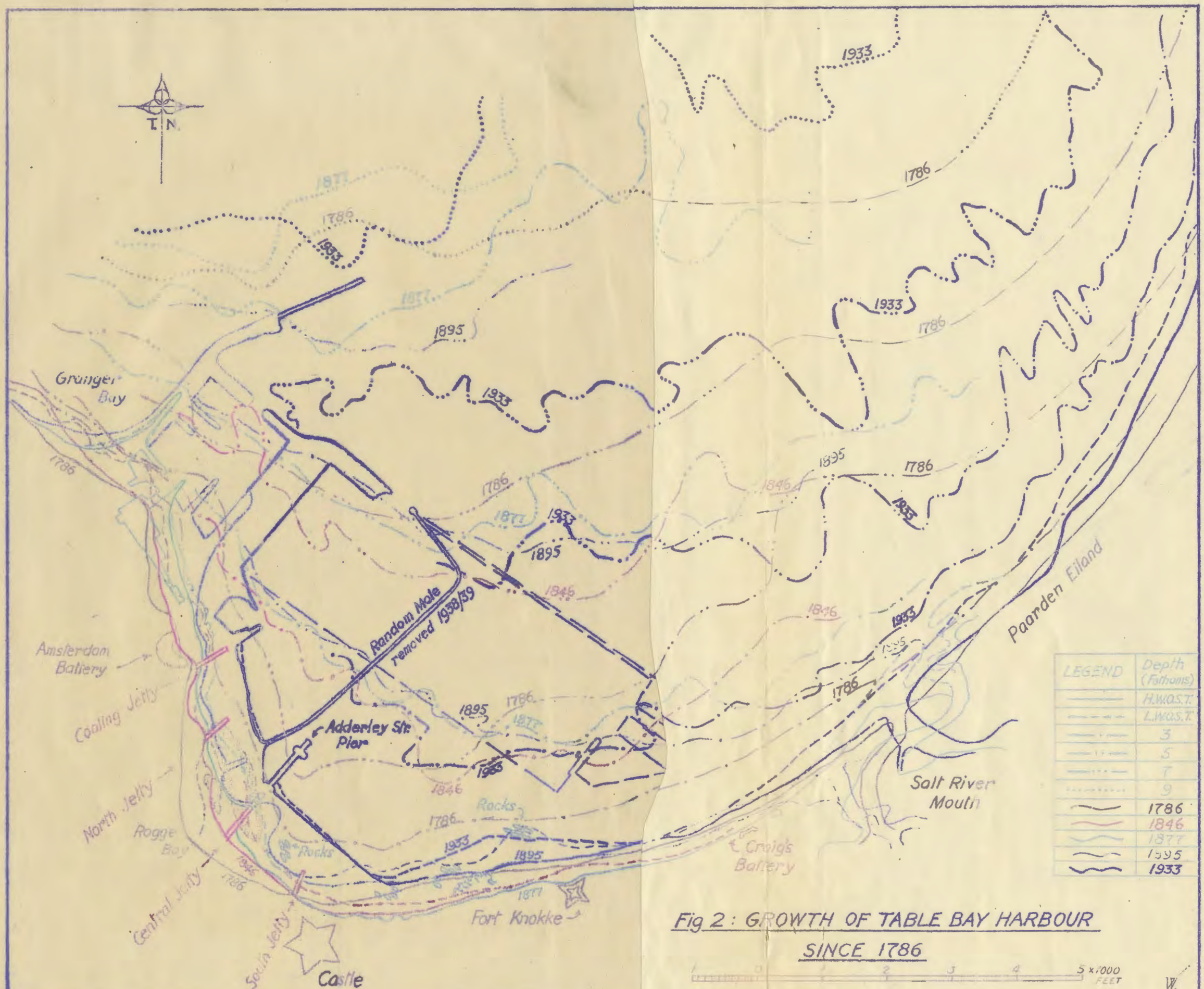


Fig 2 : GROWTH OF TABLE BAY HARBOUR SINCE 1786

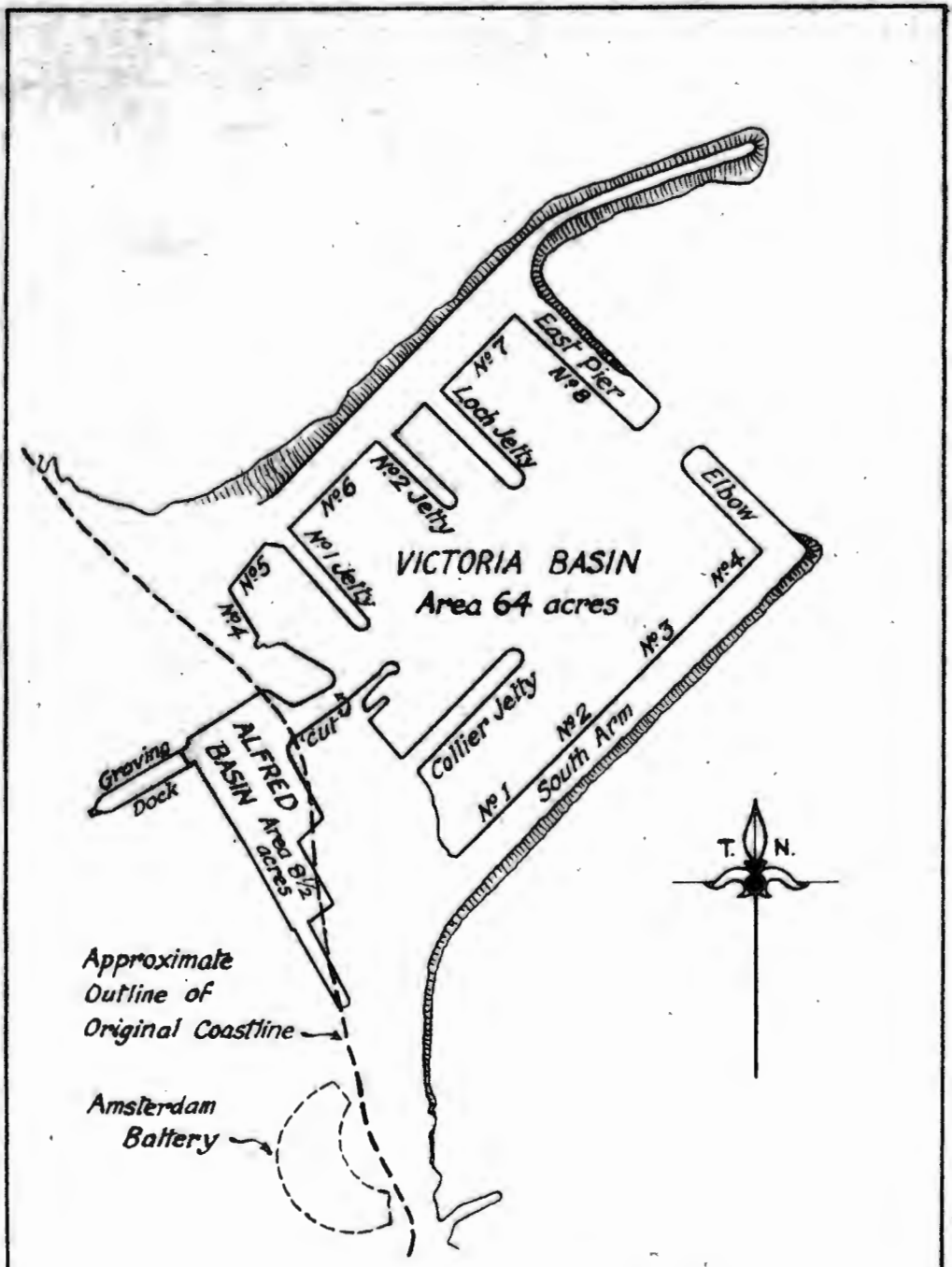


Fig 3 : Table Bay Harbour in 1900

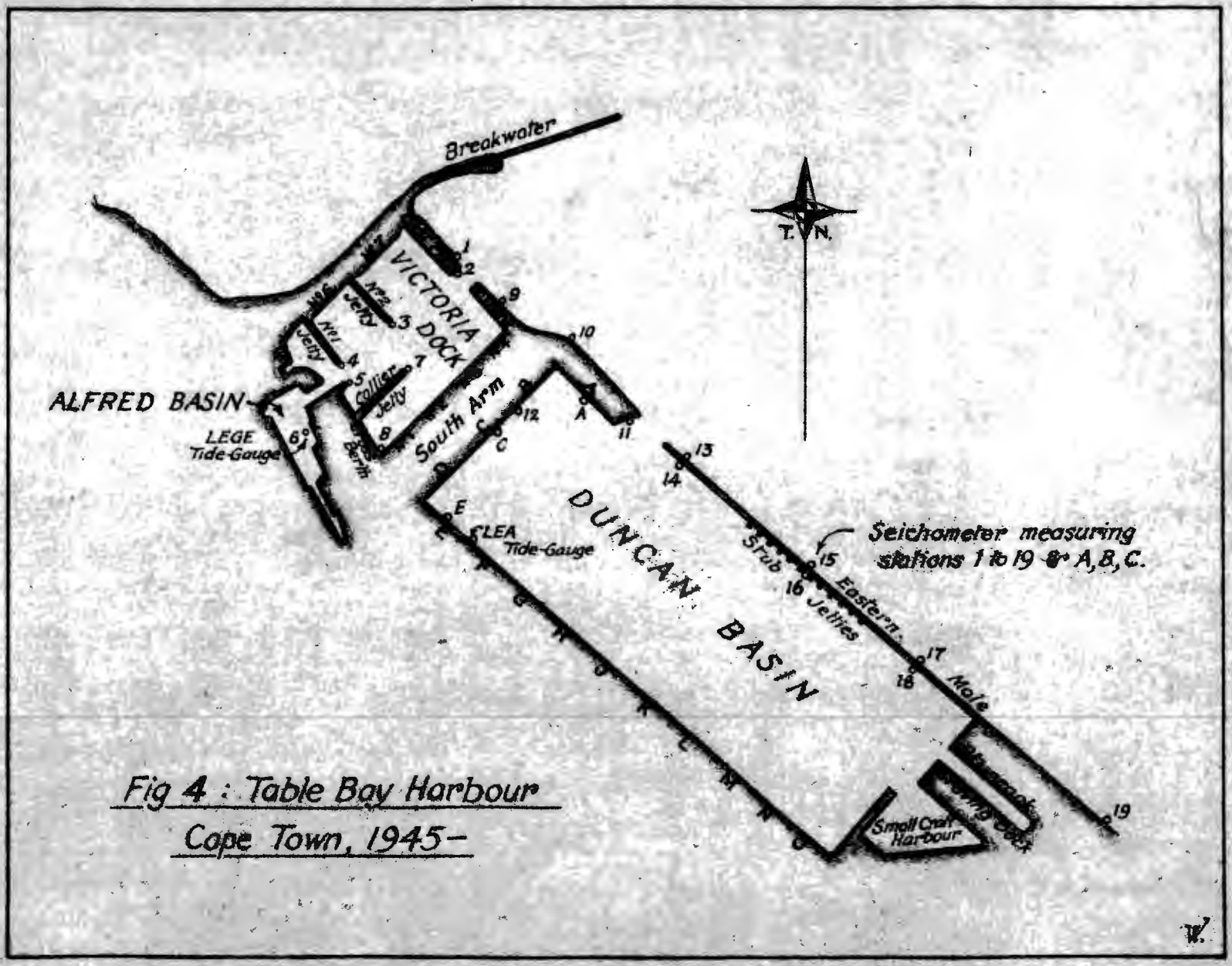
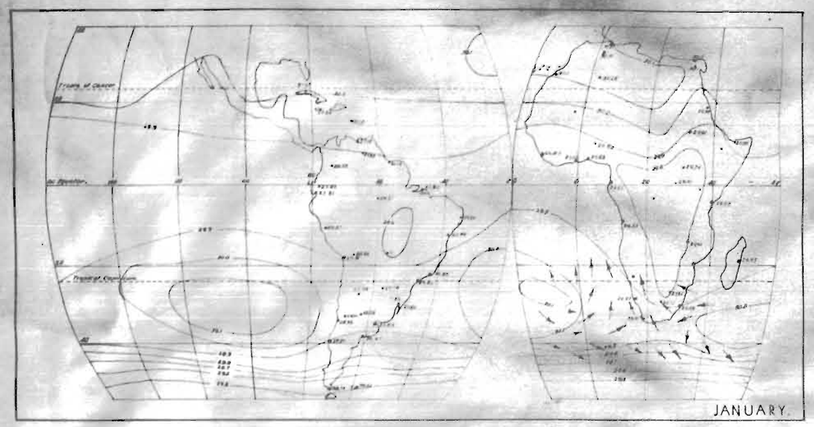
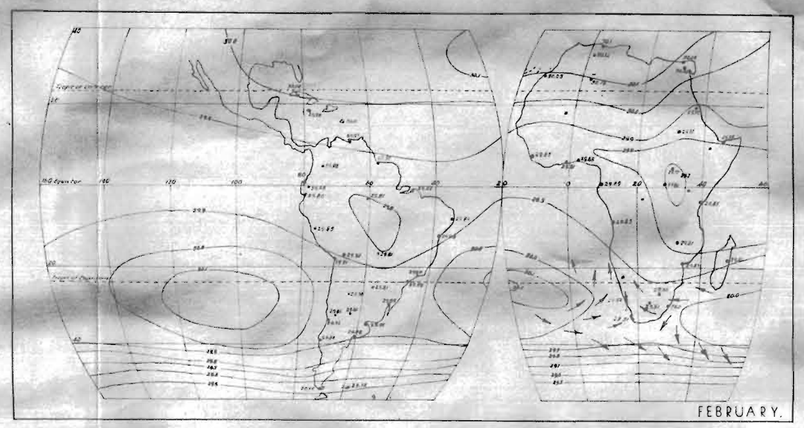
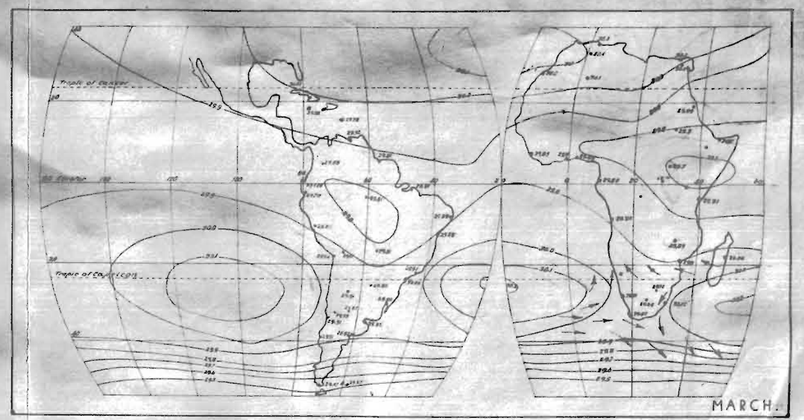
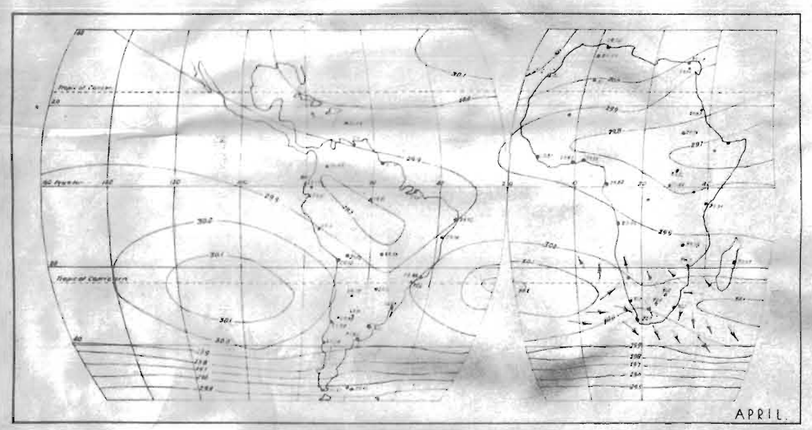


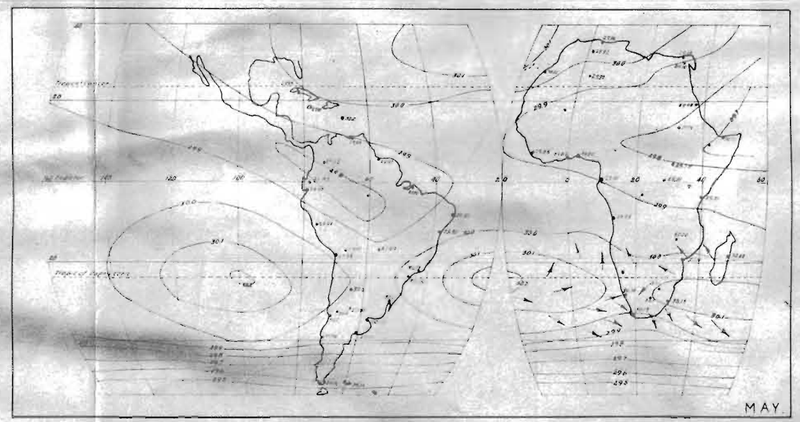
Fig 4 : Table Bay Harbour
Cape Town, 1945–

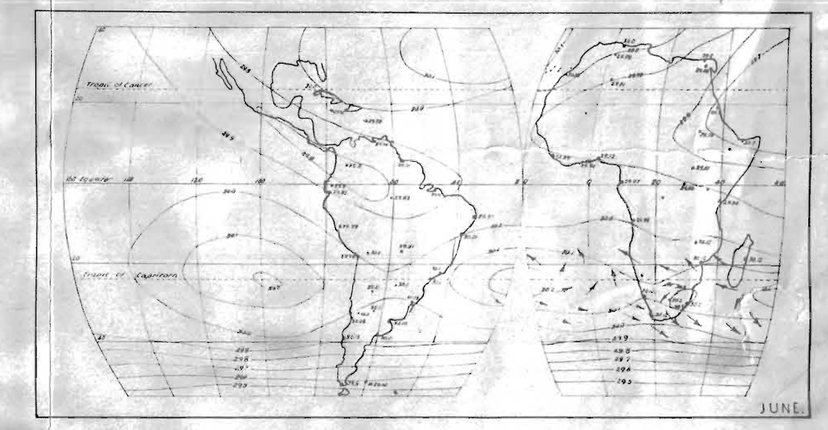


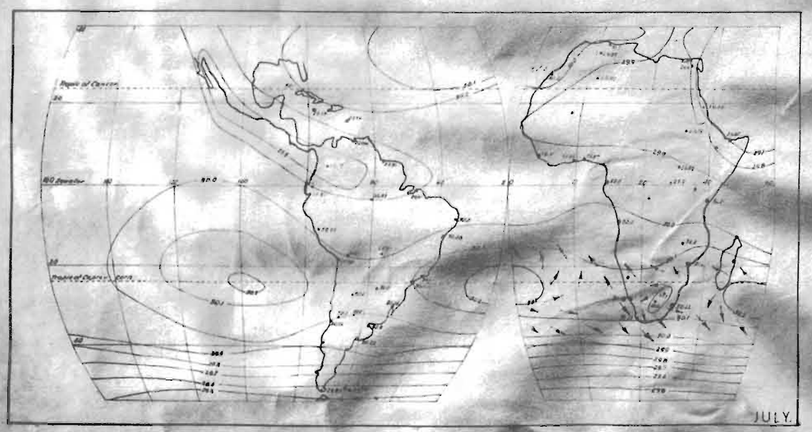












Description.
Charts of Mean Monthly Isobars (to Mollweide's Interrupted Homalographic Projection) as derived by interpolation from information given in Goodall & Darby's University Atlas. (George Philip & Son, Ltd, London, 1960).
figures represent average monthly barometric pressures at the points indicated and are the averages of 35 years observations in most cases. Prevailing wind directions are shown in the region of Southern Africa by arrow heads.

FIG. 5

SEASONAL CLIMATIC CHANGES over SOUTH ATLANTIC.

Date	17.4.1944
Drawn by	R.J. de B
Traced by	R.J. de B
Checked by	

S A R & H.
C.C.E's RESEARCH SECTION
Investigation into Range Table Bay Harbour.
DWG No
Chief Civil Engineer RD 114.

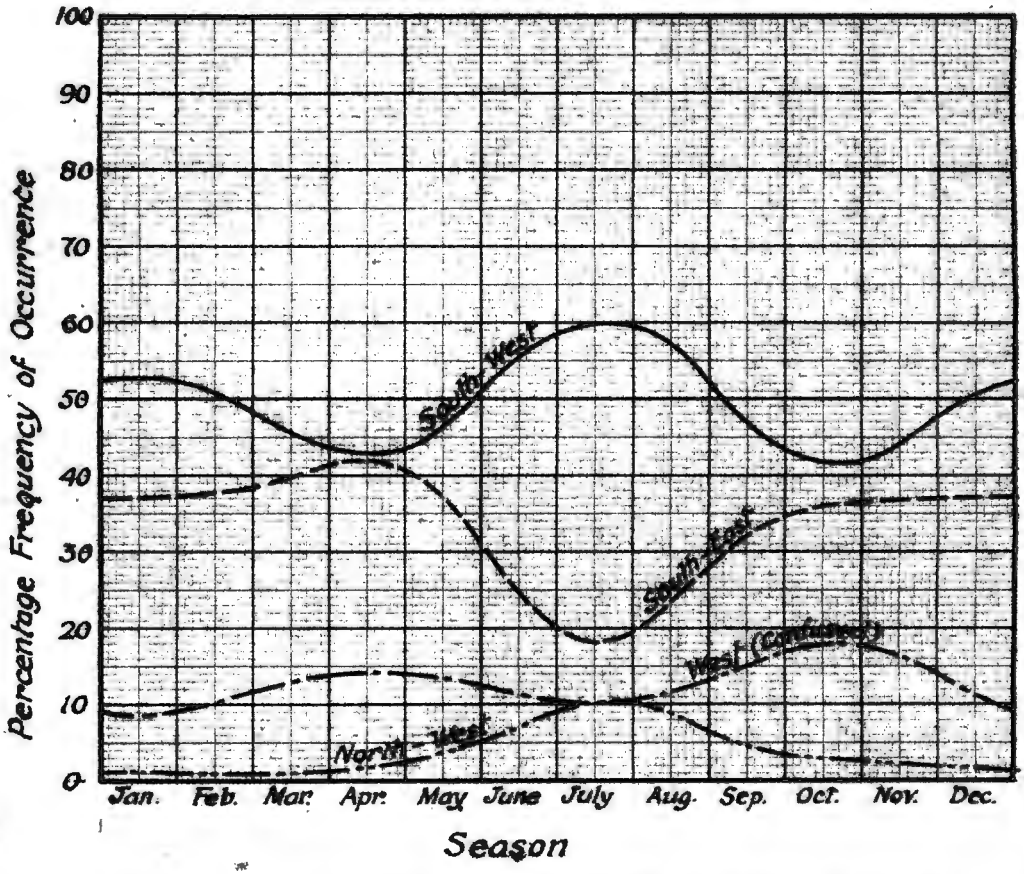


Fig. 6 : Frequency of Swells in Open Ocean (So. Atlantic) near Cape Town.

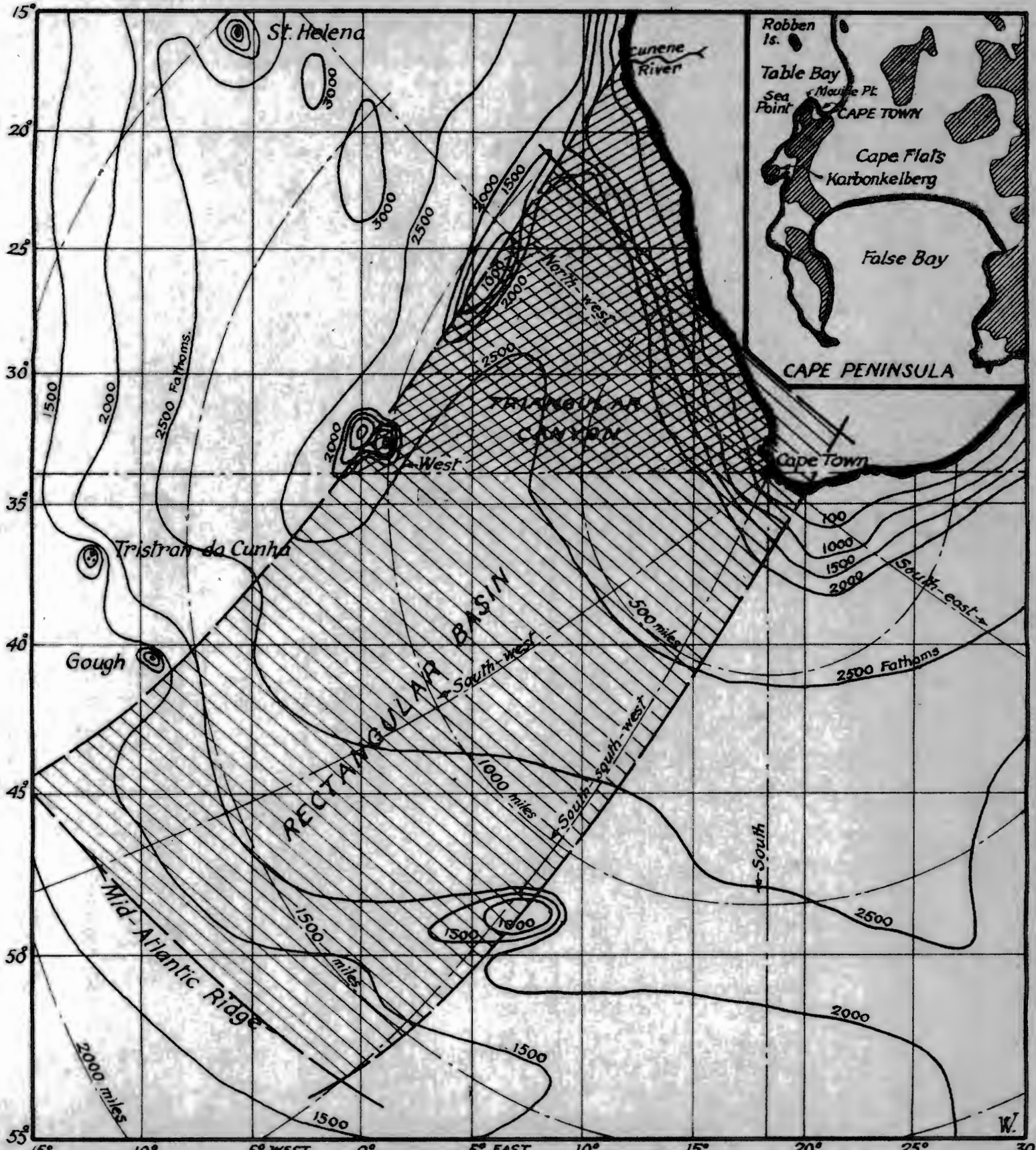


FIG. 7: CONFIGURATION OF SOUTH ATLANTIC OCEAN.

FIG. 7.

FIG. 8..

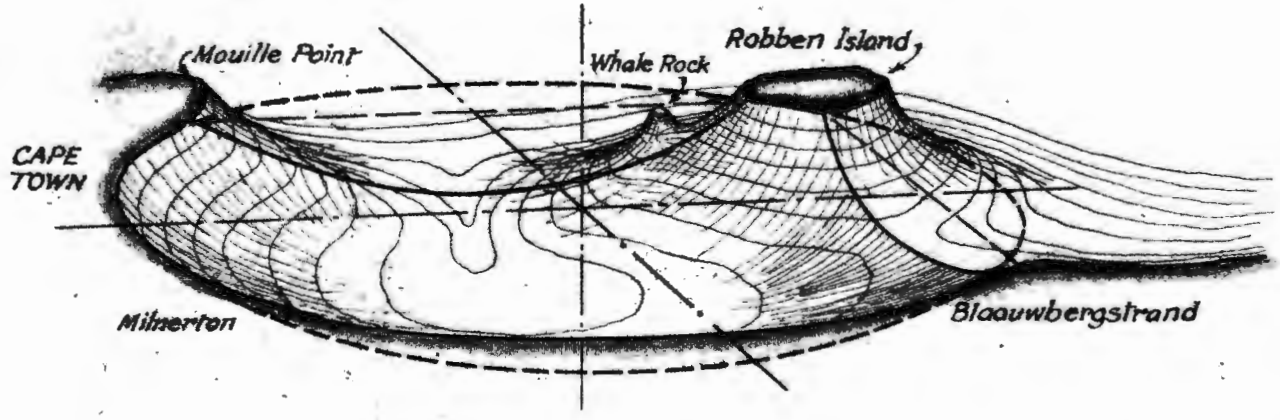
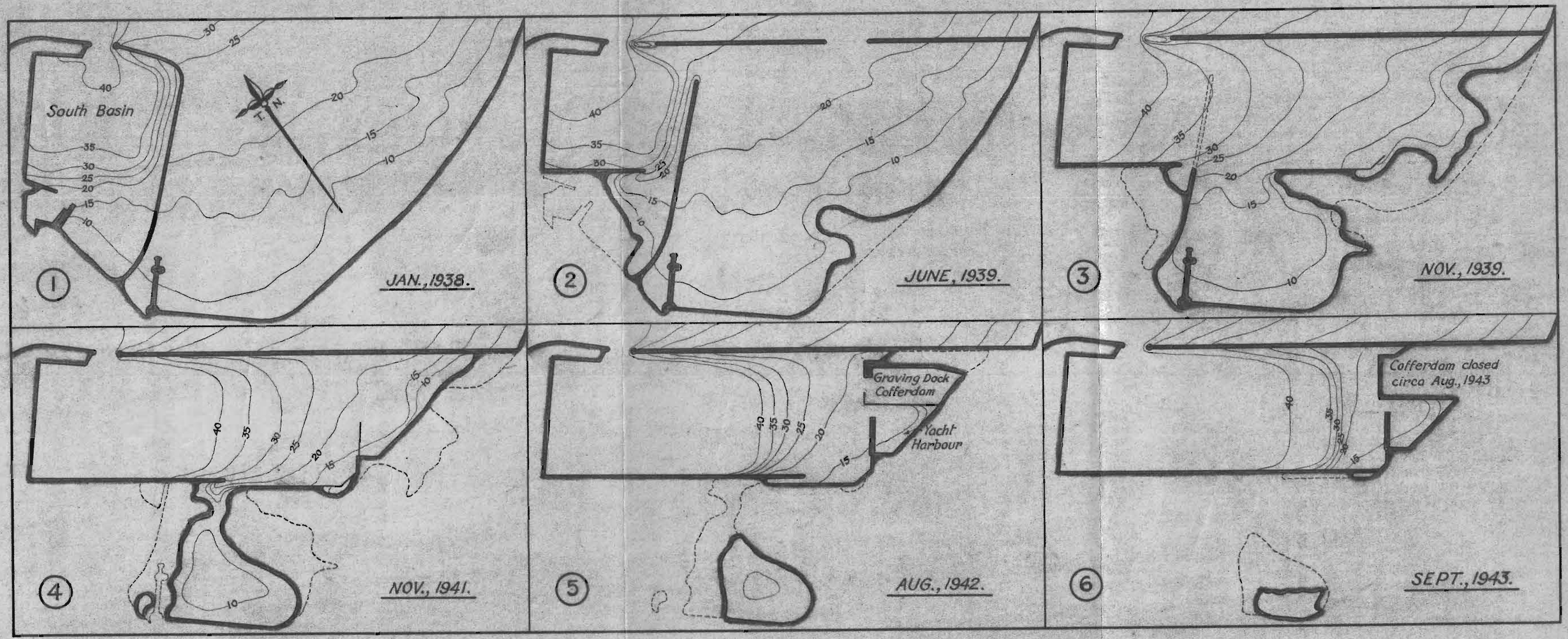


Fig 8 : Sketch showing resemblance of Table Bay to an Elliptic Bowl

FIG. 9. SOUNDING CHART FOR TABLE BAY.

S.A.R. & H.
C.C.I.S. RESEARCH SECTION.
Investigation into Range:
Table Bay Harbour.
Scale 6 inch = 2500 Yards



Contours (in feet) approximate only

FIG. 10: GROWTH OF THE DUNCAN BASIN, 1938-1943.

TABLE BAY HARBOUR, CAPE TOWN.

FIG. 10.

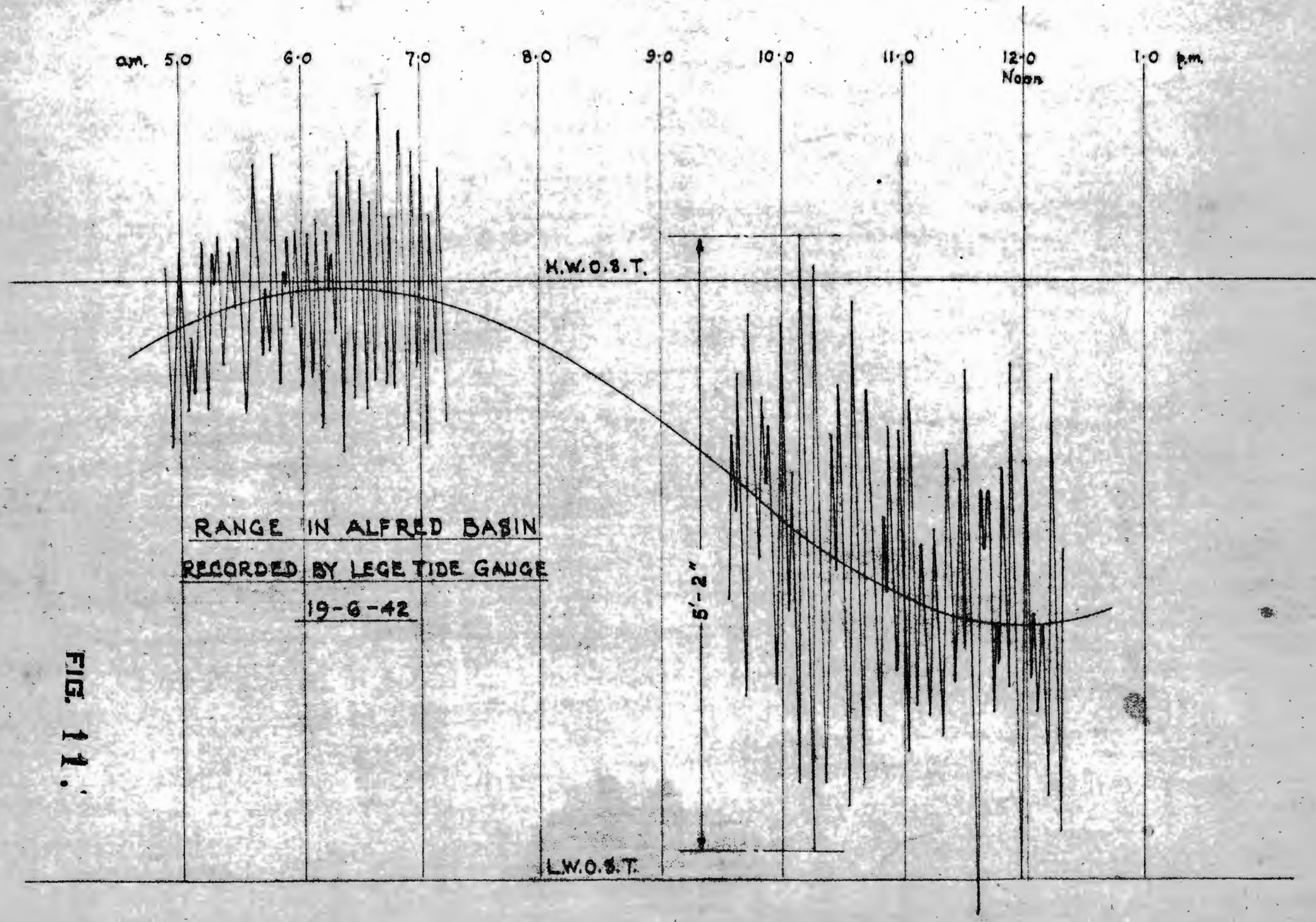

a.m. 5·0
6·0
7·0
8·0
9·0
10·0
11·0
12·0
Noon
1·0 p.m.
H.W.O.S.T.
L.W.O.S.T.
5'-2"
RANGE IN ALFRED BASIN
RECORDED BY LEGE TIDE GAUGE
19-6-42

FIG. 11.

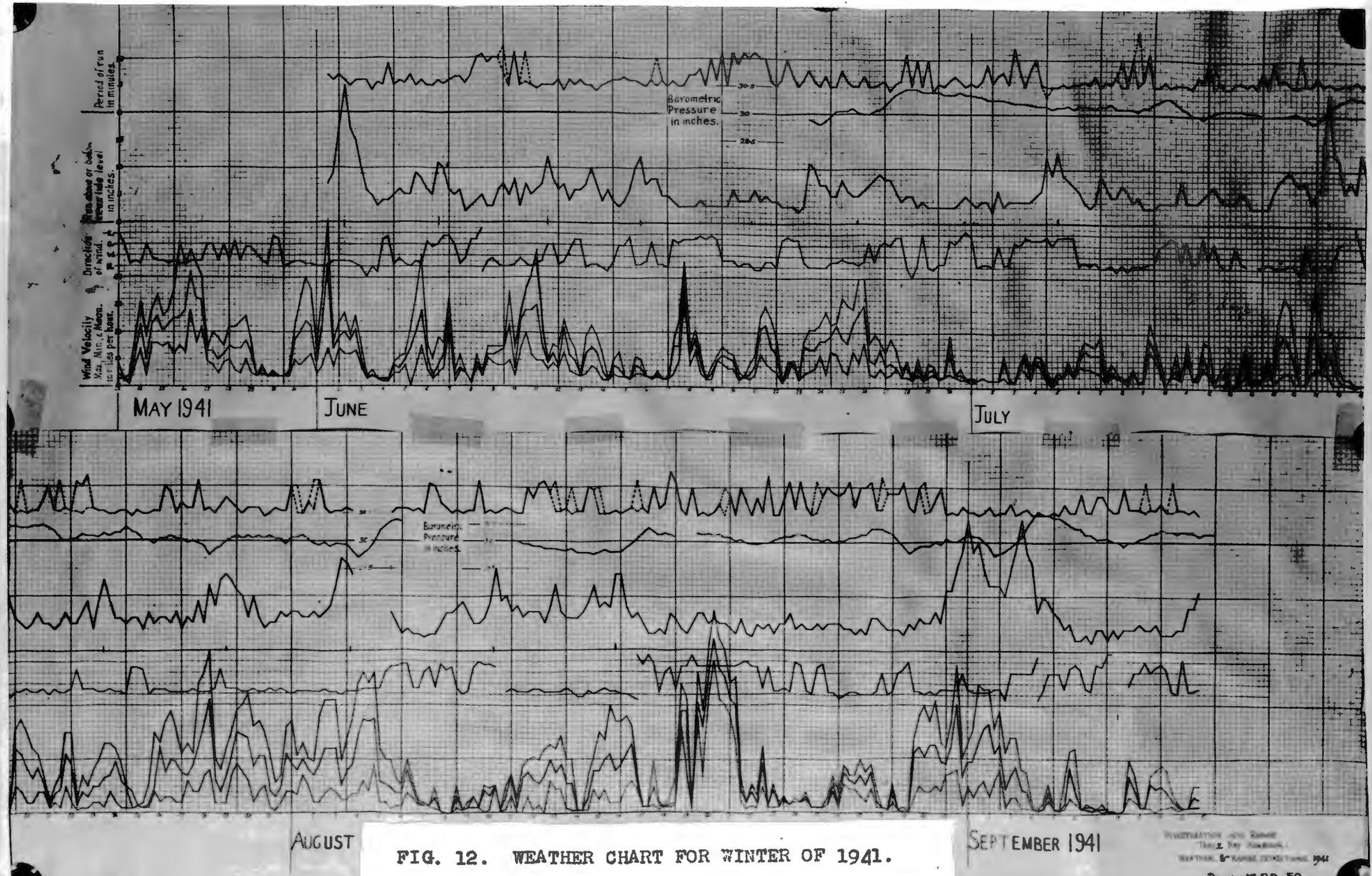


FIG. 12. WEATHER CHART FOR WINTER OF 1941.

Drawing № R.D. 59

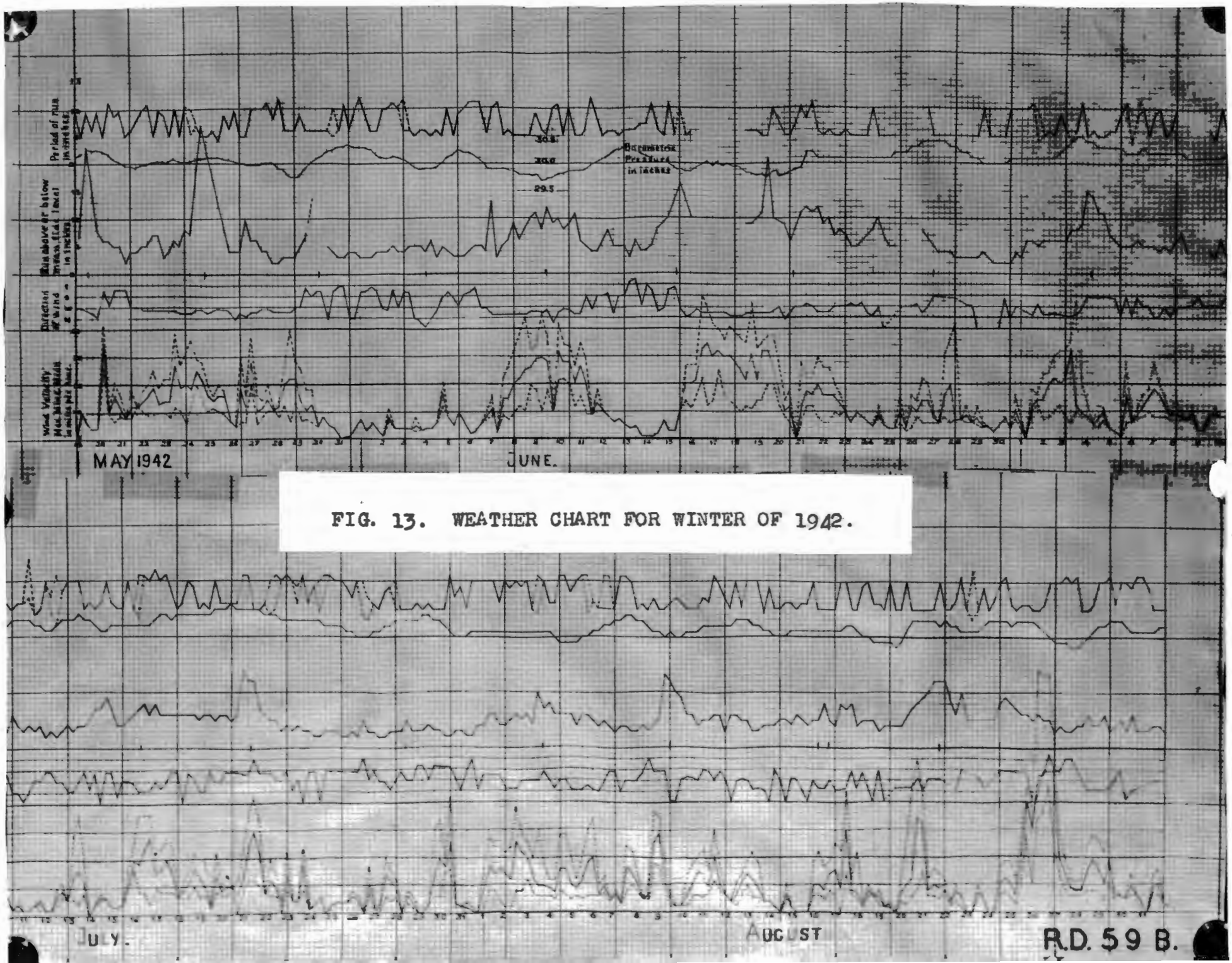


FIG. 13. WEATHER CHART FOR WINTER OF 1942.

FIG. 13.

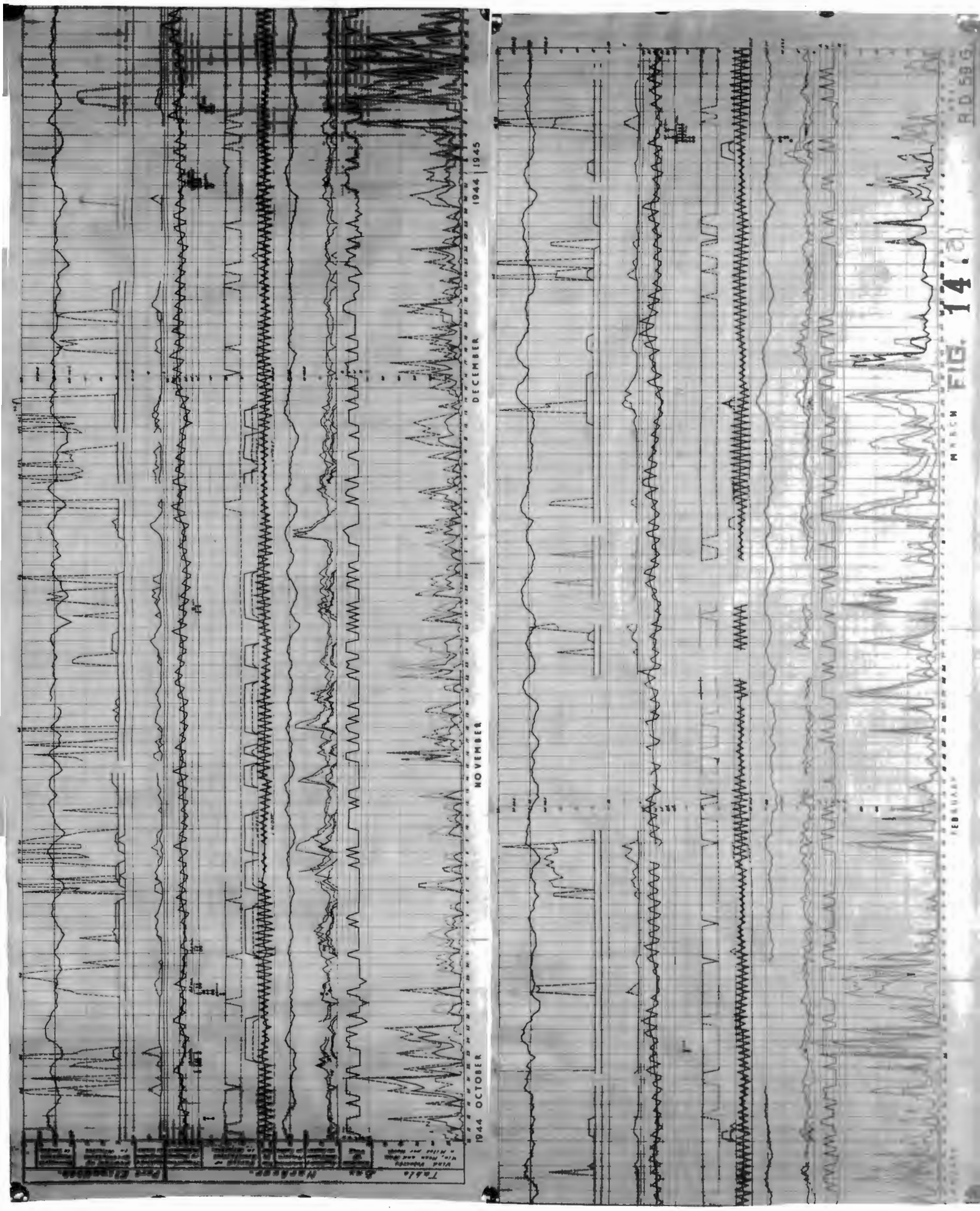


FIG. 14 (a). WEATHER CHART FOR SUMMER OF 1944/45.

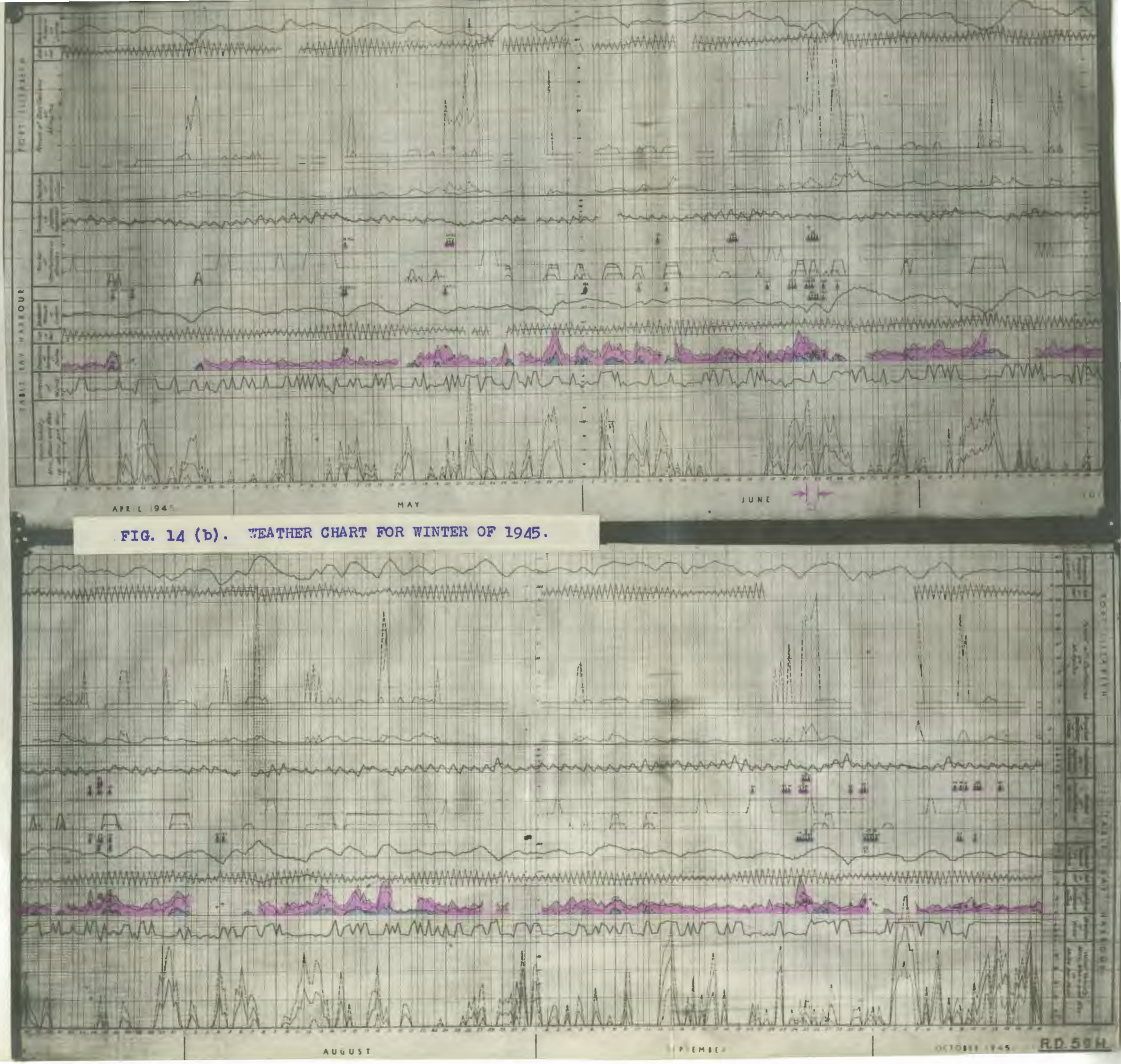


FIG. 14 (b). WEATHER CHART FOR WINTER OF 1945.

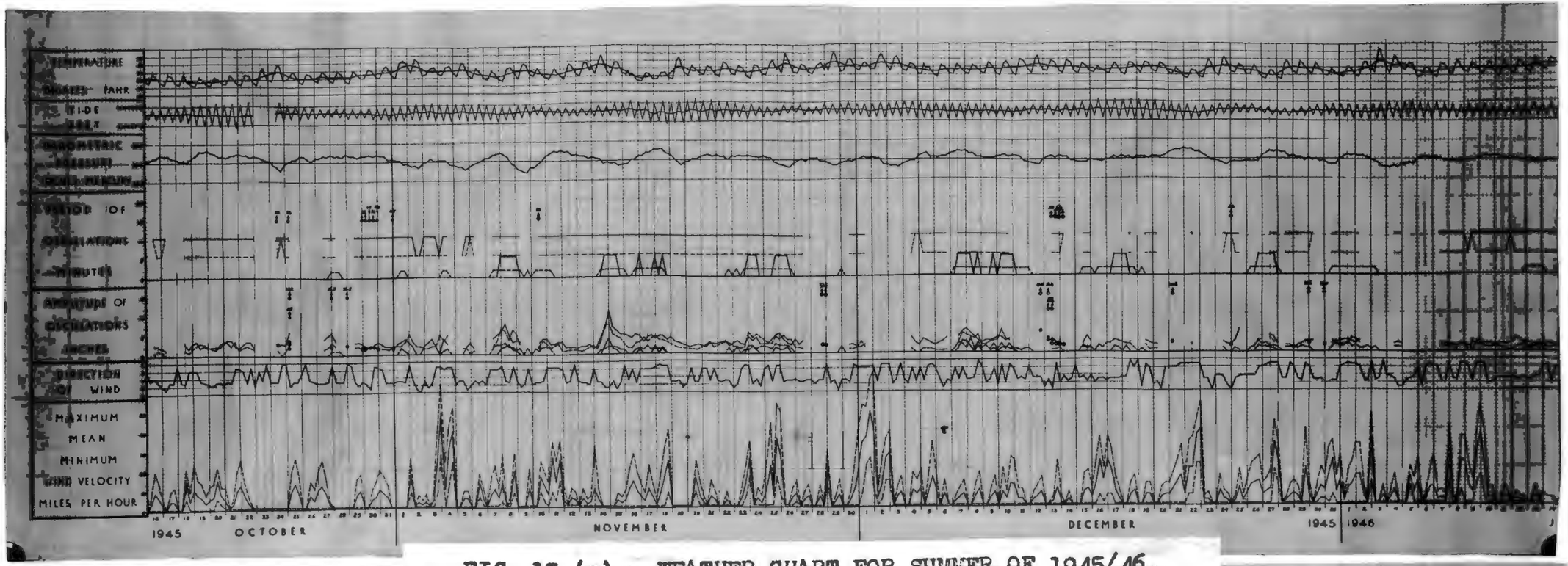


FIG. 15 (a). WEATHER CHART FOR SUMMER OF 1945/46.

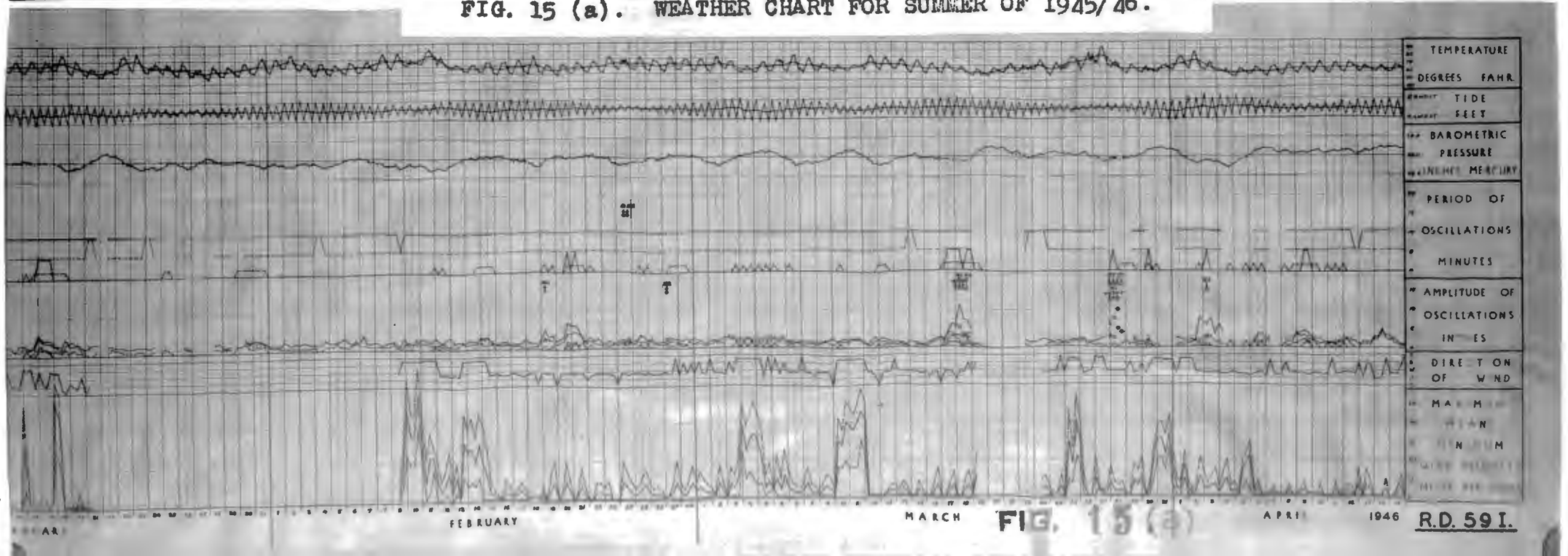


FIG. 15 (a)

R.D. 59 I.

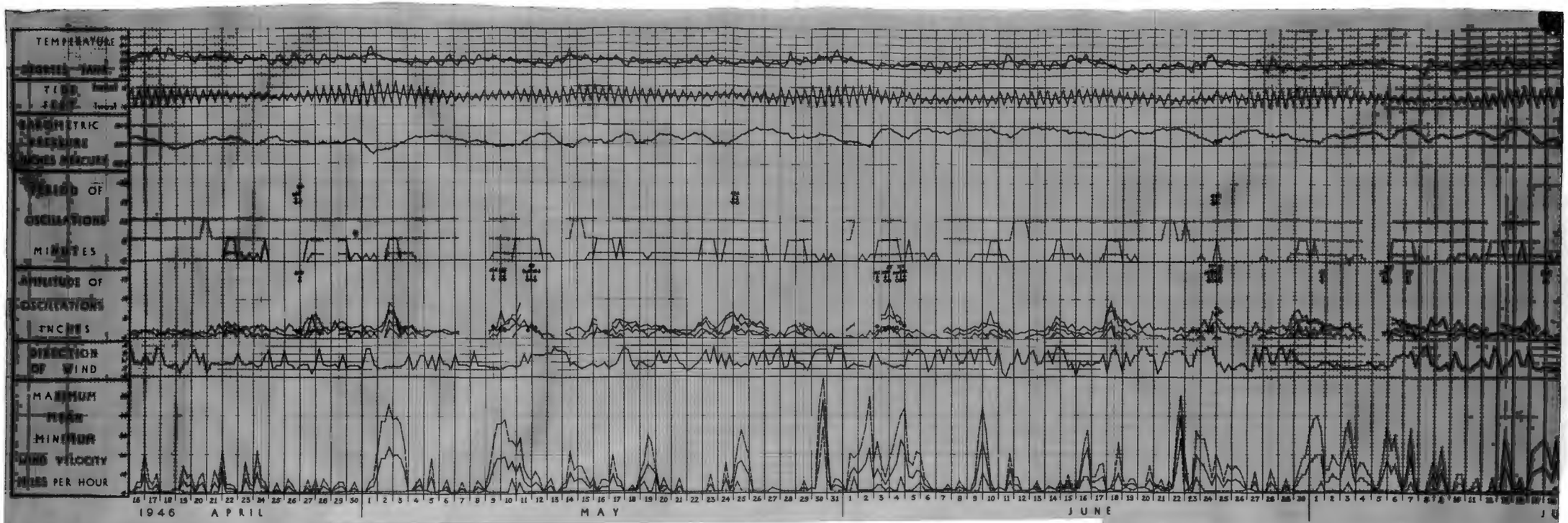
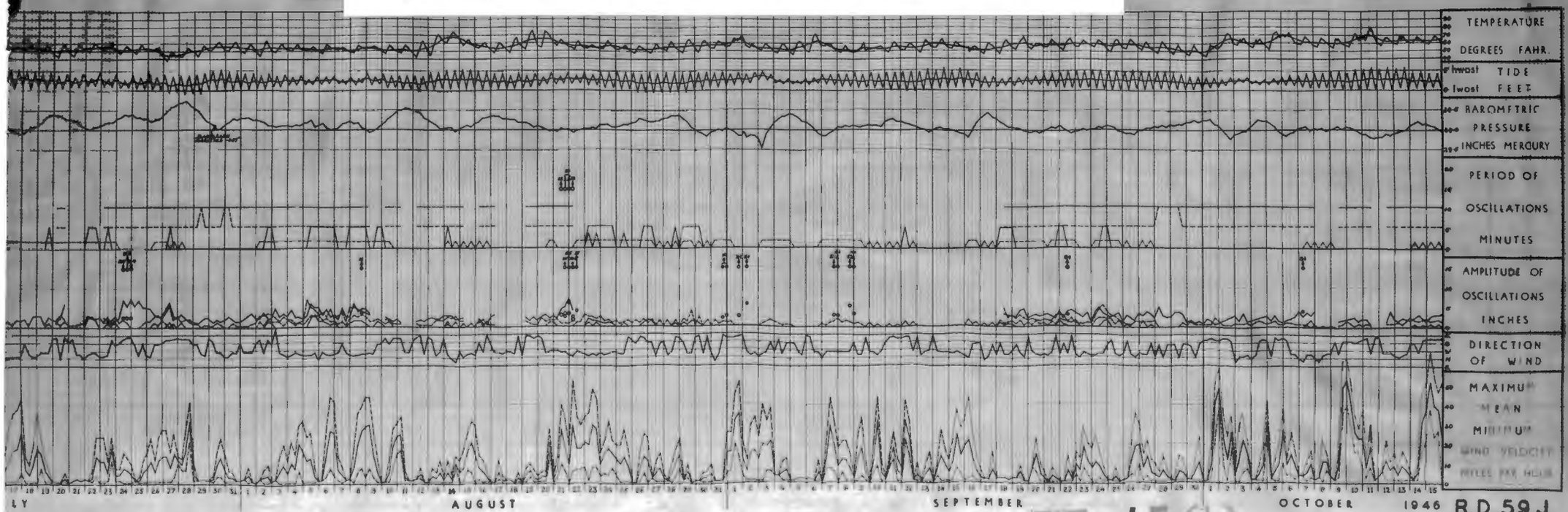


FIG. 15 (b). WEATHER CHART FOR WINTER OF 1946.



R.D. 59 J.

FIG. 15 (b)

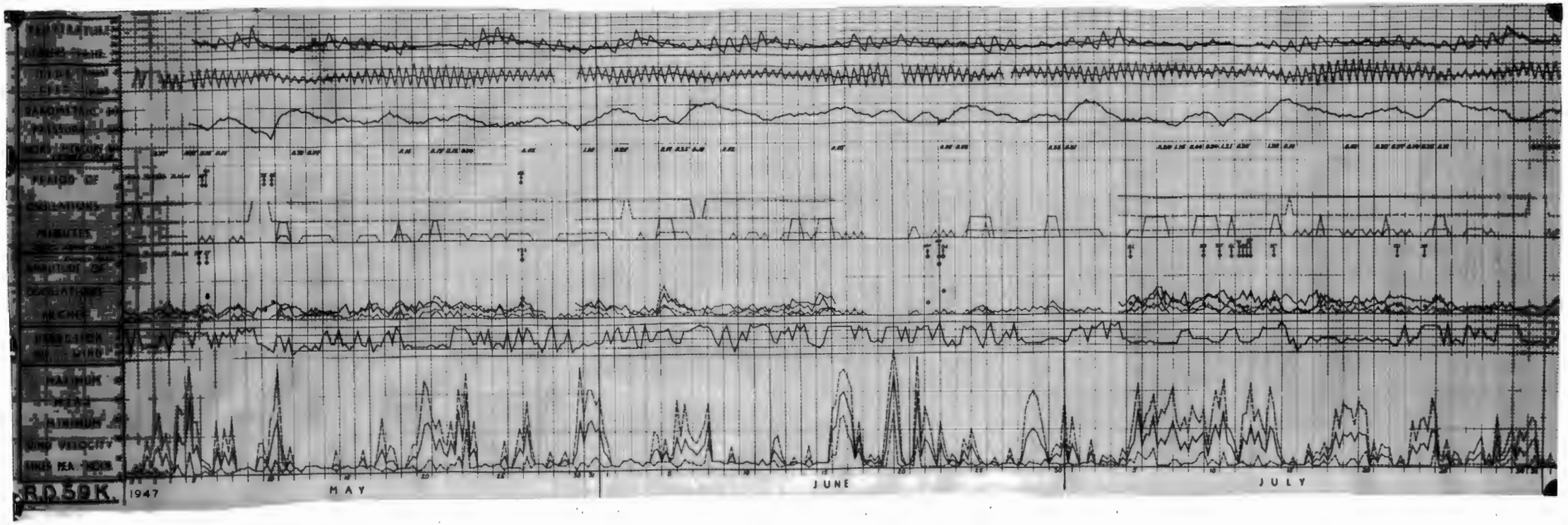
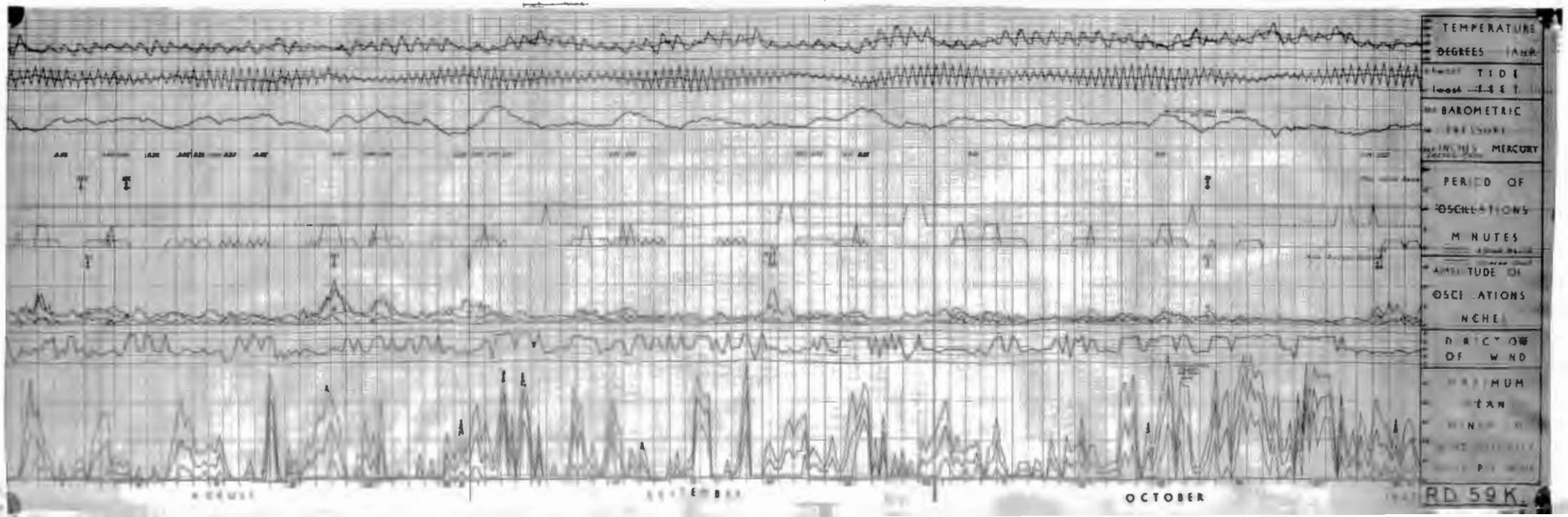
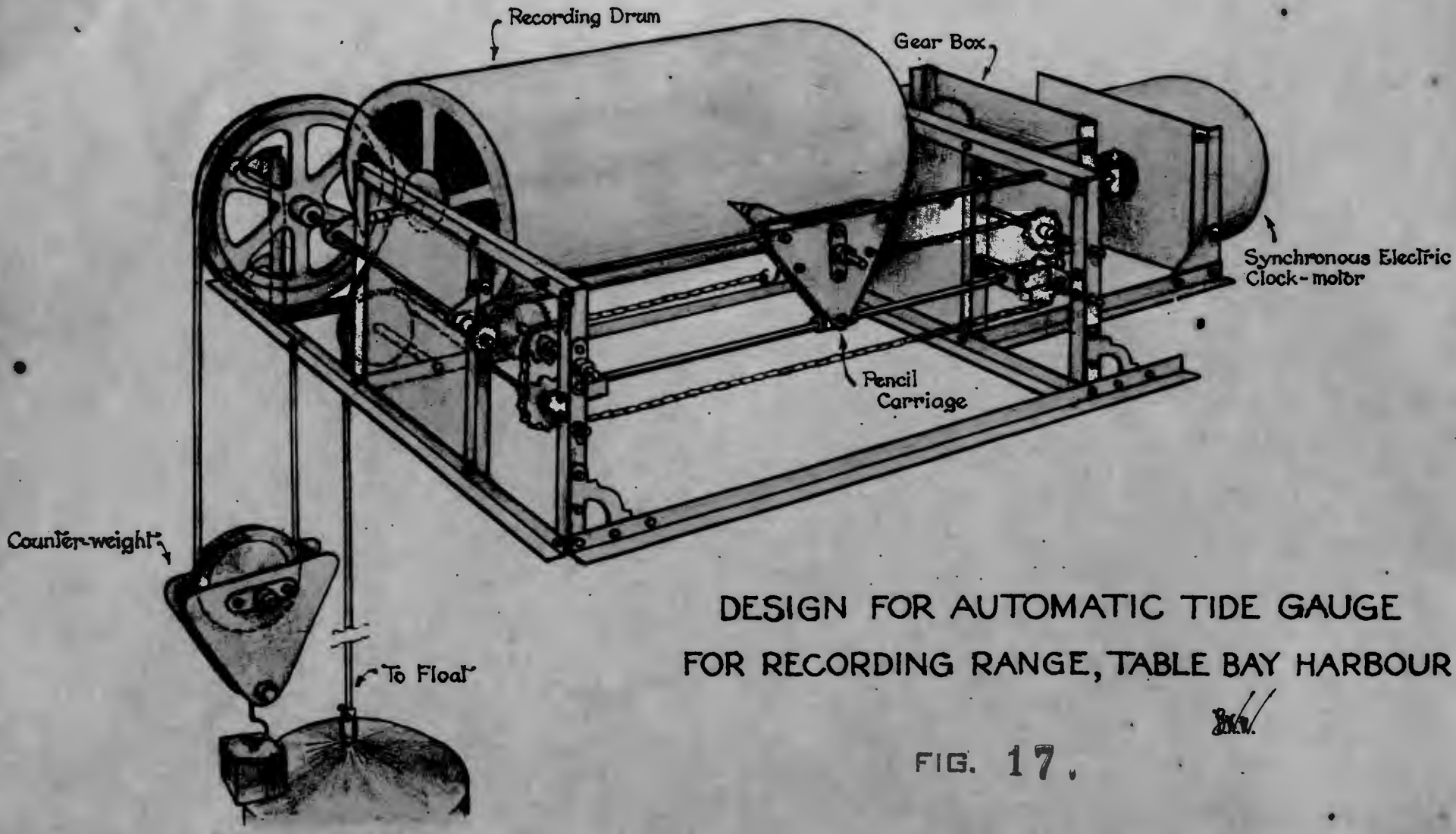


FIG. 16. WEATHER CHART FOR WINTER OF 1947.

FIG. 16.

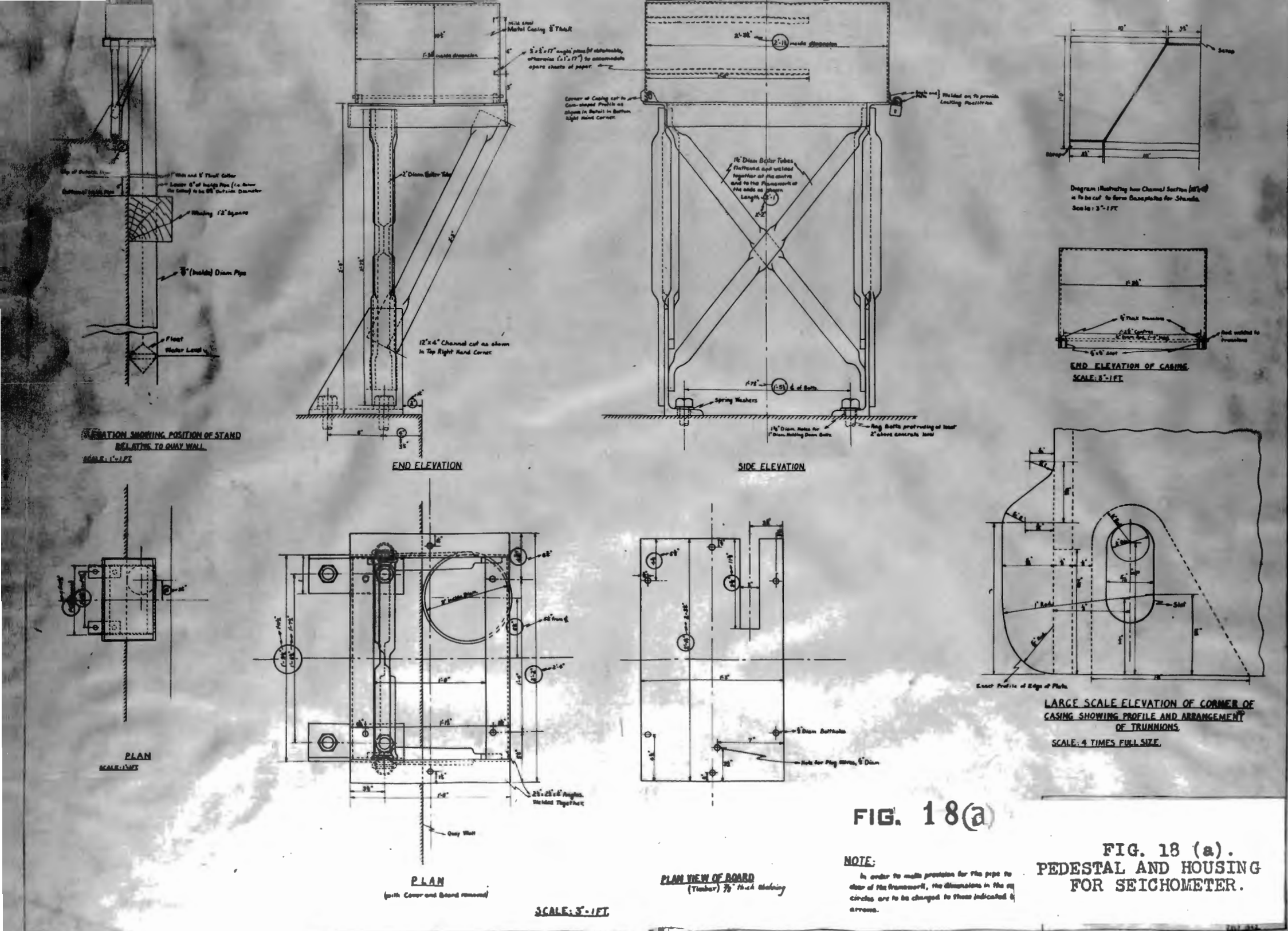




DESIGN FOR AUTOMATIC TIDE GAUGE

FOR RECORDING RANGE, TABLE BAY HARBOUR

FIG. 17.



ELEVATION SHOWING POSITION OF STAND RELATIVE TO QUAY WALL.
SCALE: 1'=1FT.

END ELEVATION

SIDE ELEVATION

END ELEVATION OF CASING.
SCALE: 3"=1FT.

PLAN
SCALE: 1"=1FT.

PLAN
(with Cover and Board removed)
SCALE: 3"=1FT.

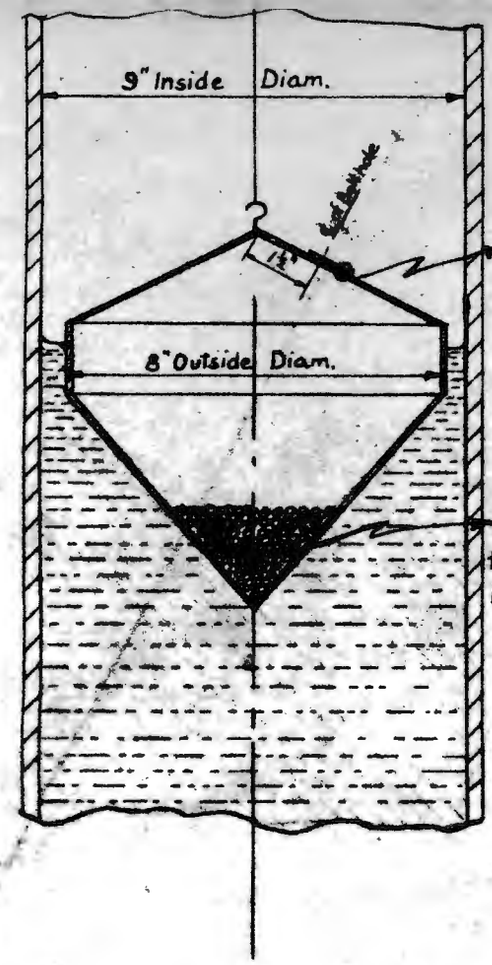
PLAN VIEW OF BOARD
(Timber) ¾" thick Teakwood

LARGE SCALE ELEVATION OF CORNER OF CASING SHOWING PROFILE AND ARRANGEMENT OF TRUNNIONS.
SCALE: 4 TIMES FULL SIZE.

FIG. 18(a)

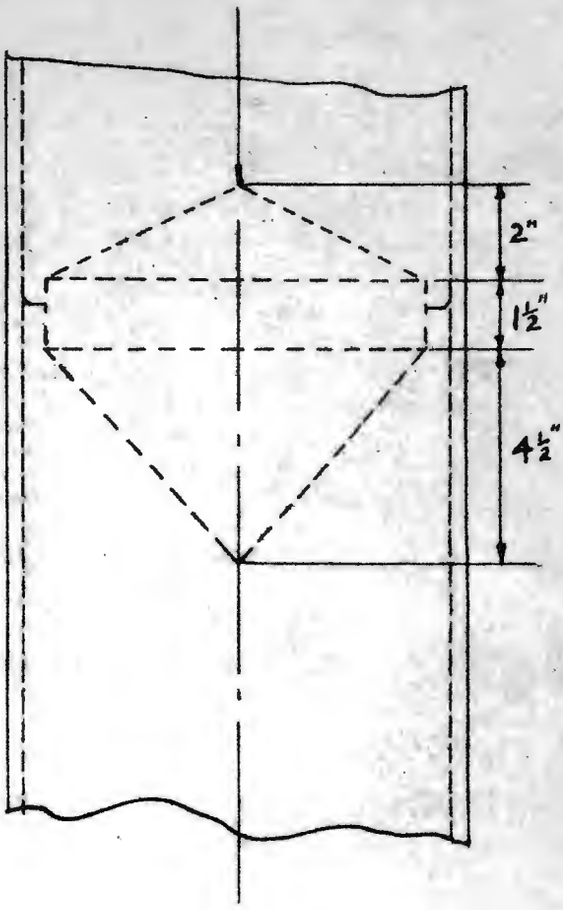
NOTE:
In order to make provision for the pipe to clear of the framework, the dimensions in the circles are to be changed to those indicated arrows.

FIG. 18 (a).
PEDESTAL AND HOUSING FOR SEICHOMETER.



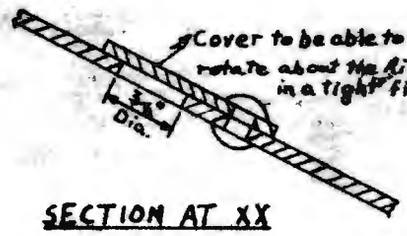
Float to be made of 14 gauge Copper Plating.

Lead Shot to be added to bring total weight of Float up to 5 lbs 10 oz.

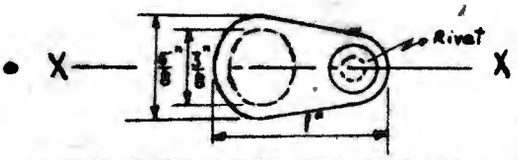


SECTION AT AB

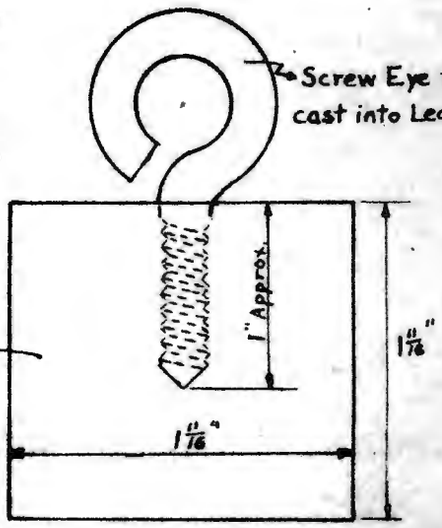
ELEVATION



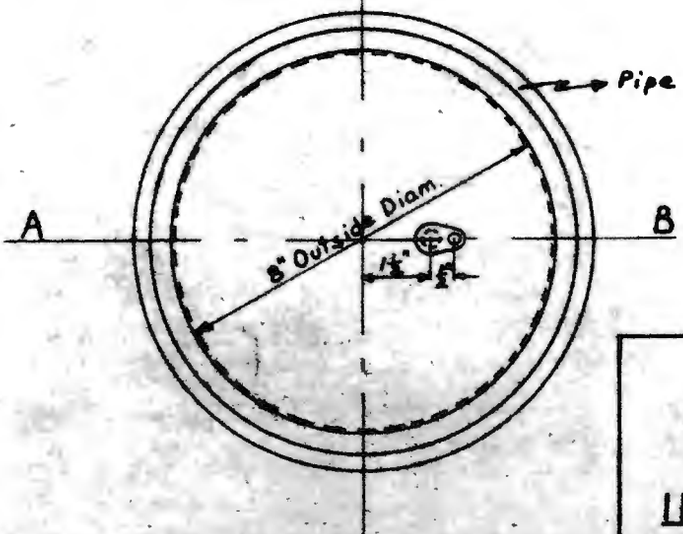
SECTION AT XX



DETAILS OF COVER OVER HOLE IN FLOAT.
SCALE: FULL SIZE



Lead Cube 1 11/16" Side



PLAN

DETAILS OF COUNTERWEIGHT TO BE CAST OF LEAD.
SCALE: FULL SIZE.

S.A.R. & H. FIG. 18(b)

C.C.E'S RESEARCH SECTION.

INVESTIGATION INTO RANGE AT TABLE BAY HARBOUR.

DETAILS OF FLOAT AND COUNTERWEIGHT FOR WATER LEVEL RECORDER.

FIG. 19 (a). PHOTOGRAPH OF SEICHOMETER IN HOUSING, POSITION 11.

FIG. 19 (b). PHOTOGRAPH OF SEICHOMETER IN HOUSING, POSITION A.

FIG. 20. FACSIMILE OF SEICHOGRAM FOR 23/8/46.

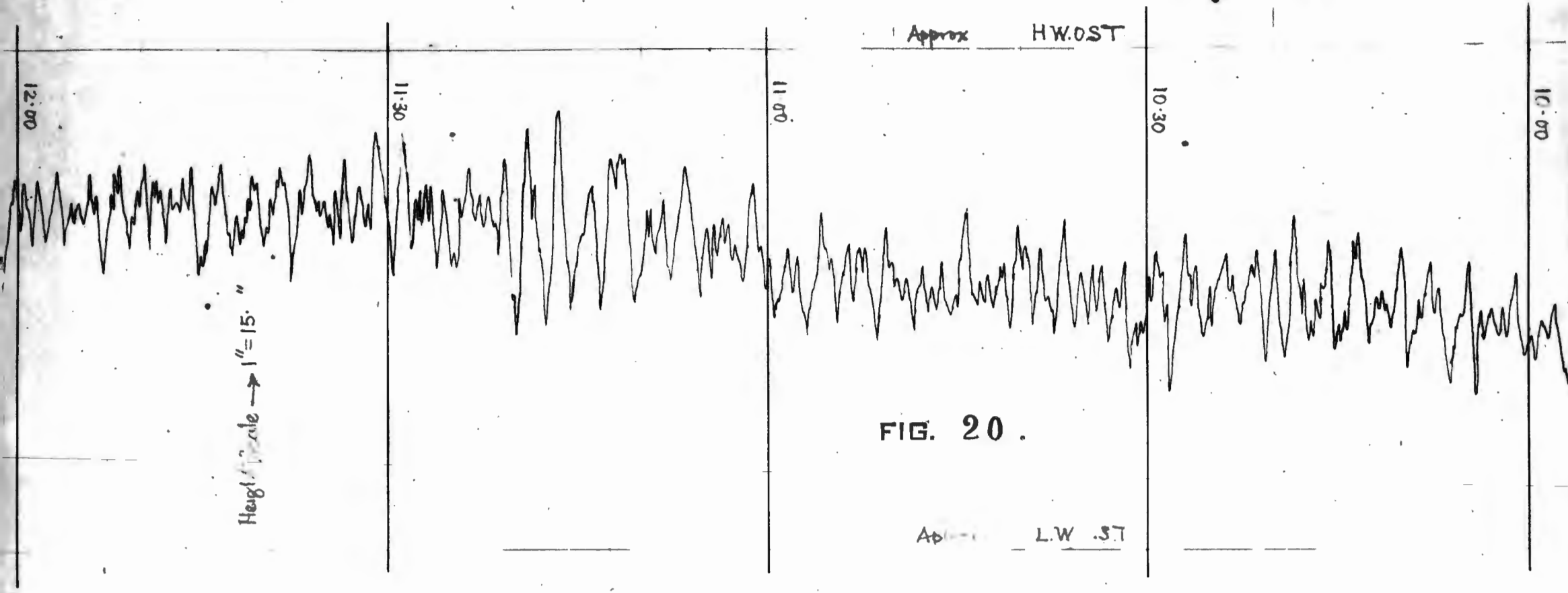


FIG. 20.

No 2 at 19 23/8/46

APPROXIMATE TIMES of TRAVEL of WAVES (A)

Estimates on Basis of 18Sec (measured) Periodicity from Wave Positions as shown.

1. Green Point - Salt River Mouth. 11 Miles
2. End Breakwater - Salt River Mouth 8¼ "
3. Whale Rock - Blaauwberg Strand 21 "
4. North Cape Robben Is. - Bloubergstrand 14-15 "
5. East Cape Robben Is. - Salt River Mouth 22 "

Note that 6-8 and 11-12 Minutes are the approximate periods of two of the prominent range-producing oscillations observed in the harbour basins. Oscillations of about 18-20 mins. have also been detected in the harbours. The conclusion to be drawn from this is that range action is a phenomenon of resonance due to a train of oscillations exactly corresponding with the modes of free oscillations of water in the elliptical basin of Table Bay. It must be pointed out, however, that as range-action is due fundamentally to long-period waves whose speed of travel differs somewhat (See Dwg. R.D 186 A) from the storm waves of Type A depicted herein, this chart does not accurately reflect the true directions or periods of the range-producing waves. These latter waves travel slightly faster and curve more round obstructions than does ordinary swell as here shown.

Nevertheless comparison of this chart with Dwg. R.D 186A does establish the general reliability of Graphical Integration methods of analysing wave propagation. This may be gauged from the following comparison of theoretical, and measured average velocities of travel of 18 sec. period waves (T = 18 sec)

Depth d in (Feet)	Wave Length λ (Measured) (Feet)	Theoretical Speed $v=\sqrt{\frac{g}{2\pi}\lambda \tanh \frac{2\pi d}{\lambda}}$ (Feet/sec)	Measured Speed $v=\frac{\lambda}{T}$ (Feet/sec)
30	408	22.0	22.7
70	442	24.2	24.5
40	438	24.4	24.3
30	398	22.9	22.0
90	454	25.1	25.1
70	394	22.6	21.9
80	417	23.8	23.1

A. Waves of 18 Sec (measured) Period forming the principal Disturbance. Wavelength & Speed vary according to Depth.
B. Probable 3rd. Harmonic of Main Wave (Periodicity 6 Secs).
C. Waves of Disturbance originating from End of Breakwater (Probable 5th. Harmonic of Main Wave; Periodicity 3 Secs)
D. Waves of Disturbance originating from Green Point (Probable 3rd. Harmonic of Main Wave; Periodicity 6 Secs).
E. Waves of Disturbance originating from Whale Rock (Probable 2nd & 5th Harmonics of Main Wave).

E. Continuous These penetrate to the Milnerton Shore.
F. Waves of Disturbance originating from Northern Tip of Robben Island (Probable 3rd and 5th. Harmonics). These penetrate as far as Mouth of Diep River.

Interruptions in the Continuity of the Waves (A) as shown are due generally to an Overlap of Photographs of different Timings. By a curious Coincidence (due to Photographs having been taken at about 15 Secs. Intervals) Continuity between the Waves of different Photographs has for the most part resulted naturally.

FIG. 21.

CHART of WAVE MOVEMENTS IN TABLE BAY

INFORMATION [illegible]

Date	11/9/43
Drawn by	[illegible]
Traced by	[illegible]
Checked by	[illegible]

S.A.R.A.M. [illegible]

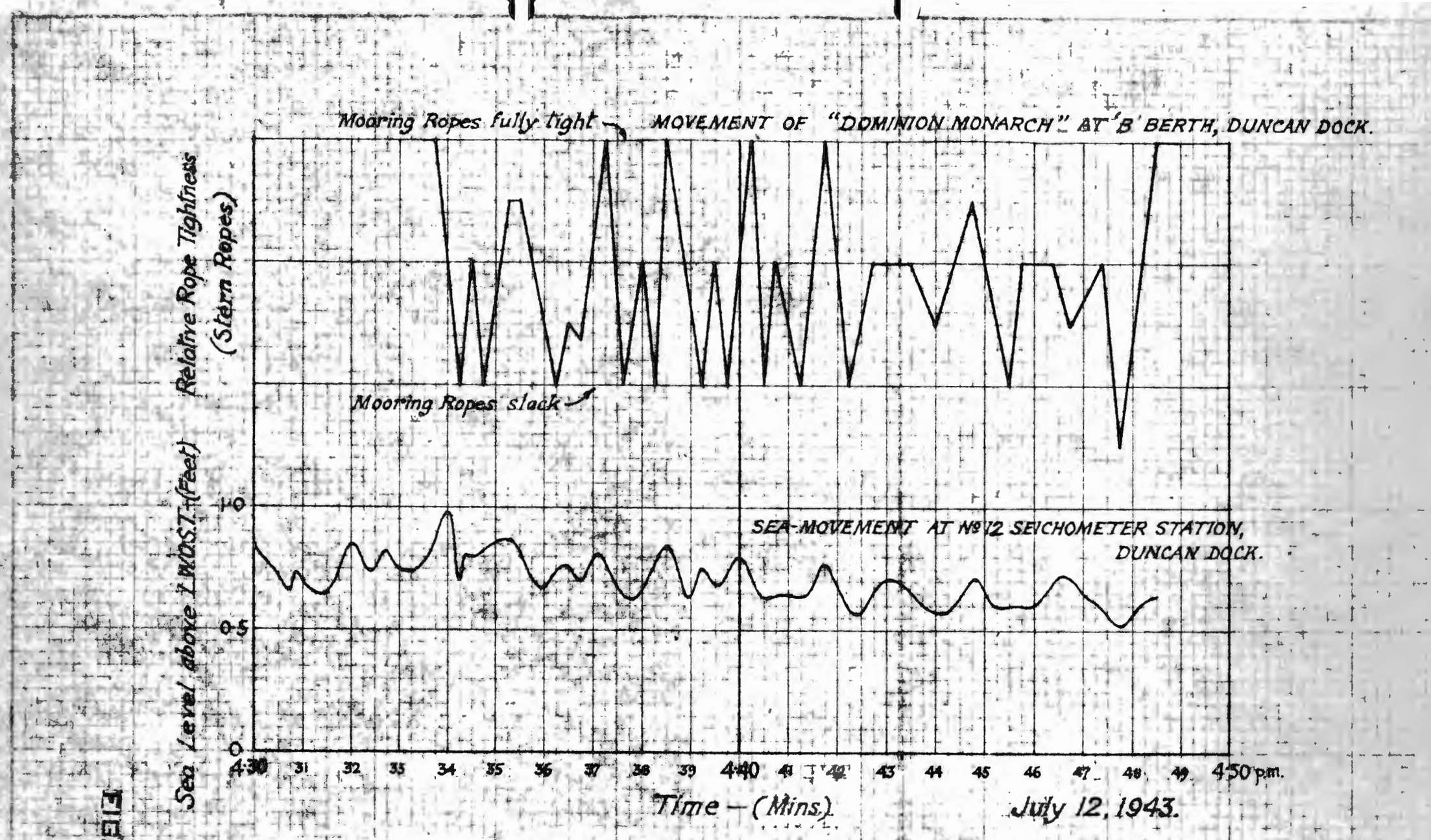


FIG. 22: CORRELATION BETWEEN SHIP-MOVEMENT & SEA-OSCILLATION

SHIP OF 35,000 TONS DISPLACEMENT - "DOMINION MONARCH."

FIG. 22.

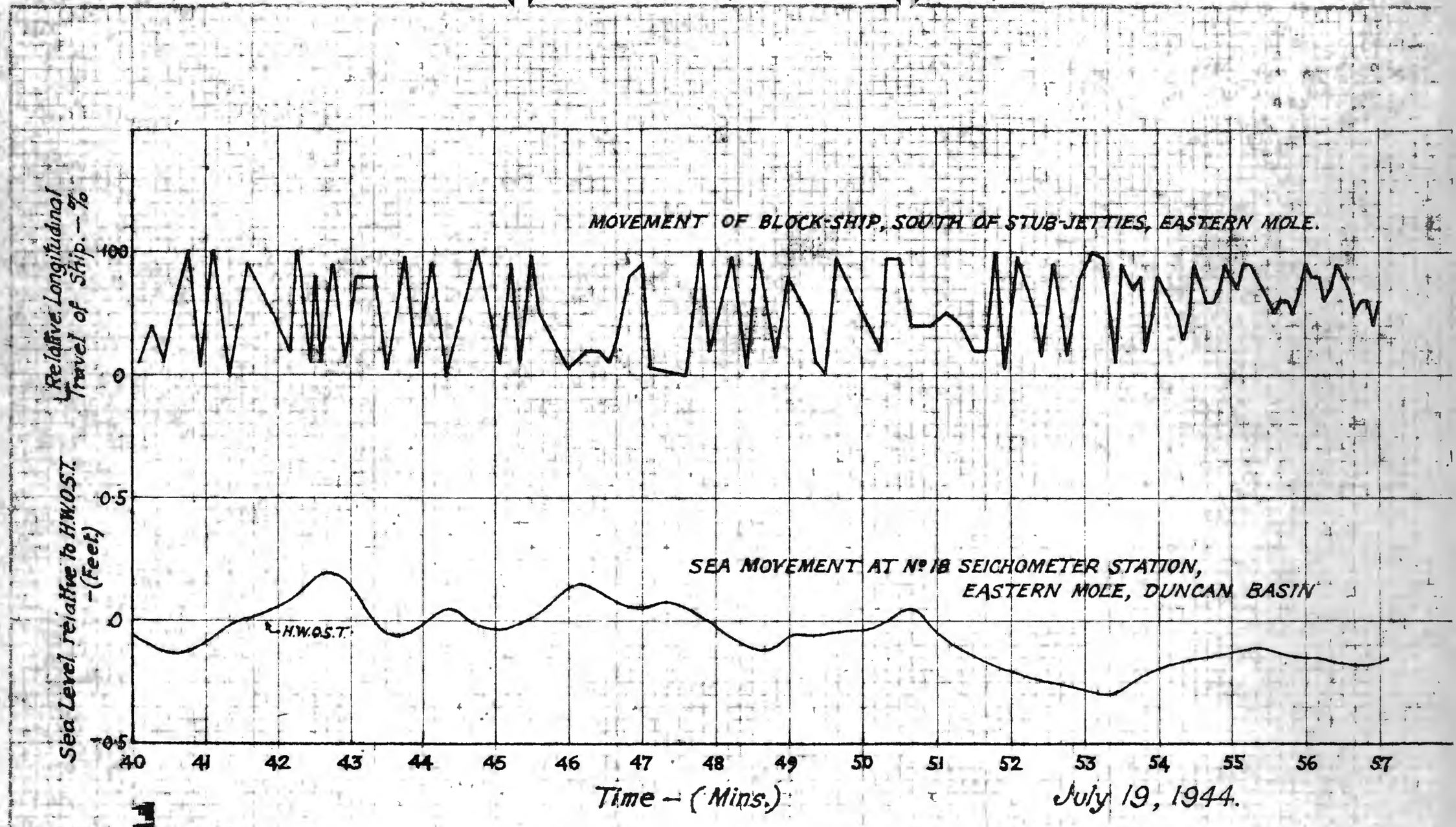


FIG. 23.

FIG. 23: CORRELATION BETWEEN SHIP-MOVEMENT & SEA-OSCILLATION.

SHIP OF 9000 TONS DISPLACEMENT.

W.

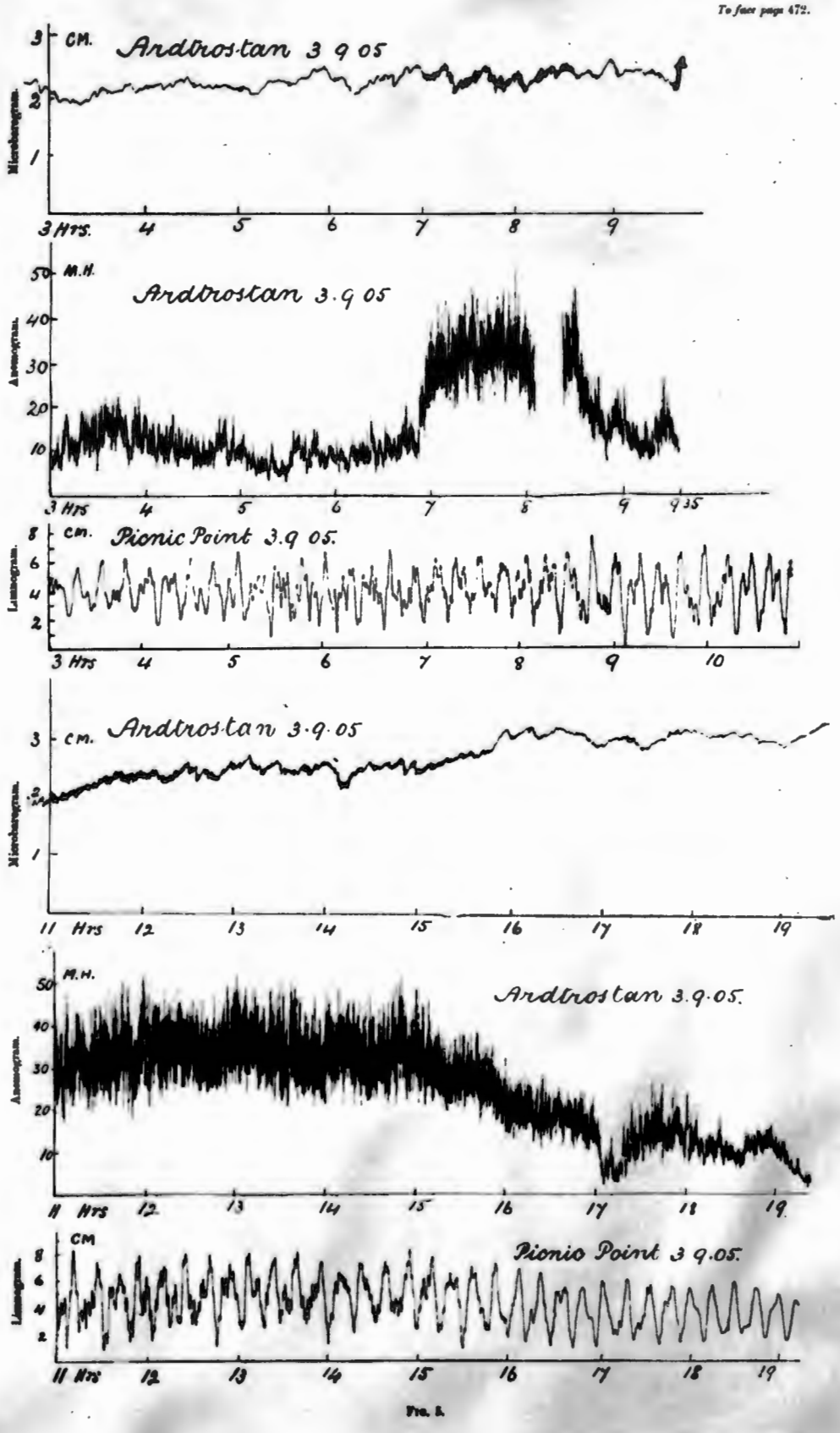
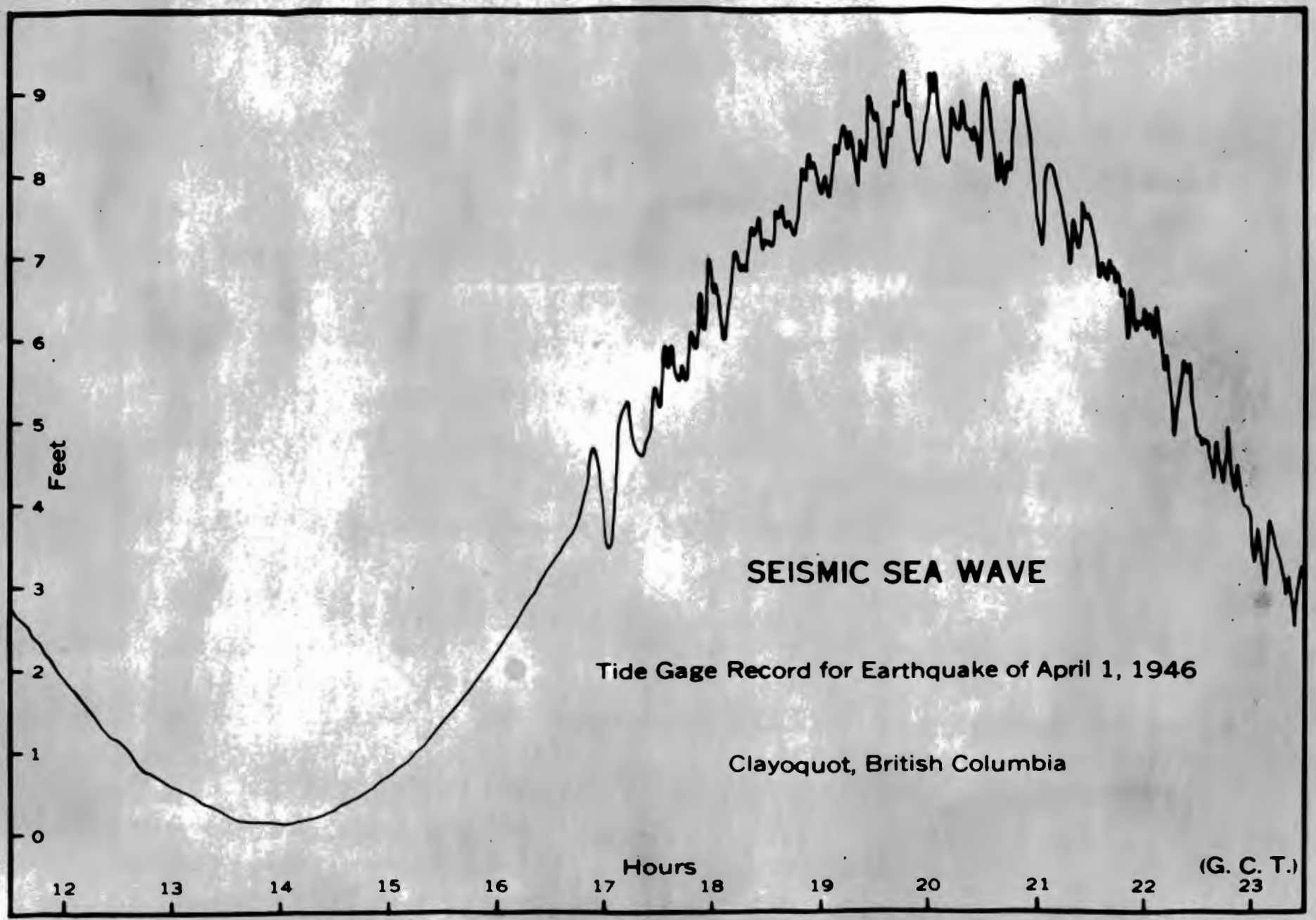
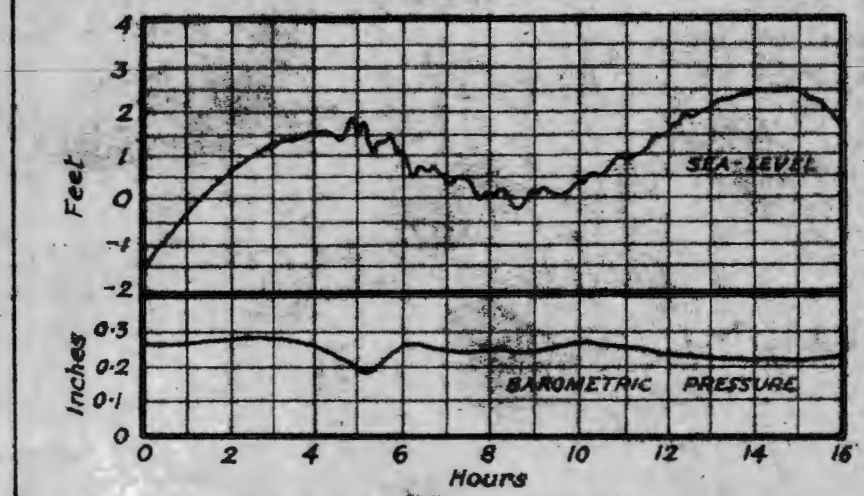


FIG. 24. FACSIMILE OF WIND, PRESSURE AND LAKE LEVELS FROM PROF. CHRYSTAL'S RESEARCHES ON LOCH EARN, SCOTLAND, 1906.



Reproduced from Report of U.S. Coast & Geodetic Survey, 1946.

FIG. 25.



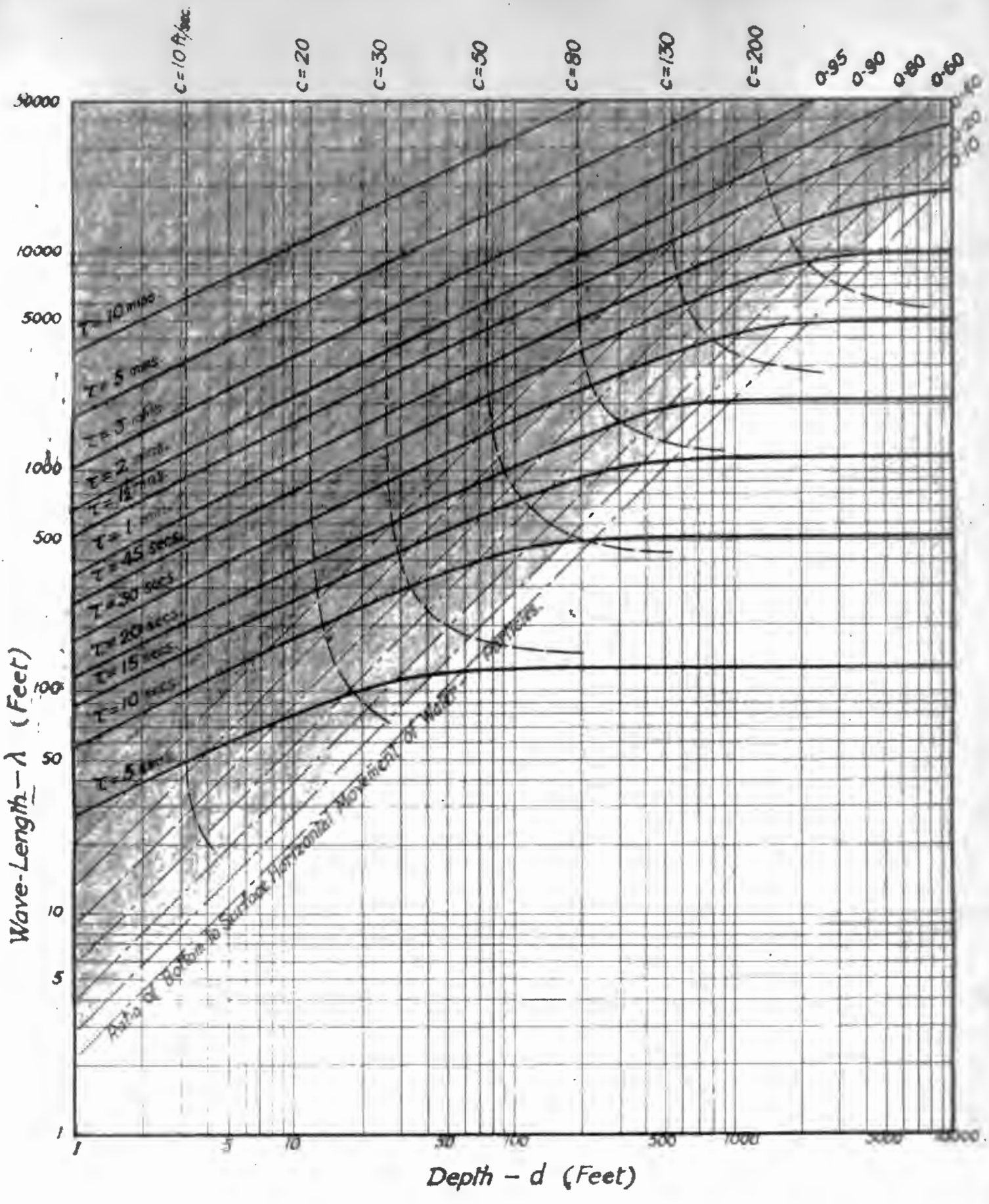
After Marmer, 'The Tide', (New York), 1926.

Fig. 26.

Seiches in San Francisco Bay developing from a Barometric Pressure Fluctuation, Nov. 21, 1910

(Mean Velocity of Wind 5 mph, Maximum, 10 mph).

W.



Relationships between Periodicity, τ, Velocity, c., Horizontal Movement, Wave-Length, λ, & Depth, d, for Small Amplitude Waves.

Based on Formula $c = \sqrt{\frac{g\lambda}{2\pi} \cdot \tanh \frac{2\pi d}{\lambda}}$.

W.

Fig. 27.

FIG. 28. PHOTO OF INSTRUMENTS IN OFFICE AT RANGE LABORATORY.

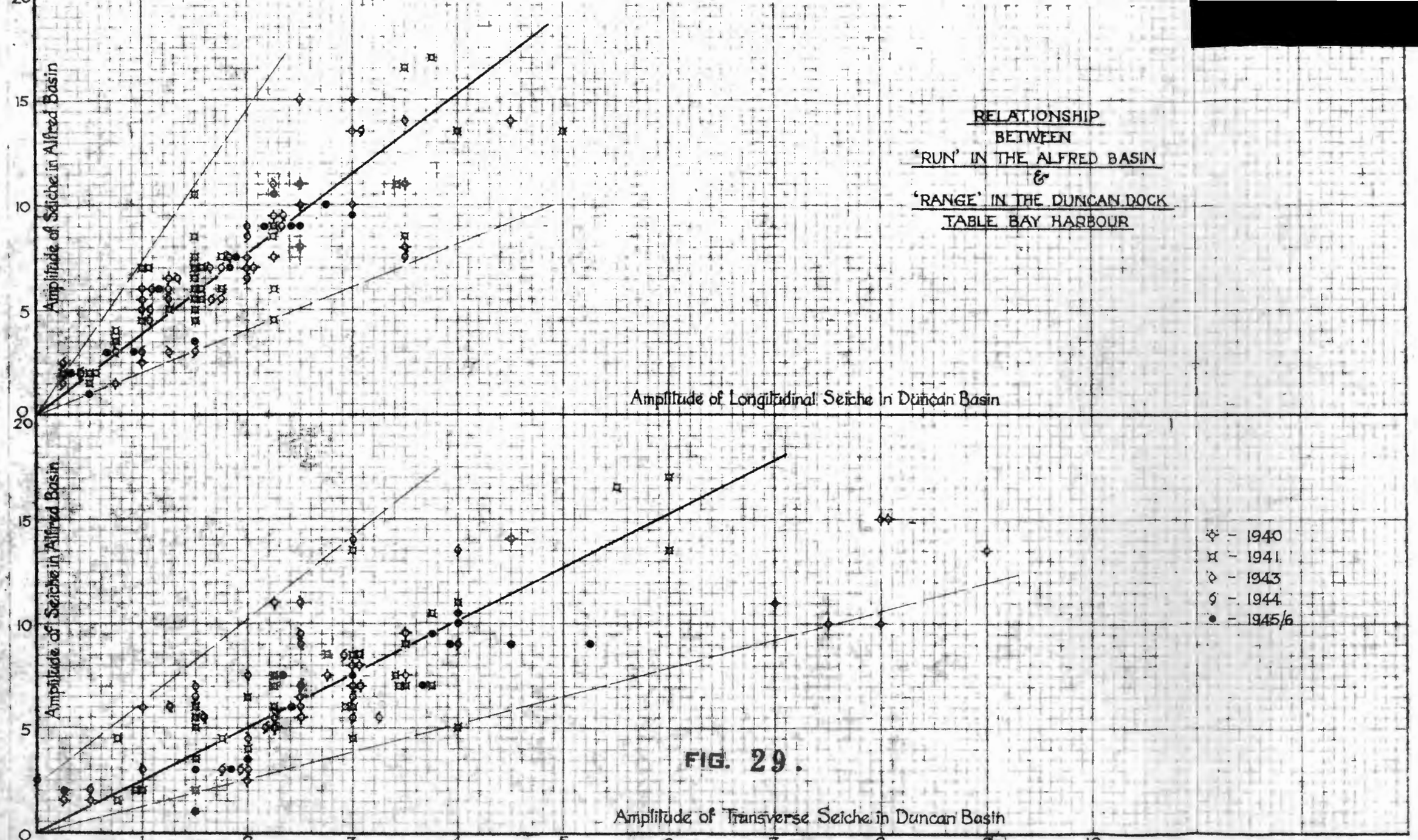

RELATIONSHIP
BETWEEN
'RUN' IN THE ALFRED BASIN
&
'RANGE' IN THE DUNCAN DOCK
TABLE BAY HARBOUR
Amplitude of Seiche in Alfred Basin
Amplitude of Longitudinal Seiche in Duncan Basin
Amplitude of Seiche in Alfred Basin
Amplitude of Transverse Seiche in Duncan Basin
0
5
10
15
20
1
2
3
4
5
6
7
8
9
10
- 1940
- 1941
- 1943
- 1944
- 1945/6

FIG. 29.

MARIGRAMS FROM THE LEA TIDE GAUGE, DUNCAN BASIN

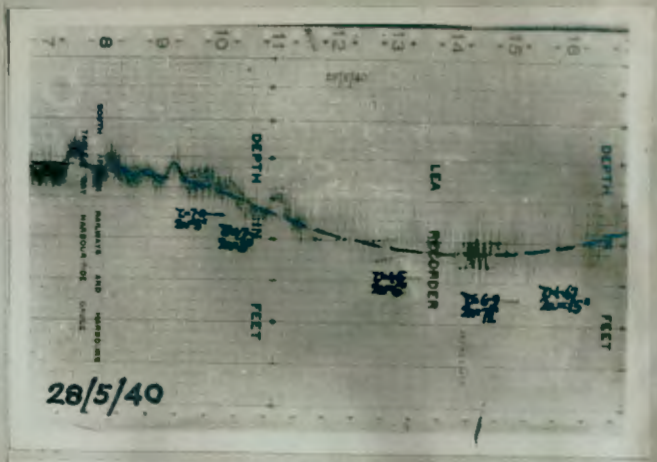


FIG. 30.

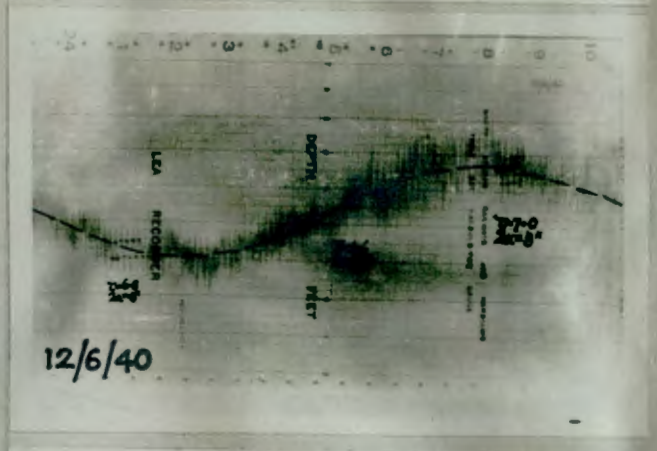


FIG. 31.

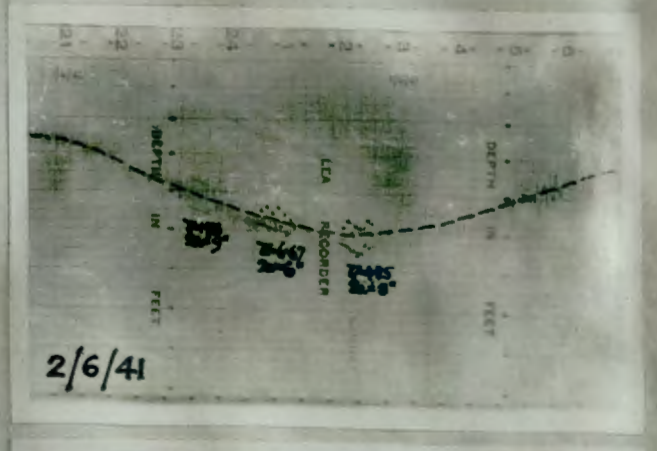


FIG. 32.

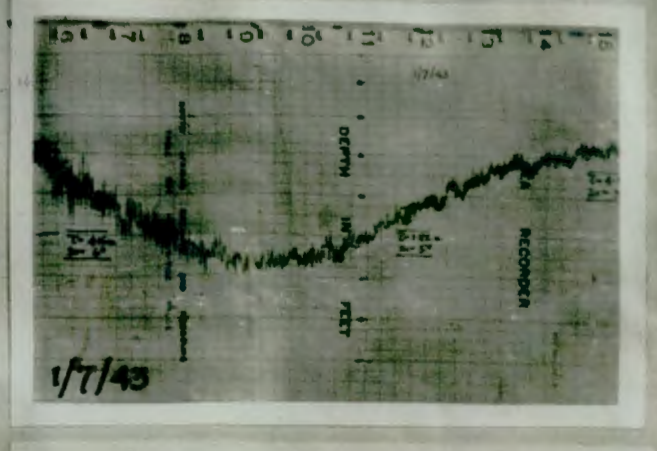


FIG. 33.

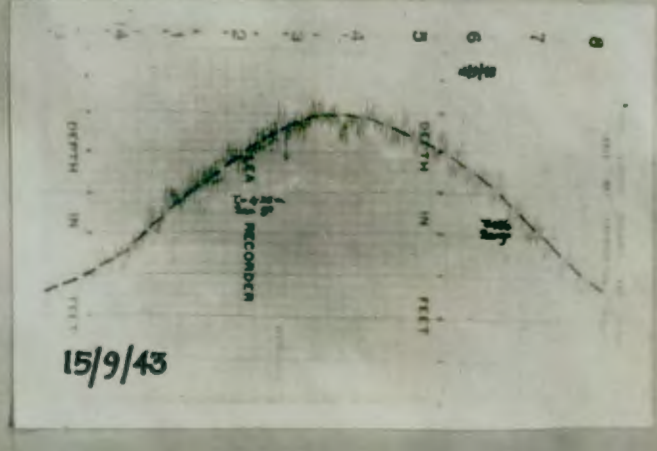


FIG. 34.

MARIGRAMS FROM THE LEA TIDE GAUGE, DUNCAN BASIN

FIG. 35.

FIG. 36.

FIG. 37.

FIG. 38.

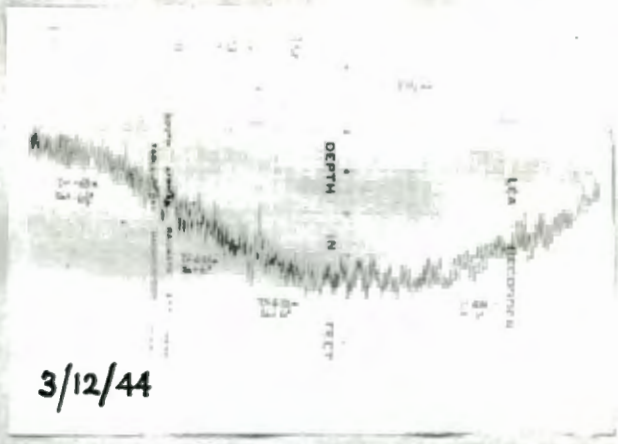


FIG. 39.

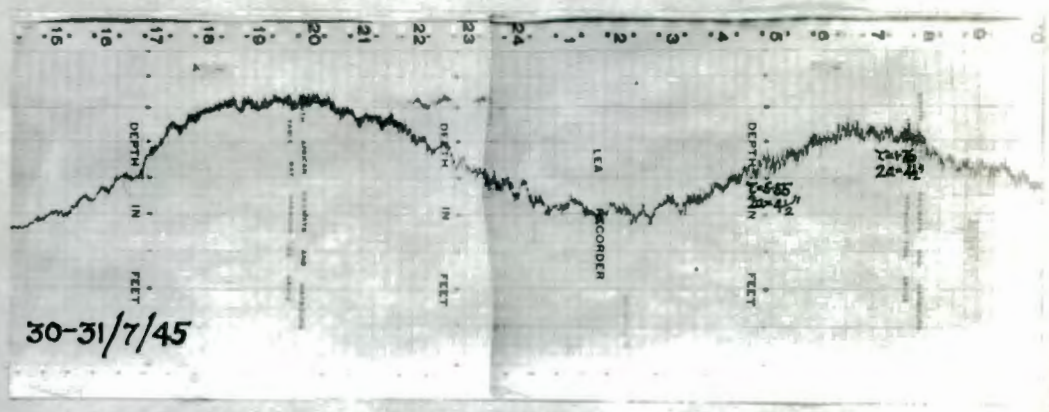


FIG. 40.

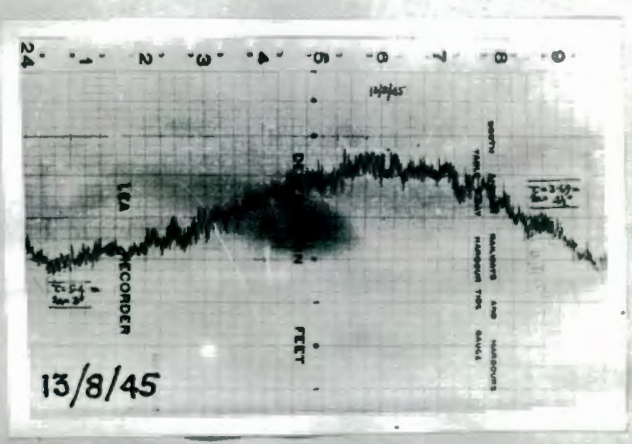


FIG. 41.

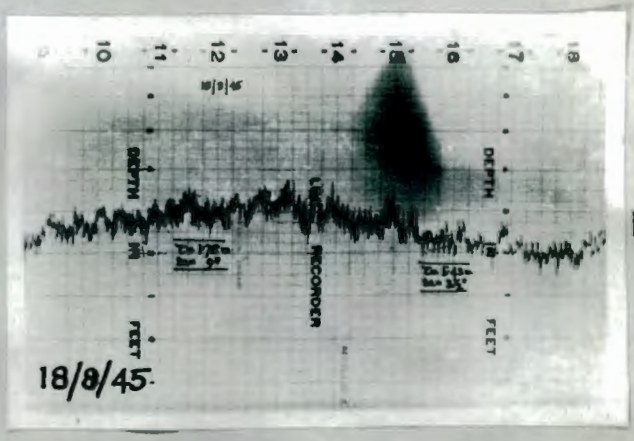
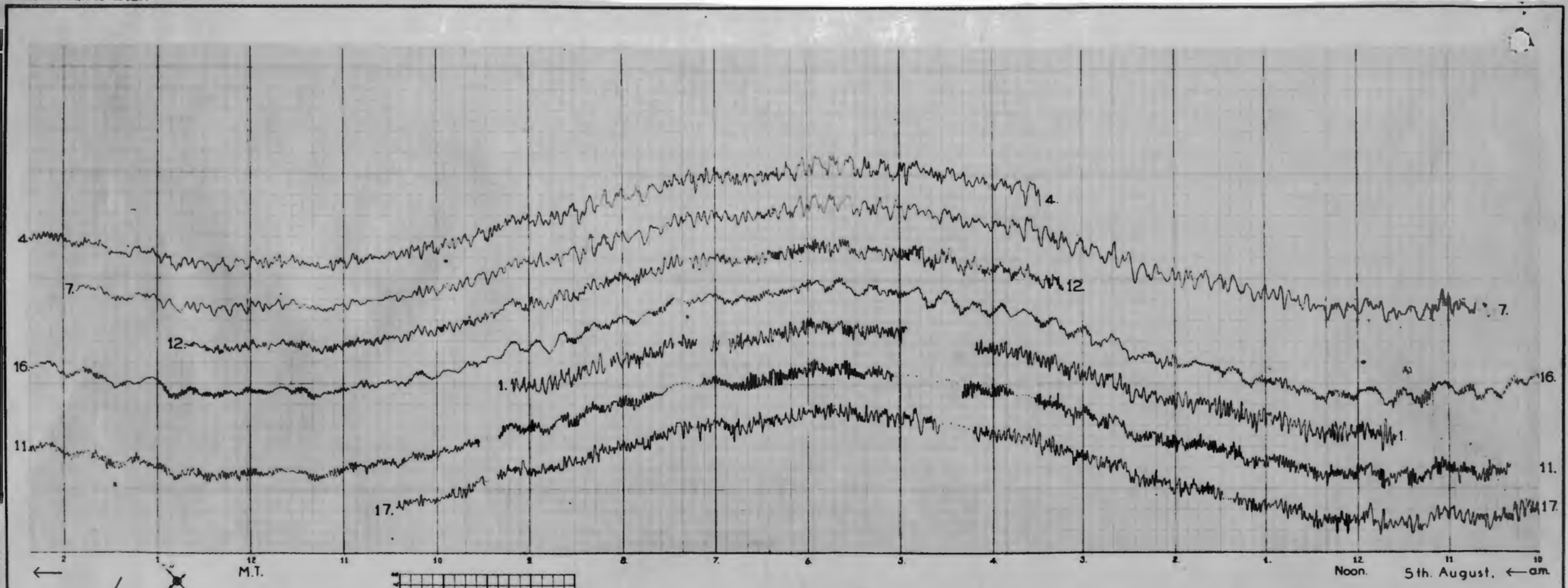
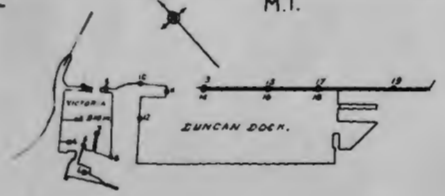


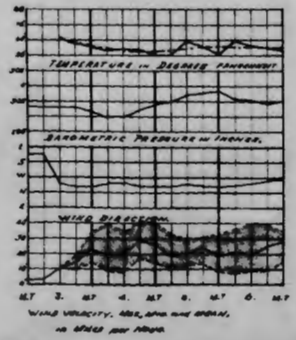
FIG. 42.

Marigrams from Lea Tide Gauge, Duncan Basin





Key to Positions of Recorders.

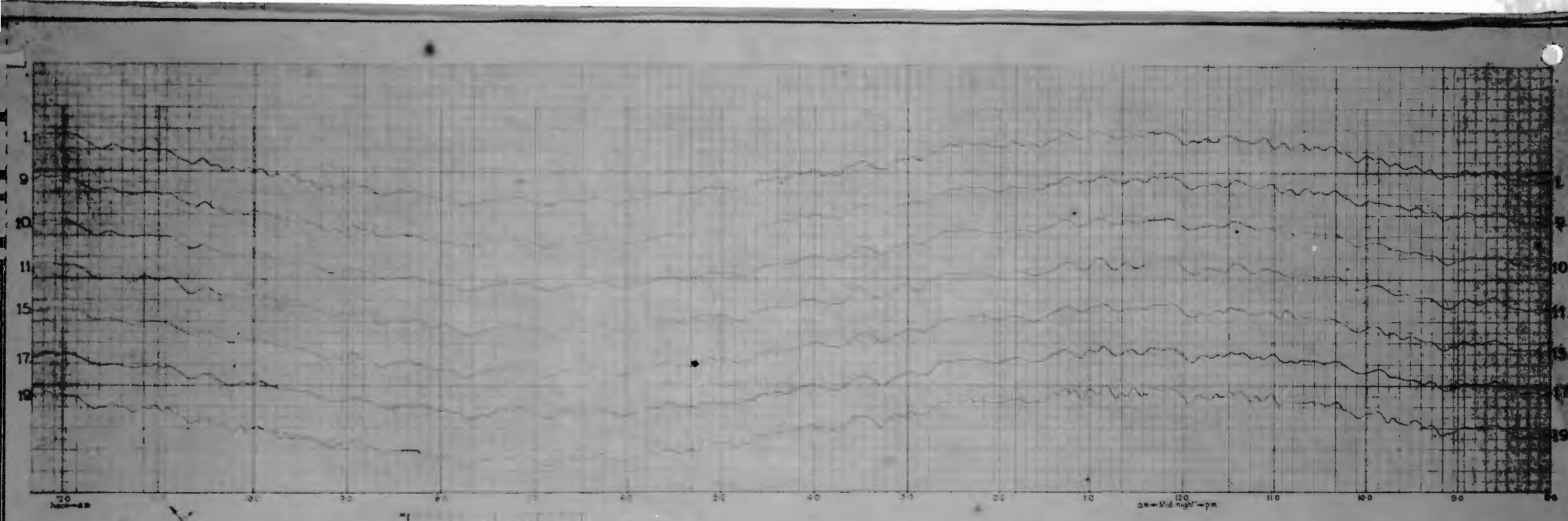


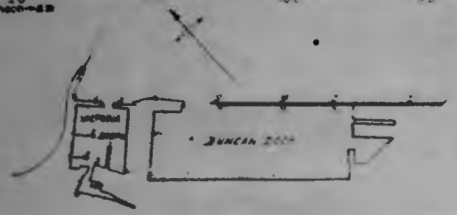
SYNCHRONISED SEICHE RECORDS.
FROM
HARBOUR RANGE RECORDERS.
5TH, AUGUST 1943.

FIG. 43.

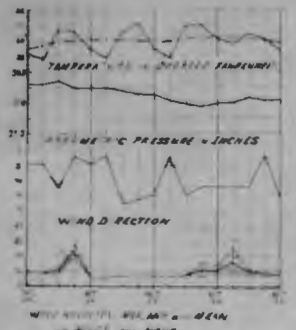
SCALES:
Hor: 1 c.m. = 14 Mins. (approx)
Vert: 1 c.m. = 9 Ins. (approx)
S. A. R. & H. C. C.E.'s RESEARCH SECTION
Investigation into Range. Table Bay Harbour.
S.W. Wilson, Chief Civil Engineer
DWG. No. RD1201

R.38.





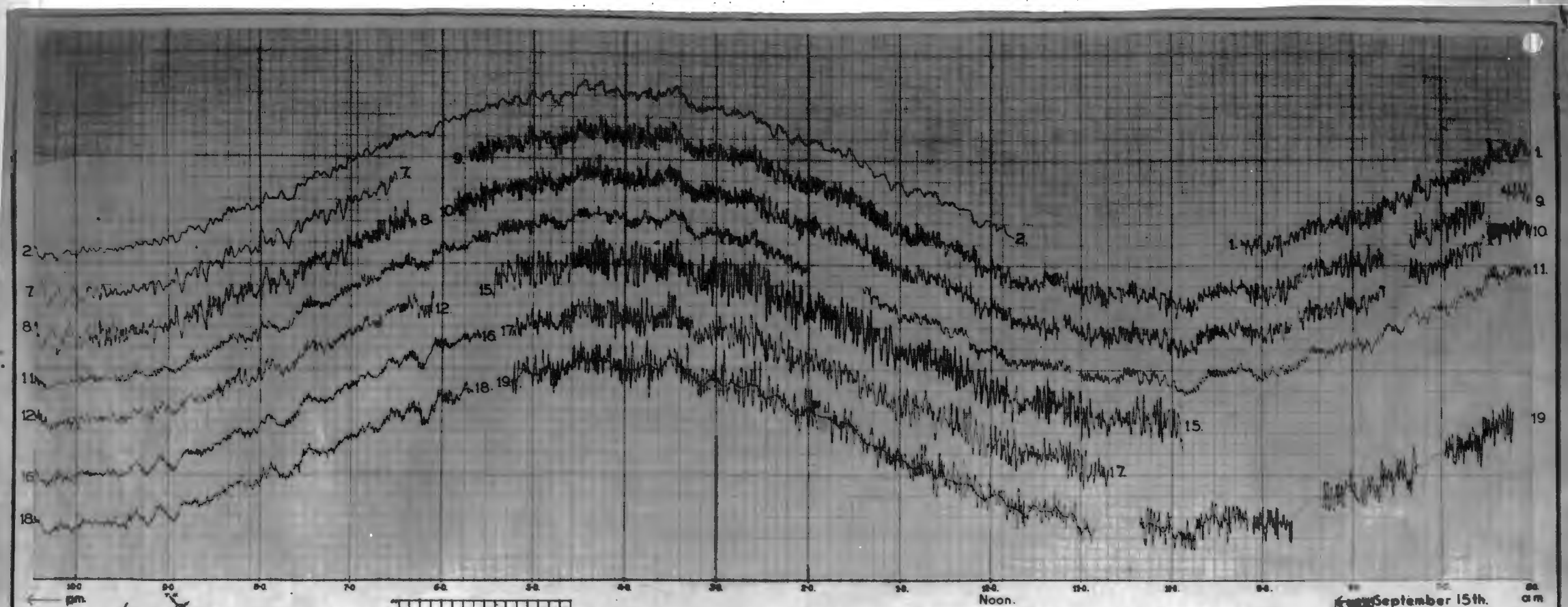
Key to Positions of Recorders.

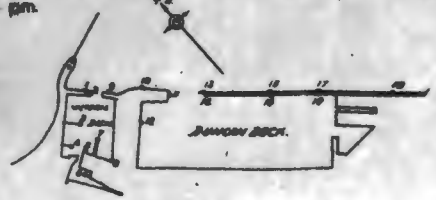


SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. AUGUST 25-26-1943.

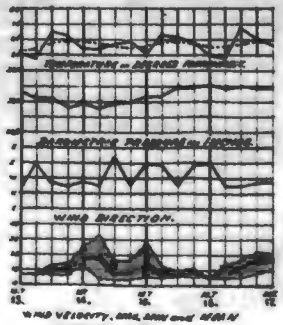
SCALES: Hor: 1 cm. = 14 Mins. Approx. Vert: 1 cm. = 9 Ins. Approx.	
S. A. R. & H. C.C.E.'s RESEARCH SECTION Investigation into Range Table Bay Harbour.	
F.W. Wilson Chief Civil Engineer	DWG No. R.D. 12

FIG. 44.





Key to Positions of Recorders.



SYNCHRONISED SEICHE RECORDS.
FROM
HARBOUR RANGE RECORDERS.
SEPTEMBER 15-16-1943.

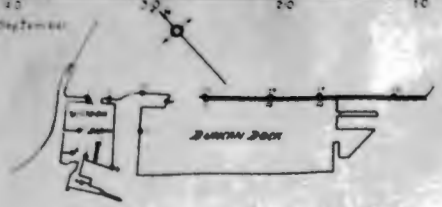
SCALES:	
Hor: 1 cm. = 14 Mins.	[approx.]
Vert: 1 c.m. = 9 Ins.	[approx.]

S A R & H
C. C.E's RESEARCH SECTION
Investigation into Range Table Bay Harbour.

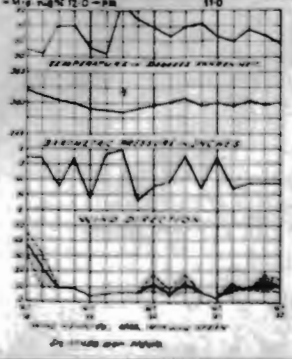
J.W. Wilson
Chief Civil Engineer

DWG. No RD 120C

FIG. 45.



Key to Positions of Recorders.



SYNCHRONISED SEICHE RECORDS.
FROM
HARBOUR RANGE RECORDERS.
SEPTEMBER 20-21-1943.

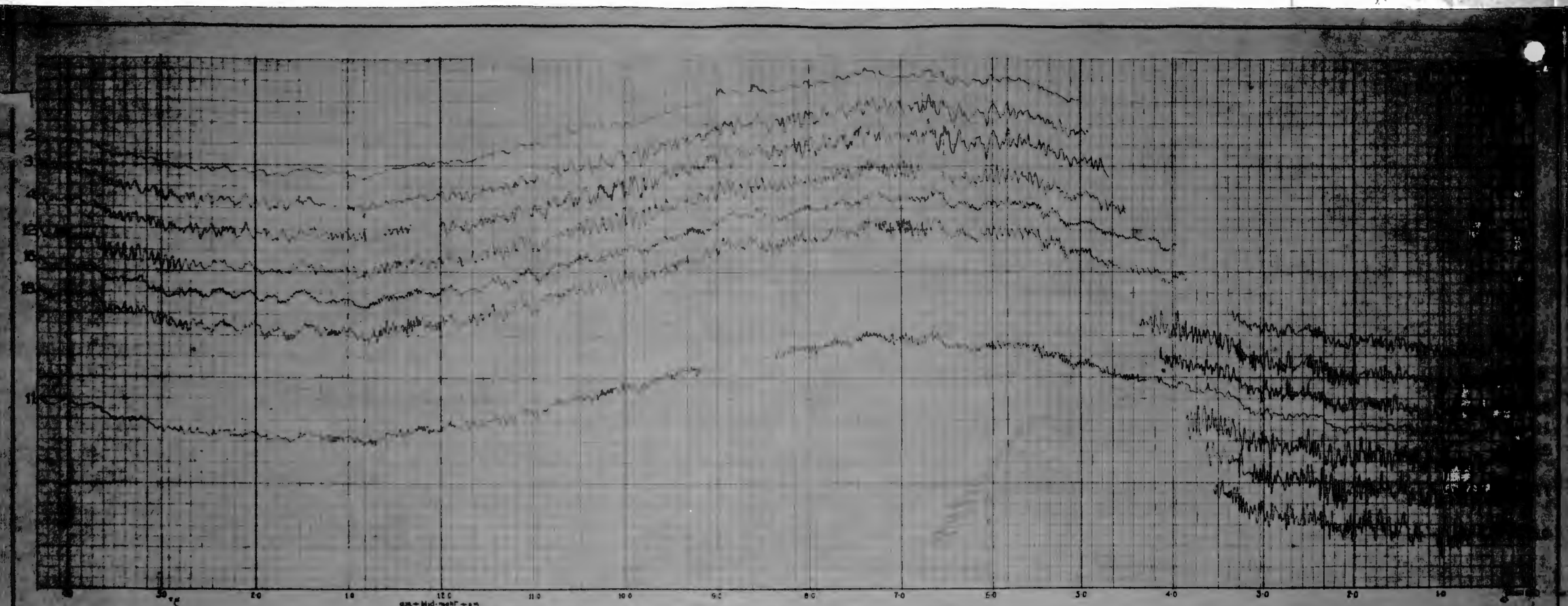
FIG. 46.

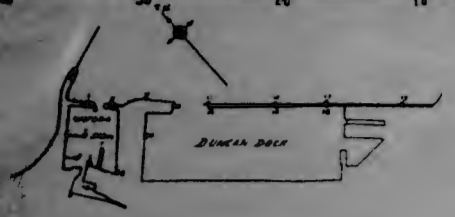
SCALES.	
Hor. 1 cm. = 14 Mins	(approx.)
Vert. 1 cm. = 9 Ins	(approx.)

S A R & H
C C E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour

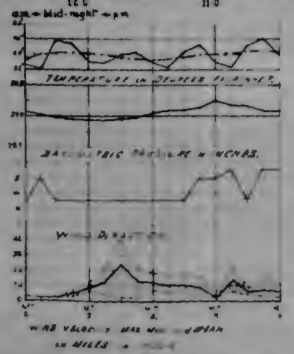
J.W. Wilson
Chief Civil Engineer

DWG No. RD1203





Key to Positions of Recorders.



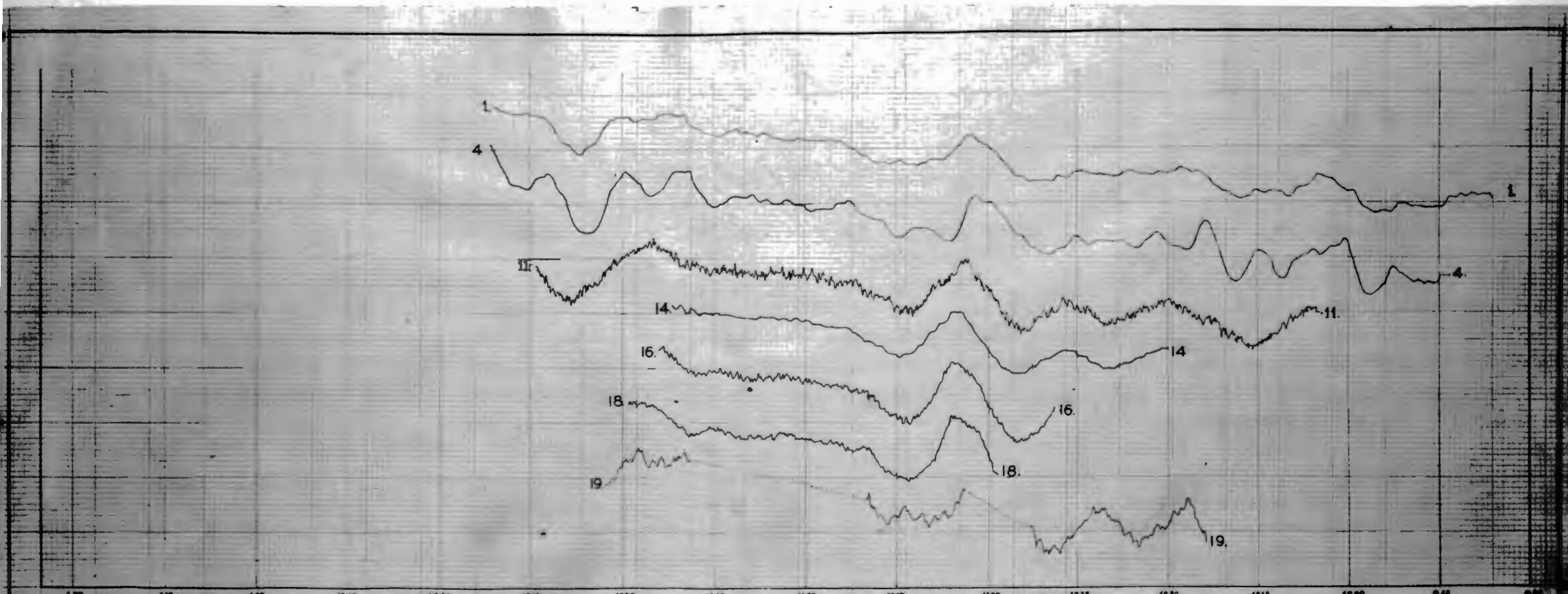
SYNCHRONISED SEICHE RECORDS.
FROM
HARBOUR RANGE RECORDERS.
OCTOBER 4-5-1943.

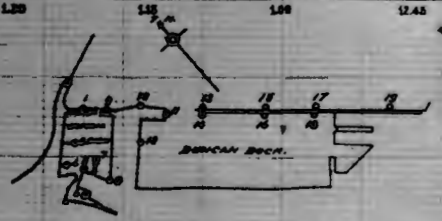
SCALES:
Hor: 1 c.m. = 14 Mins approx.
Vert: 1 c.m. = 9 Ins. approx.

S. A. R. & H.
C C E's RESEARCH SECTION.
Investigation into Range
Table Bay Harbour.

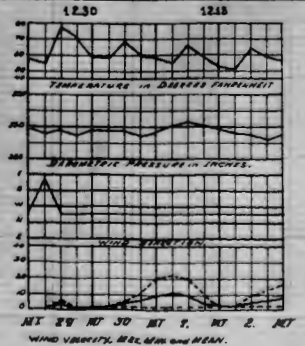
Chief Civil Engineer

FIG. 47.





Key to Positions of Recorders.



SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. OCTOBER 1ST 1944.

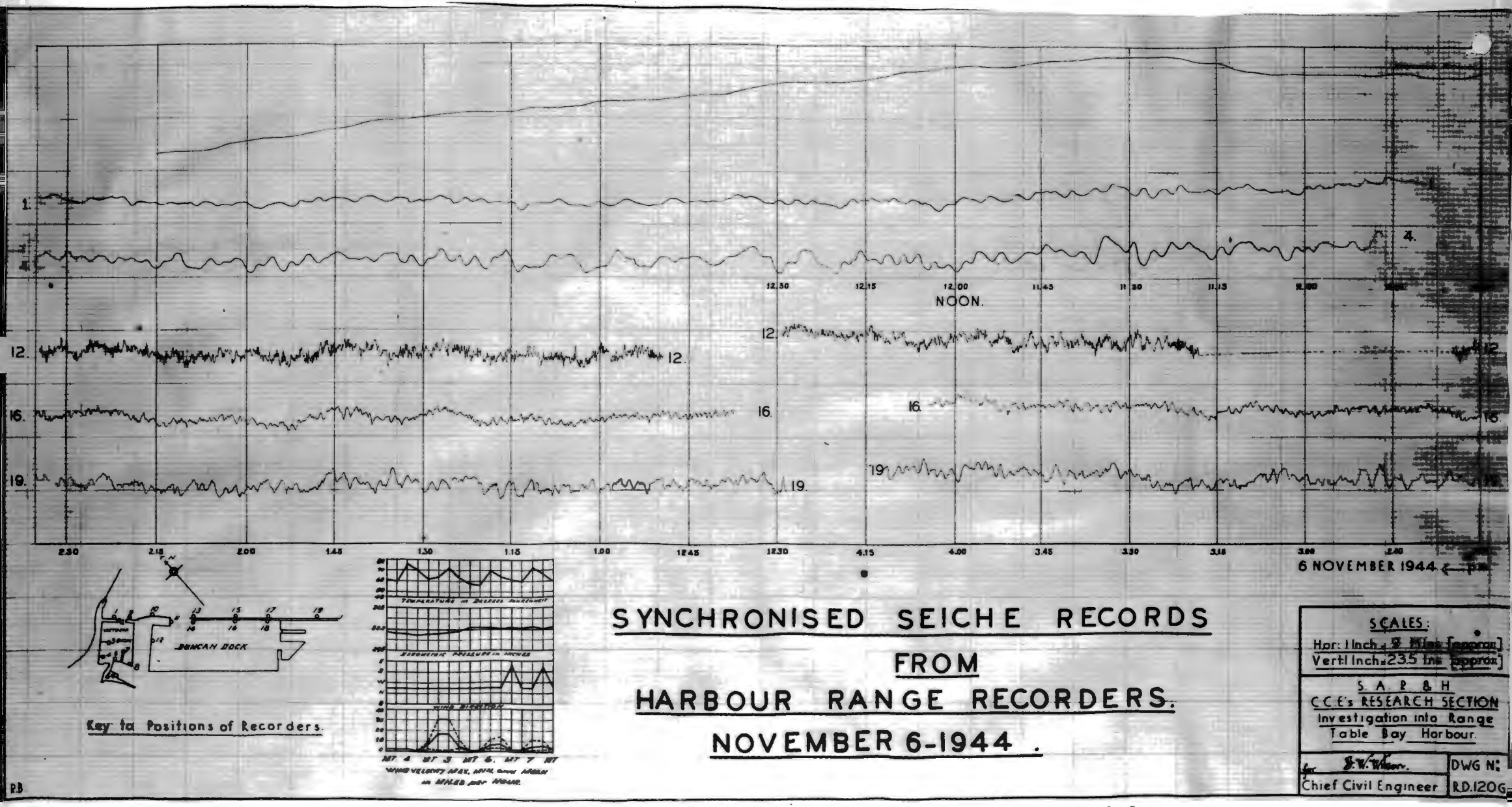
FIG. 48.

SCALES:
Hor: 1 Inch = 9 Mins. [approx]
Vert: 1 Inch = 2.35 Ins. [approx]

S. A. R. & H.
C.C.E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour.

E.W. Mears.
Chief Civil Engineer

DWG. No. RD1208



Key to Positions of Recorders.

SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. NOVEMBER 6-1944.

SCALES:
Hor: 1 Inch = 1/2 Hour [approx]
Vertl Inch = 2.5 Ins [approx]

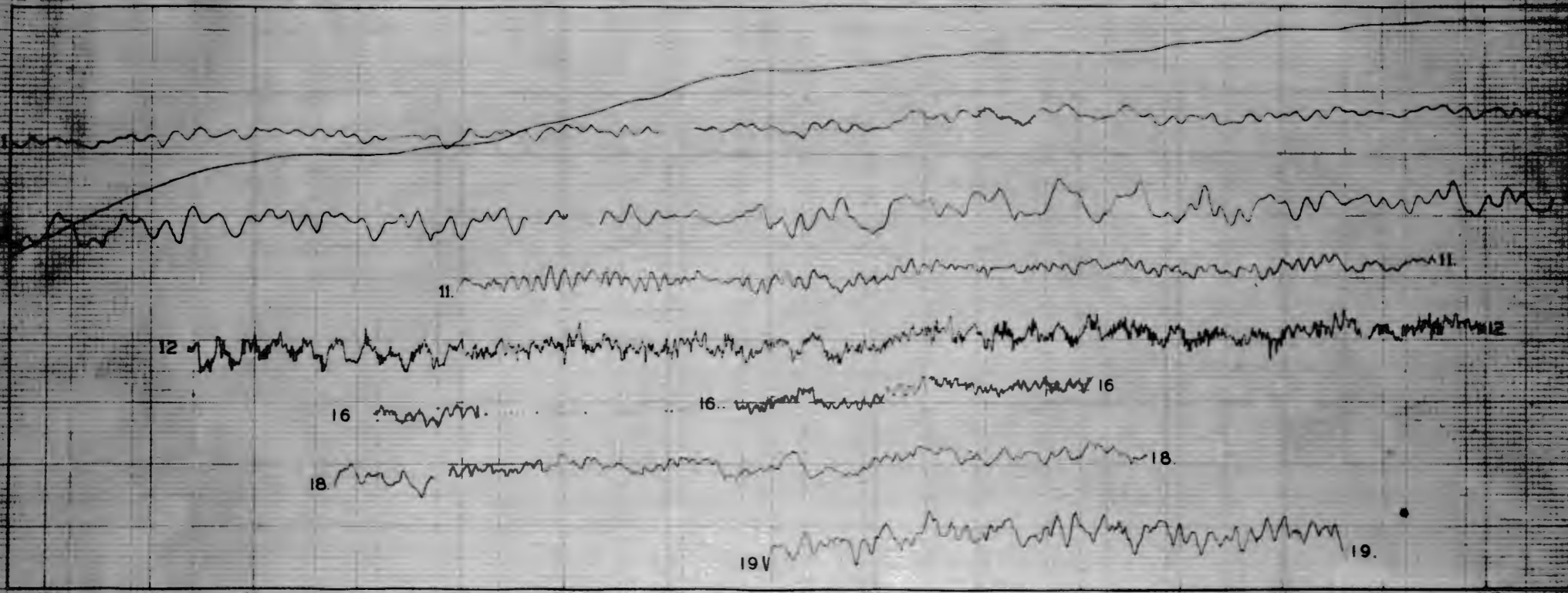
S. A. R & H
C.C.E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour.

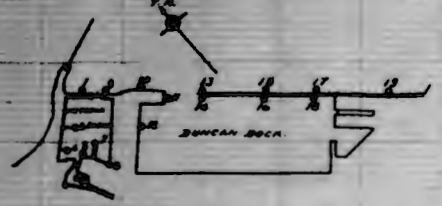
for E. W. Wilson.
Chief Civil Engineer

DWG N°
R.D.1206

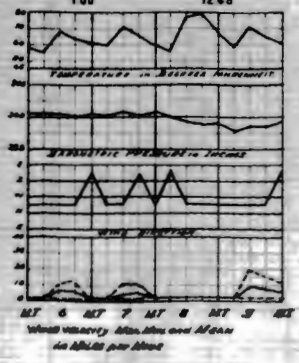
P.B

FIG. 49.





Key to Positions of Recorders.



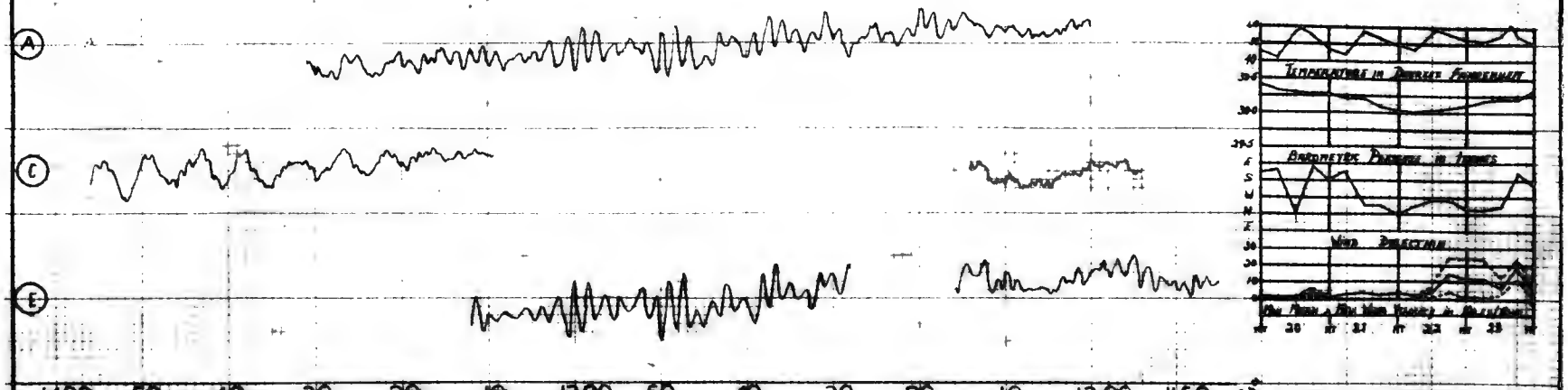
SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. NOVEMBER 8-1944. FIG. 50.

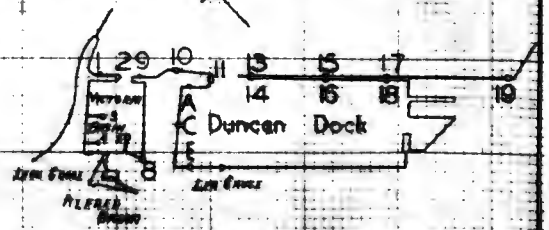
SCALES:
Hor: 1 Inch = 9 Mins (approx)
Vert 1 Inch = 2.35 Ins (approx)

S. A. R. & H.
C.C.E's RESEARCH
Investigation into Seiche
Table Bay Harbour.

Chief Civil Engineer

DWG No
SD120F





KEY TO POSITIONS OF RECORDERS

SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. JULY 22-1946

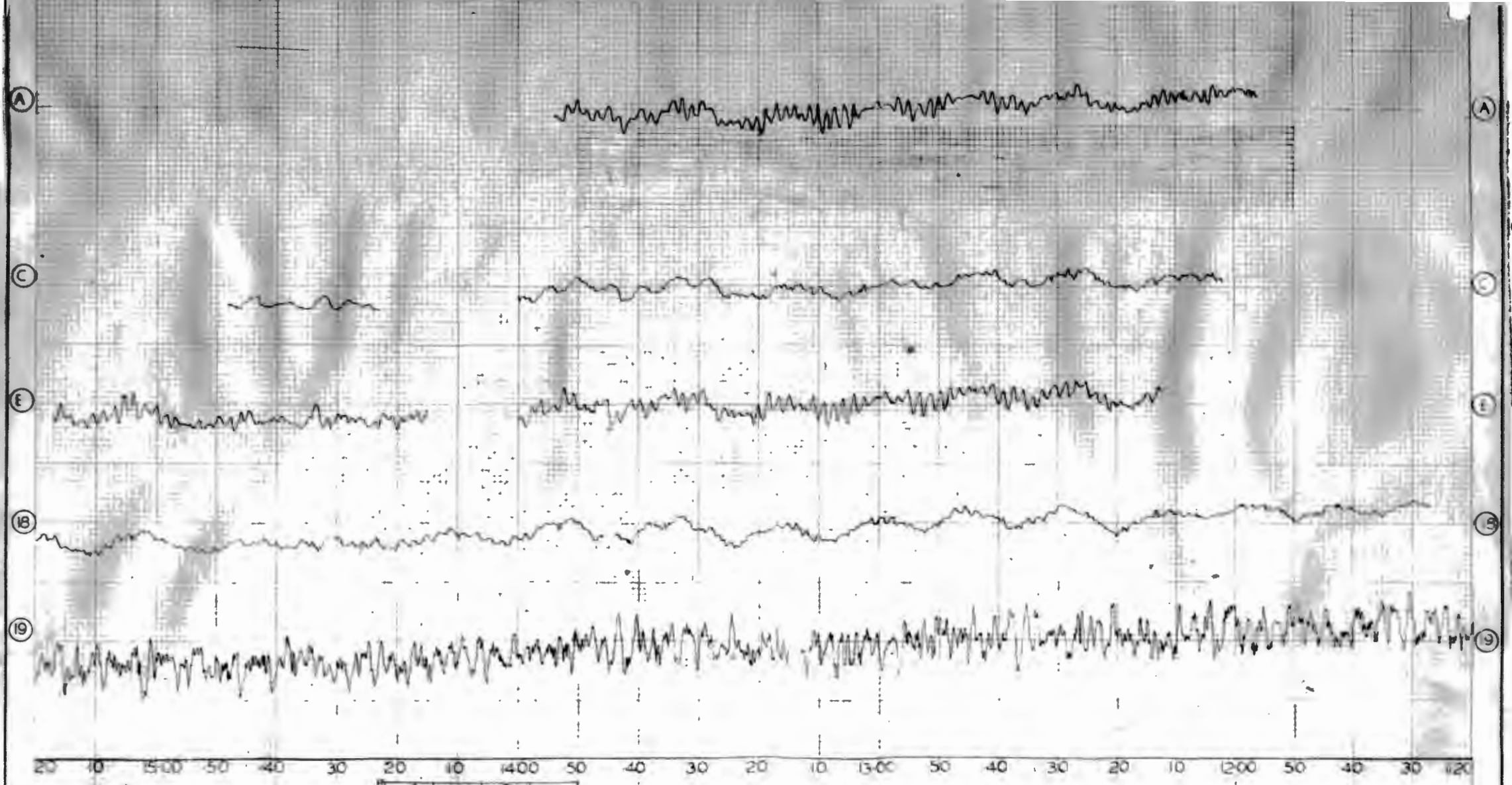
FIG. 51.

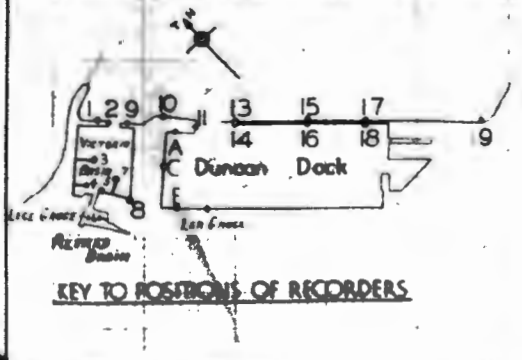
SCALES
Horiz. Length = 10 Hrs.
Vert. Length = 15.7 Inches.

S. A. R. & H.
C.C.E. RESEARCH SECTION
Investigation into Range
Table Bay Harbour

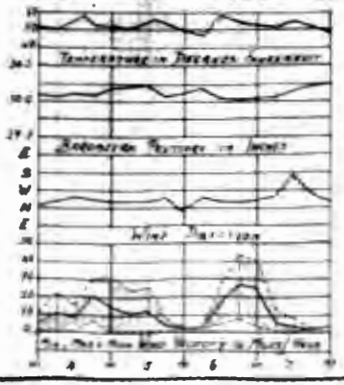
for Chief Civil Engineer

DWG No. RD 1201





KEY TO POSITIONS OF RECORDERS

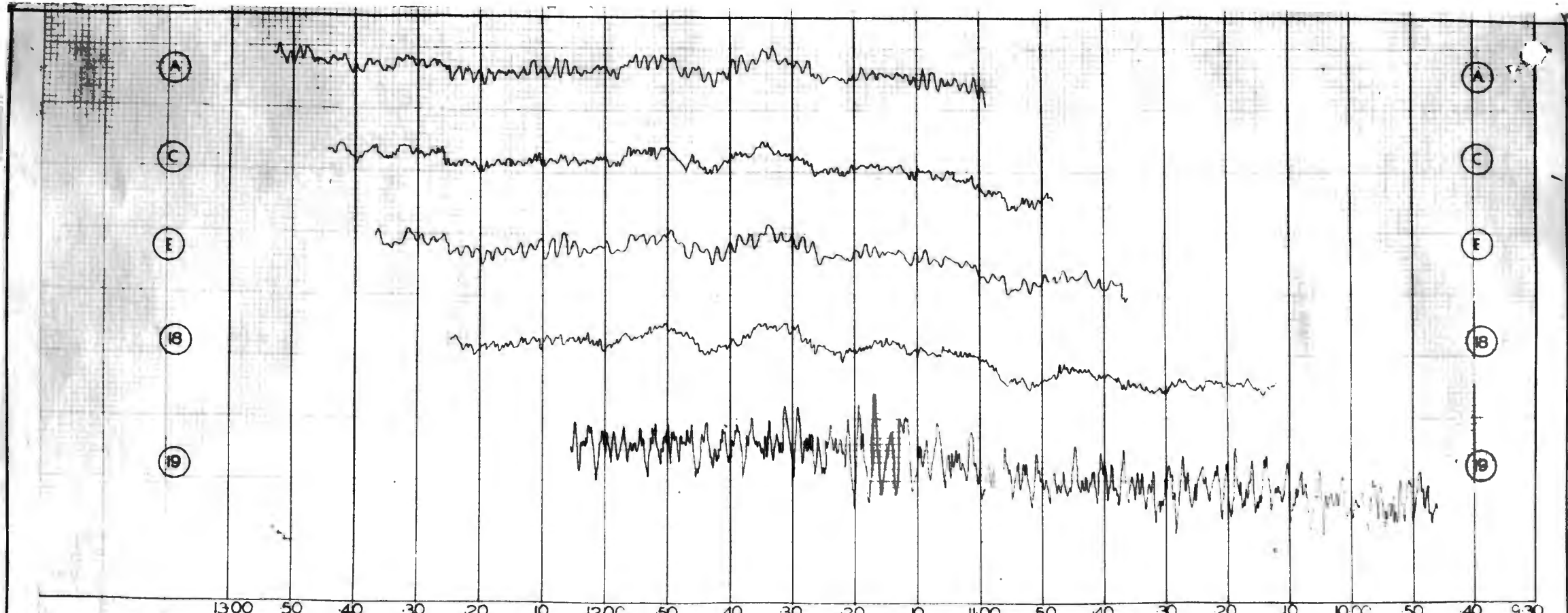


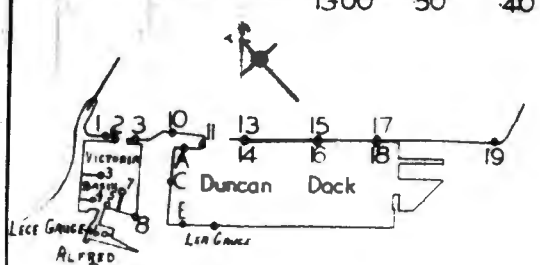
SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS.

AUGUST 6-1946

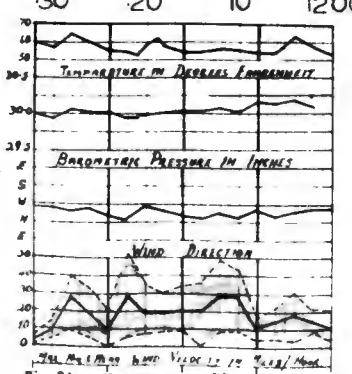
FIG. 52.

SCALES	
Hor.	1 inch = 10 Mins
Vert	inch = 57 inches
S. A. R. & H. C.C.E. RESEARCH SECTION	
Investigation Inlet Range	
Table Bay Harbour	
Drawn	Dwg No
Chief Engineer	RD K





KEY TO POSITIONS OF RECORDERS



SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. AUGUST 23–1946.

FIG. 53.

SCALES	
Hor	1 Inch = 10 Mins
Vert	1 Inch = 15.7 Inches
S A R & H C C E RESEARCH SECTION Investigation into Range Table Bay Harbour	
Brs. to Chief Civil Engineer	DWG No RD 1201

FIG. 54.

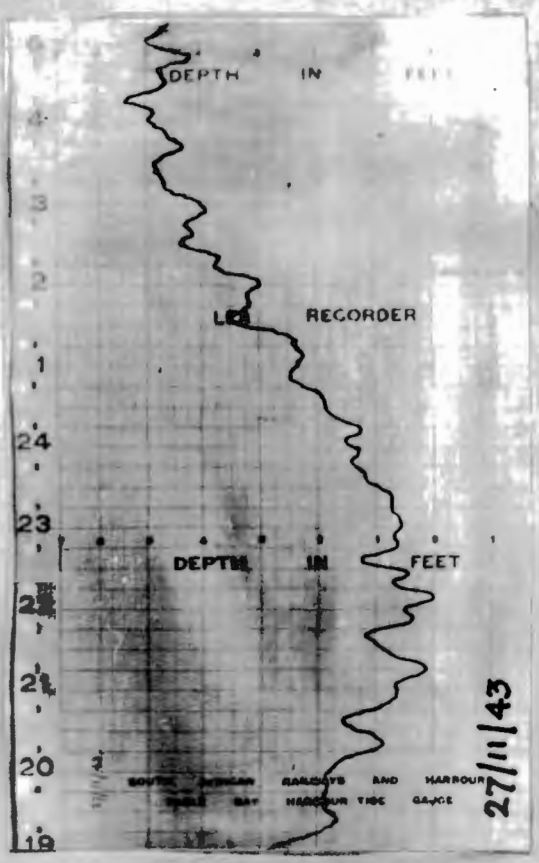
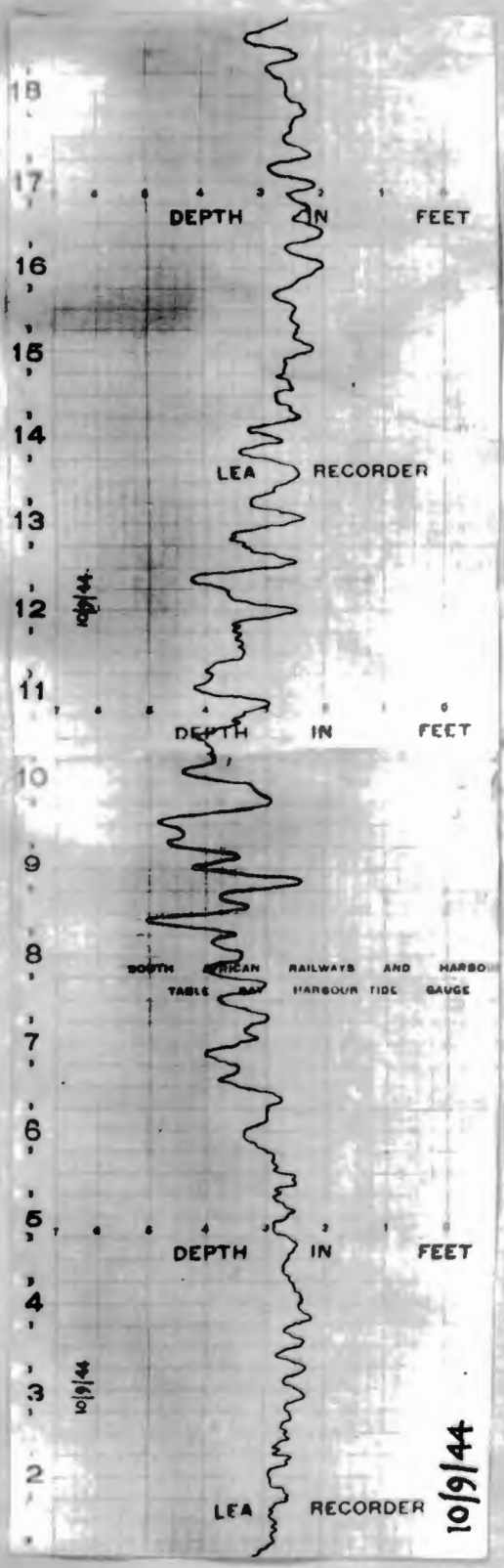
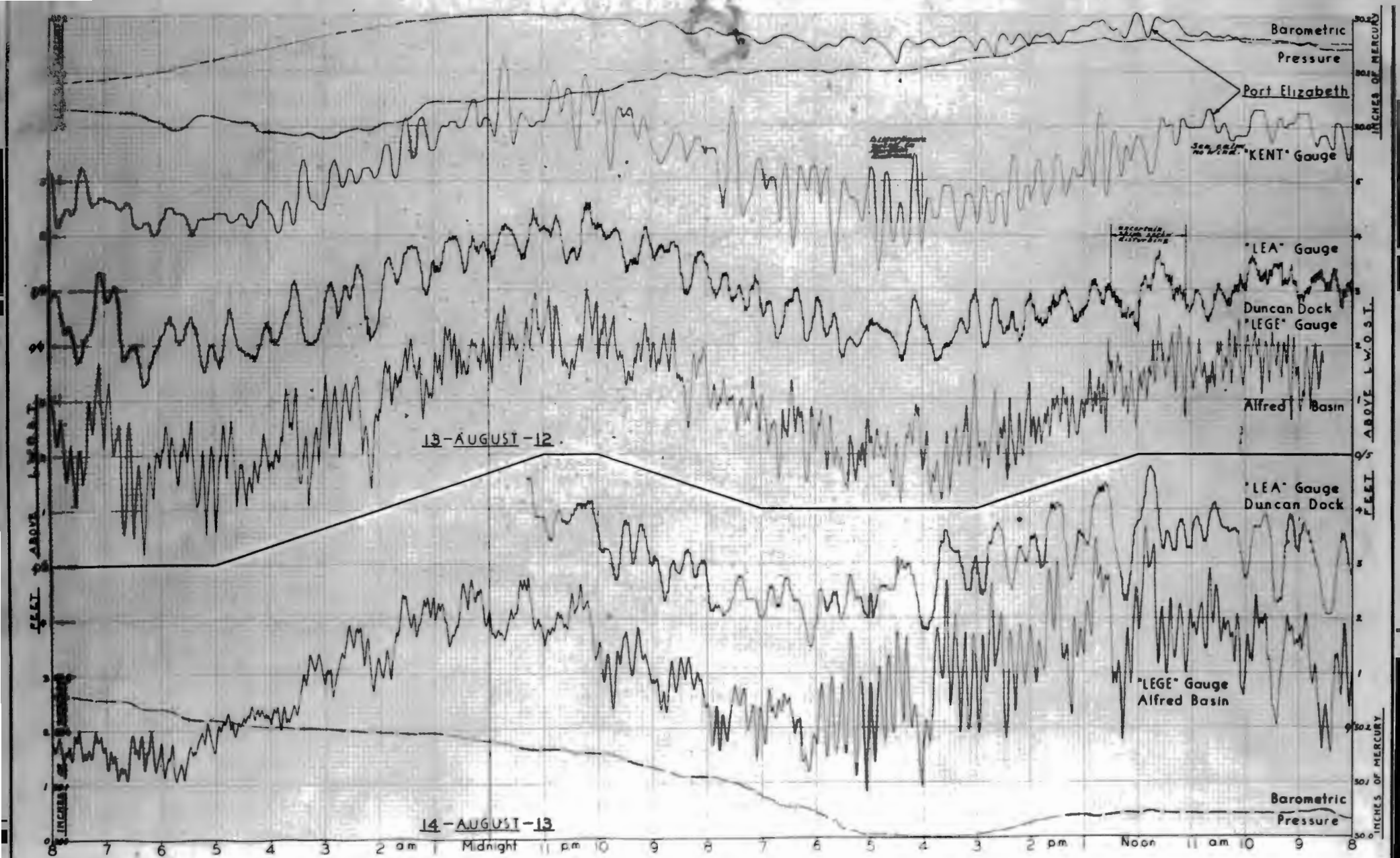
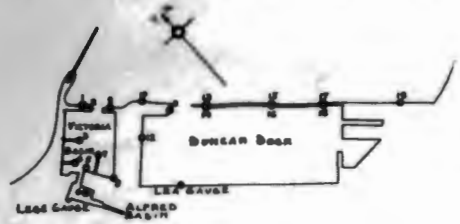


FIG. 55.

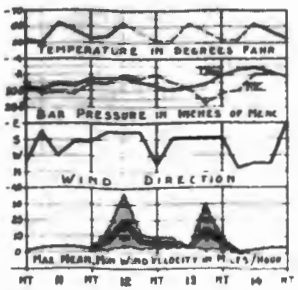


Marigrams from Lea Tide Gauge,
Duncan Basin





KEY TO POSITIONS OF RECORDERS



SYNCHRONISED SEICHE RECORDS FROM HARBOUR RANGE RECORDERS. AUGUST 12-13-1944.

FIG. 56.

wcaj

SCALES:	
Hor.	1 inch = 1 Hour
Vert.	" = 0·1 ins of Mercury
	" = 1 Foot " Water

S A R & H
C.C.E's RESEARCH SECTION.
Investigation into Range
Table Bay Harbour

for Chief Civil Engineer

DWG No. P.D.1201

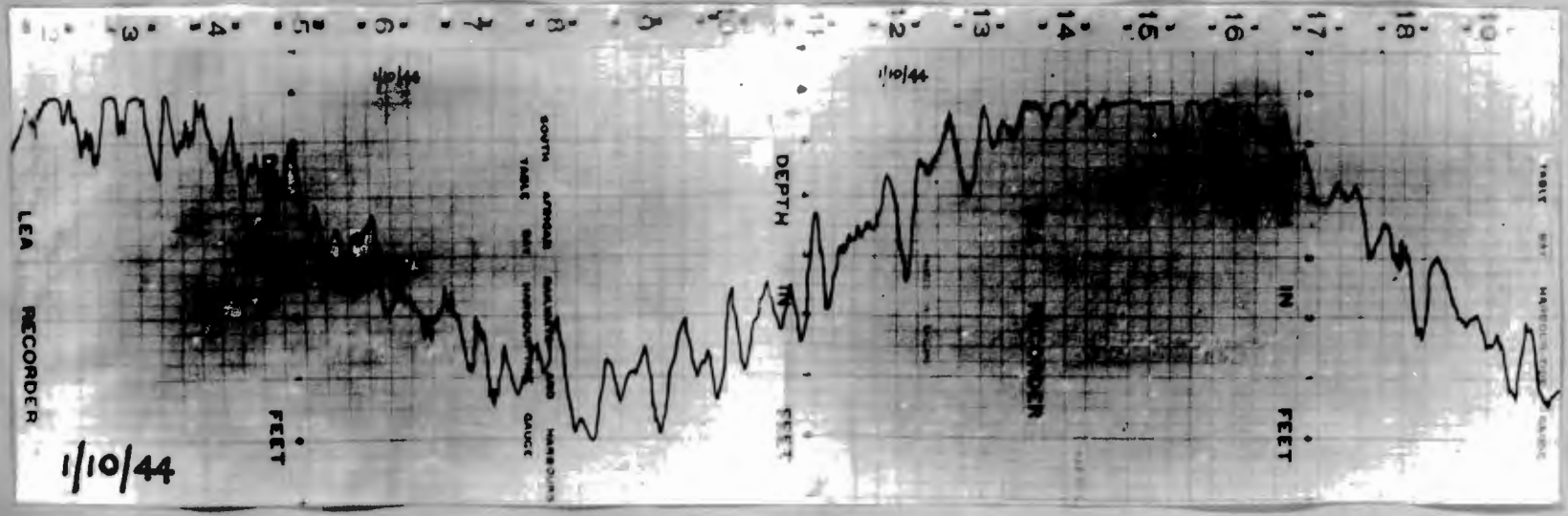
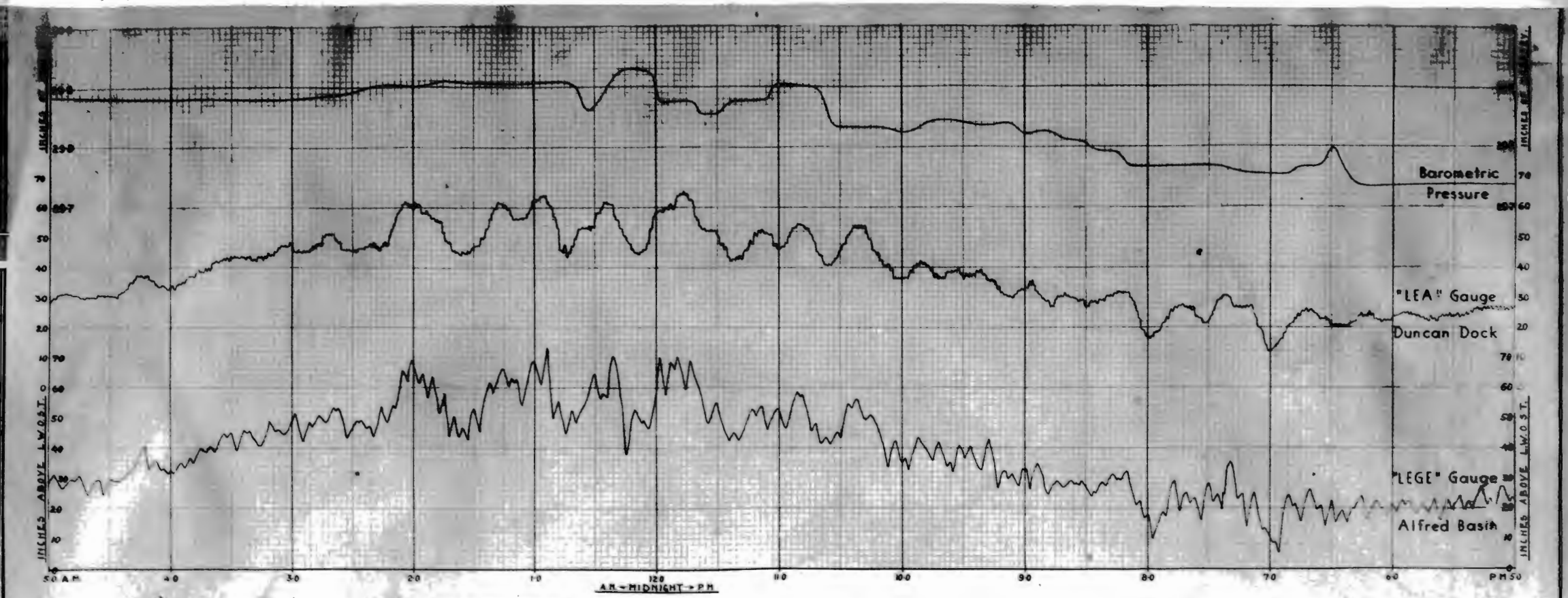
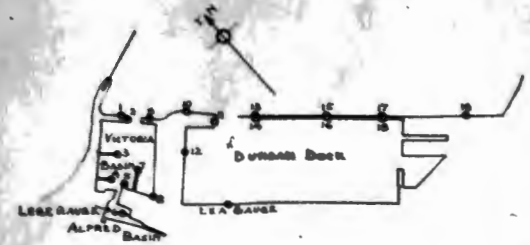


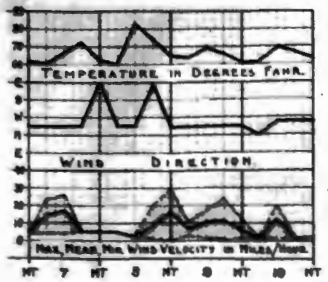
FIG. 57.

Marigram from Lea Tide Gauge, Duncan Basin





KEY TO POSITIONS OF RECORDERS.



SYNCHRONISED SEICHE RECORDS. FROM HARBOUR RANGE RECORDERS. APRIL 8-9-1945.

FIG. 58.

SCALES	
Hor.	1 Inch = 30 Minutes
Vert.	1 " = 0·1 Ins of Mercury
	1 " = 20 " " Water

S. A. R. & H.
C.C.E.'s RESEARCH SECTION
Investigation into Range
Table Bay Harbour

J.K. Wilson. for Chief Civil Engineer	DWG No. RD 120H

WCEJ

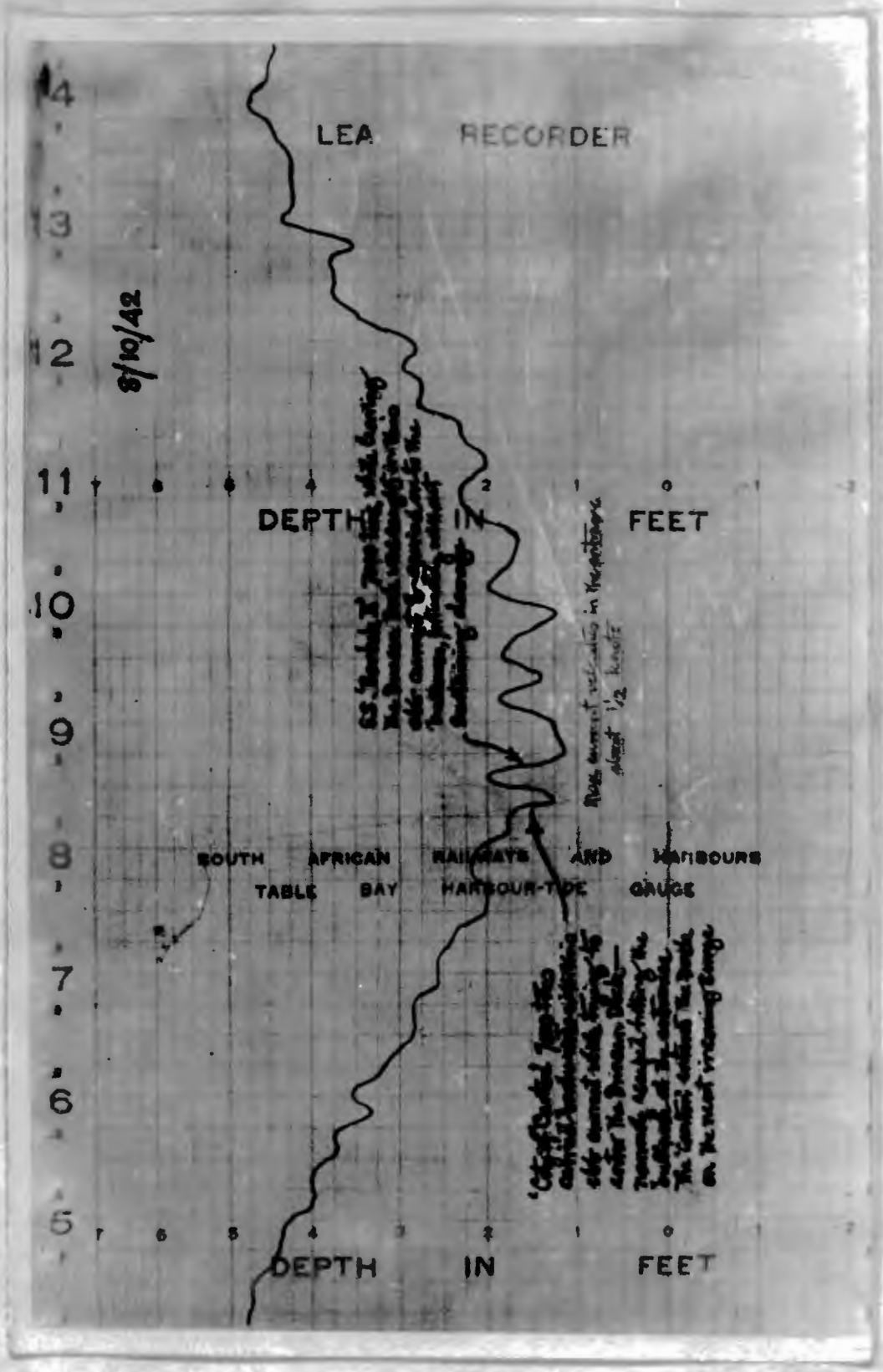


FIG. 59.

FIG. 59. MARIGRAM: LONG PERIOD SEICHES OF 8/10/42.

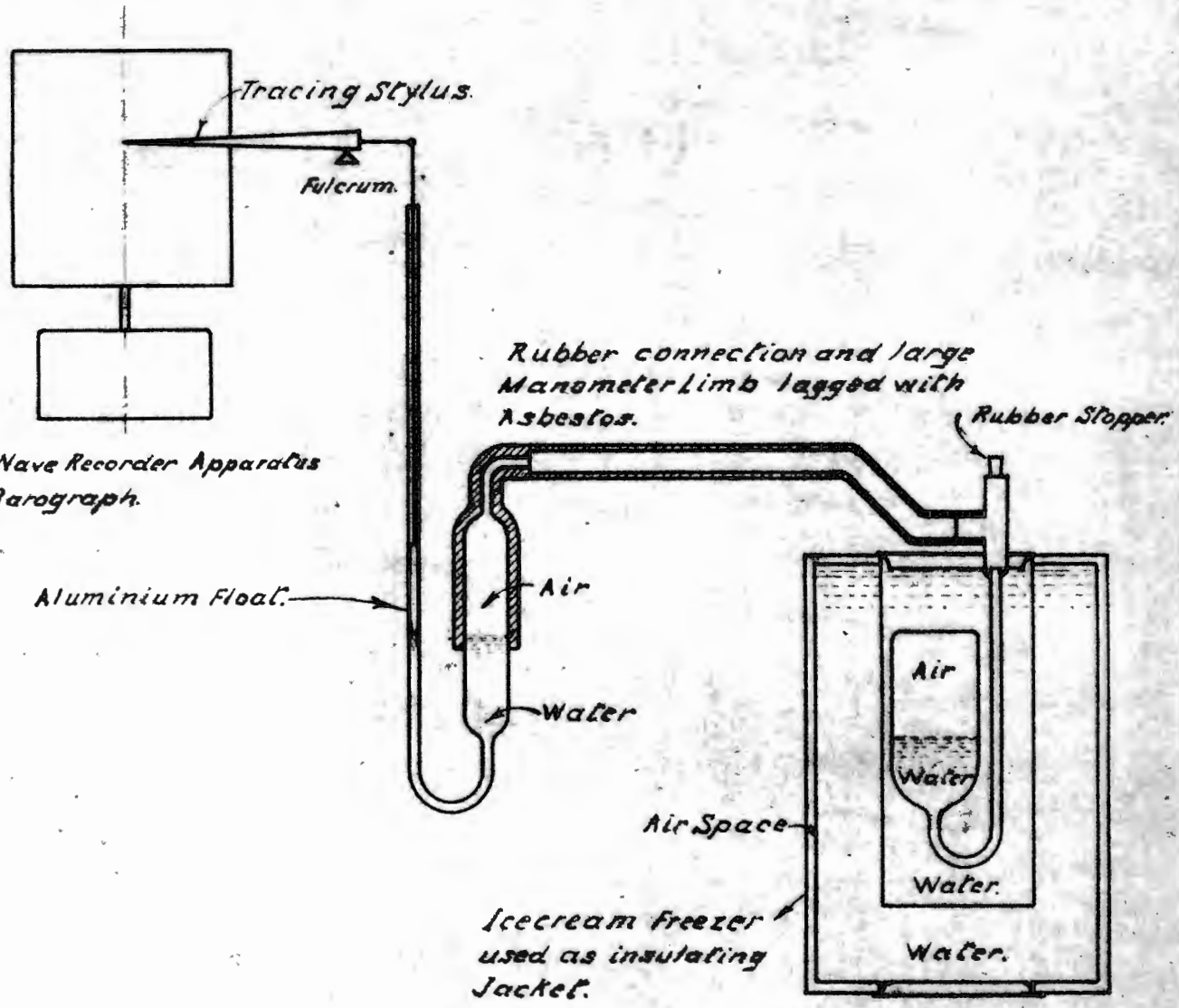


FIG. 60.

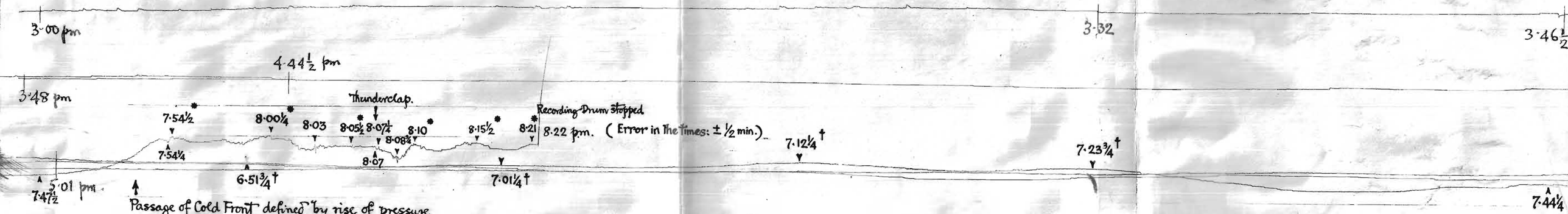
SKETCH of MANOMETER MICROBAROGRAPH.

R.J.B.

R.D. 136.

FIG. 61. PHOTOGRAPH OF MANOMETER-MICROBAROGRAPH IN RANGE LABORATORY.

19/6/45



Passage of Cold Front defined by rise of pressure

* These times mark crests of what appear to be 5·3 min. air waves.

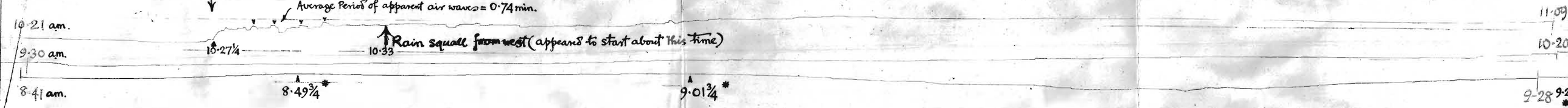
† These times define crests of apparent 10·7 min. air waves

Microbarogram on 19/6/45 Wind from N.W. Storm blowing up Thunder & lightning
Vertical Scale: 1 cm = 0·027 inch (mercury) at 7·40–7·45; 8·06½; 12·00 pm. (Not a complete list of Thunderclaps)

FIG. 62.

(3)

21/6/45



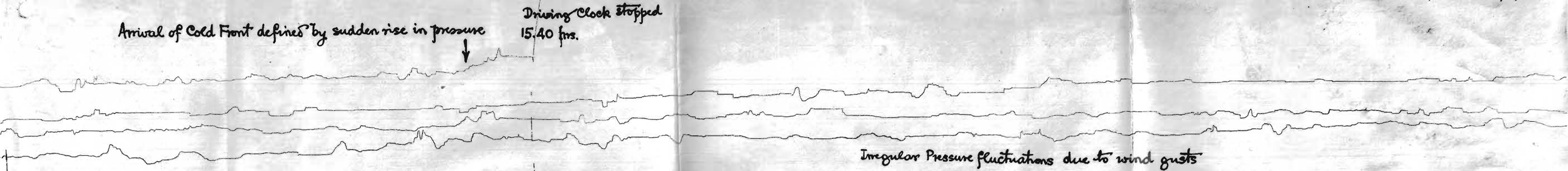
Microbarograms on 21/6/45
Approx. Vertical Scale: 1 cm. = 0·027 inch. (mercury)

* These times define crests of long-period air waves (12 mins, 27¼ m.)

FIG. 63.

(2)

23/6/45



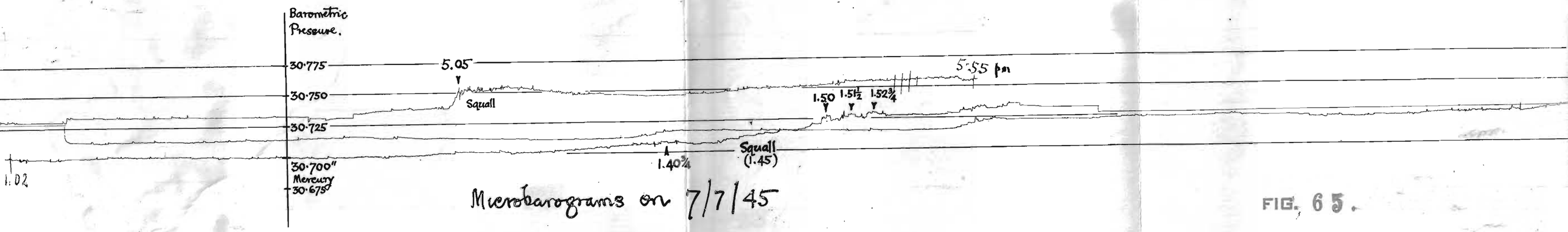
Microbarogram on 23/6/45

Approx vertical scale: 1 cm = 0·028 inch (mercury).

FIG. 64.

(4)

7/7/45 (i)

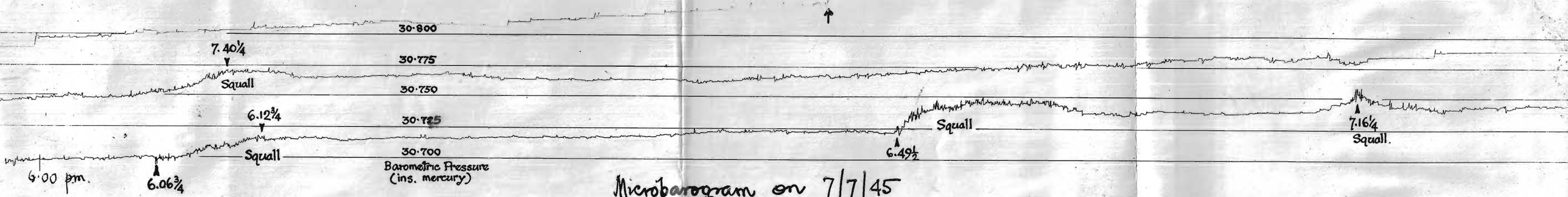


Microbarograms on 7/7/45

FIG. 65.

(6)

7/7/45
(H)



Microbarogram on 7/7/45

FIG. 66.

5

Microbarogram.

24/9/45.

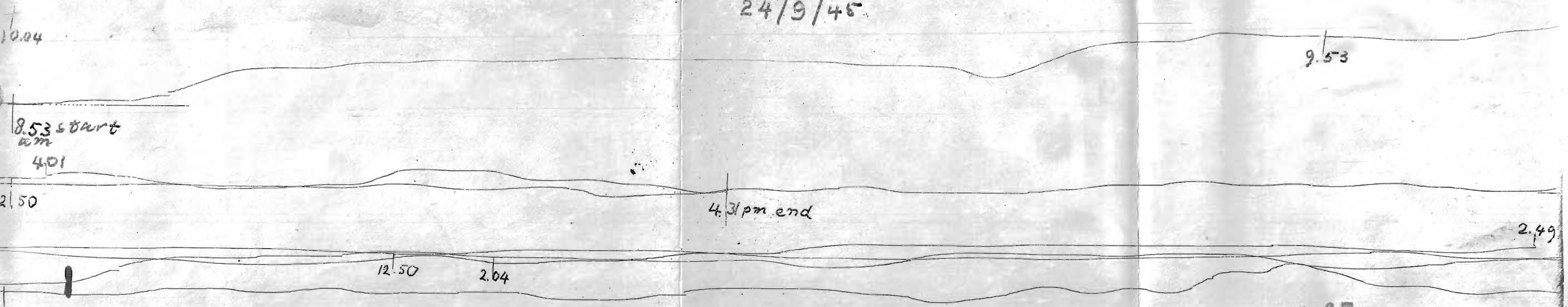


FIG. 67.

30/9/45
stopped.

5.35pm

Microbarogram on 30/9/45

10.20

9.02 am
2/10/45

11.30

3.05

2.07

Microbarogram on 2/10/45

FIG. 68.

Microbarogram on 3/10/45 (Violent Black South-Easter blowing)
showing continuous pressure drop
Peak velocity 94 mph at ~~4.55~~ Docks

Start

9.05 am.

9.06

10.11

11.34

1.03

Rewound

12.03

12.06

Rewound

2.12

2.14

3.05

4.06

Rewound

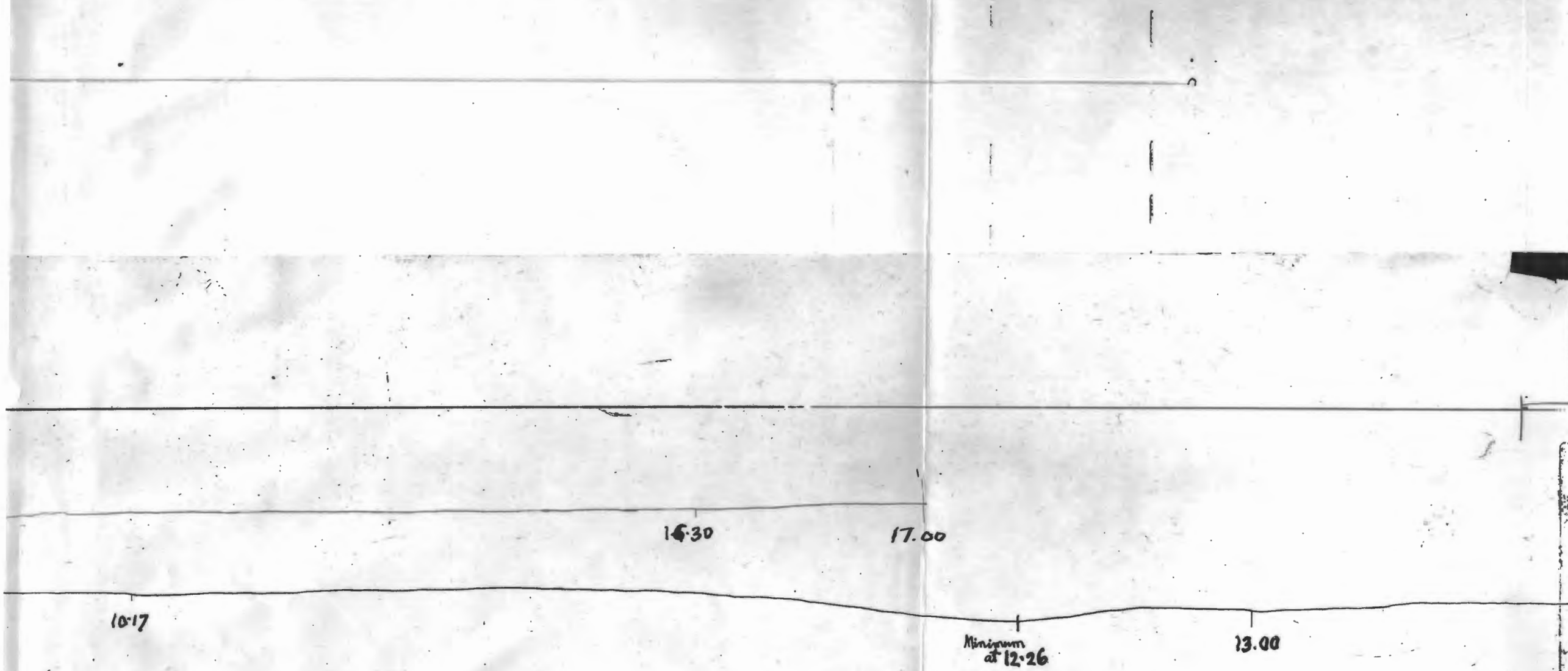
4.09

4.09

5.18 pm
Finish

FIG. 69.

7



Microbarogram on July 1st, 1946 [Time Scale 1 cm ≡ 6·33 mins.]

To determine possible repercussions of the Atomic Bomb Test at Bikini Atoll.

FIG. 70.

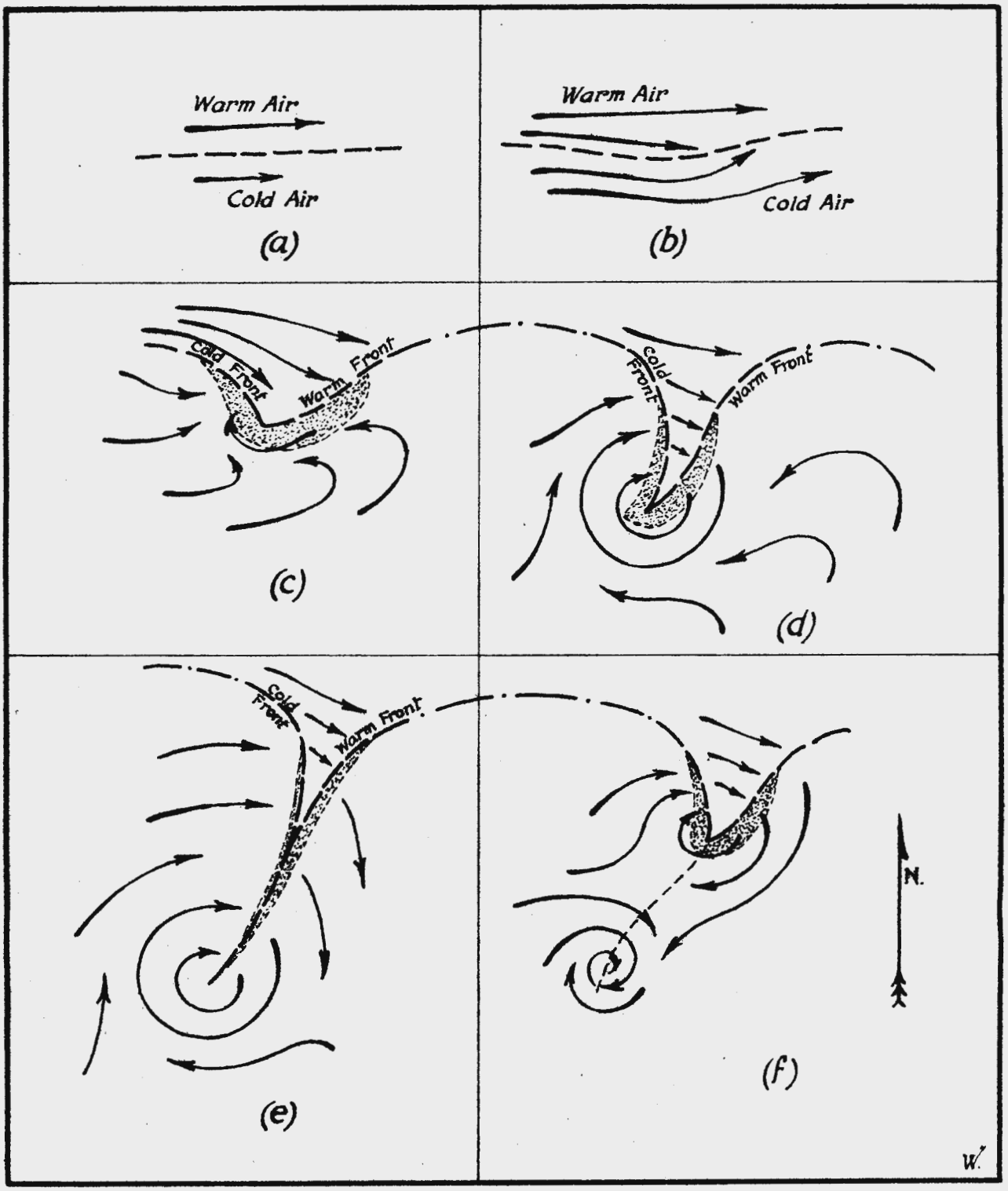
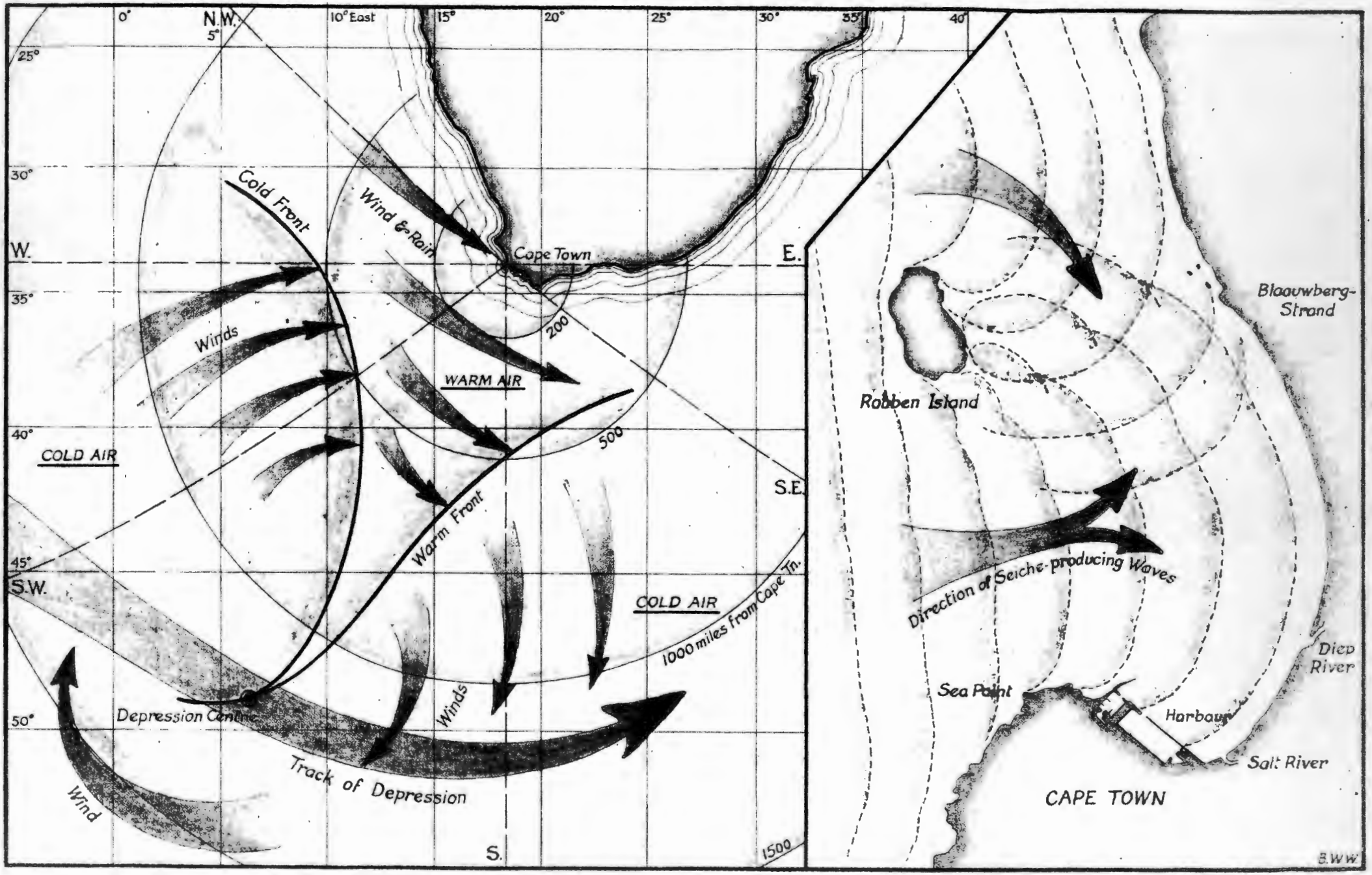


FIG. 71: STAGES IN LIFE-CYCLE OF A TRAVELLING DEPRESSION OF THE SOUTHERN HEMISPHERE

FIG. 72 – TRAVELLING-DEPRESSION OF THE SOUTH ATLANTIC



TRACK OF TRAVELLING DEPRESSION

FIG. 73.

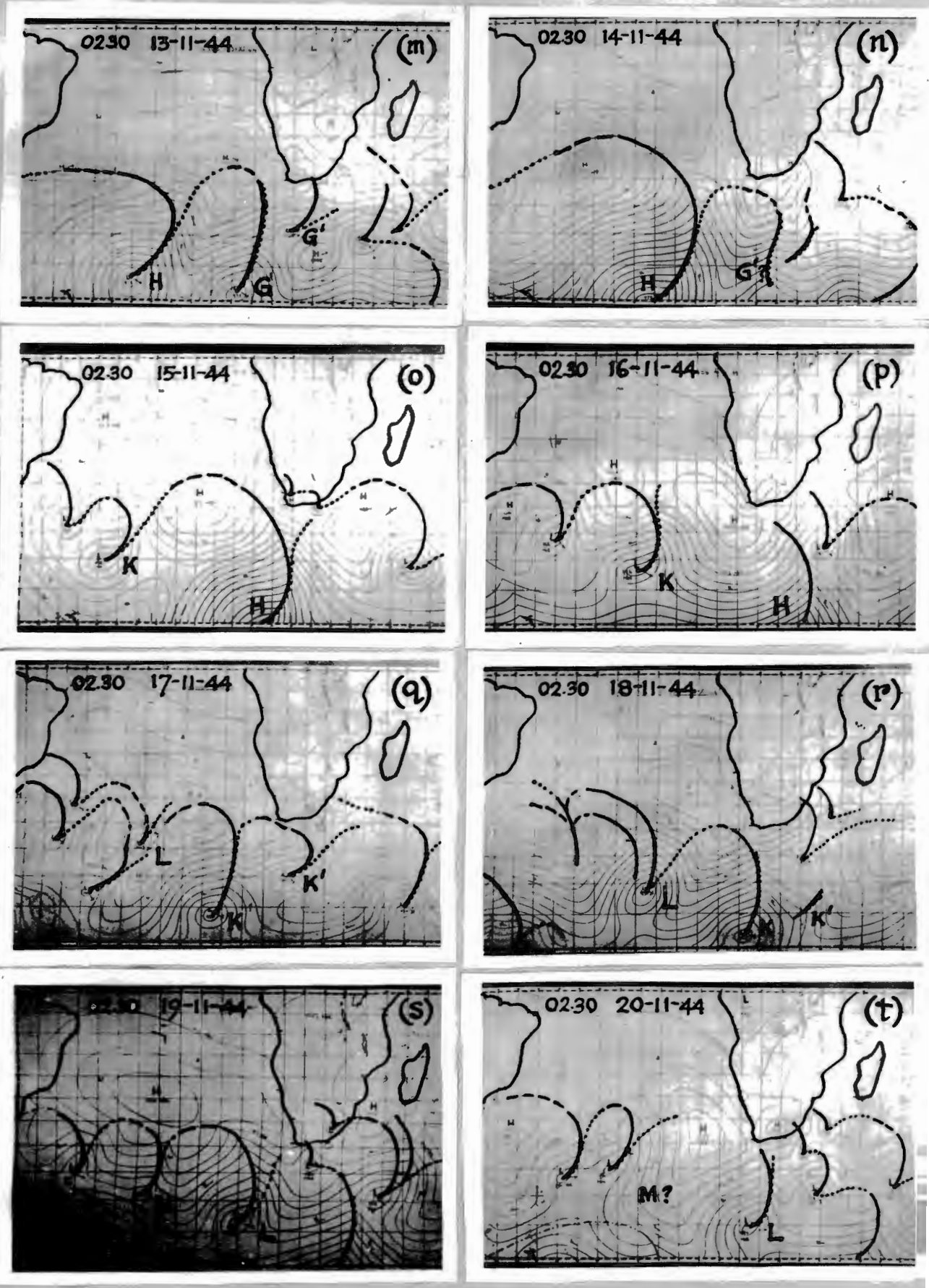

0230 13-11-44
(m)
H
G
G'
0230 14-11-44
(n)
H
G'
0230 15-11-44
(o)
K
H
0230 16-11-44
(p)
K
H
0230 17-11-44
(q)
L
K'
K
0230 18-11-44
(r)
L
K
K'
(s)
0230 20-11-44
(t)
M?
L

FIG. 74.

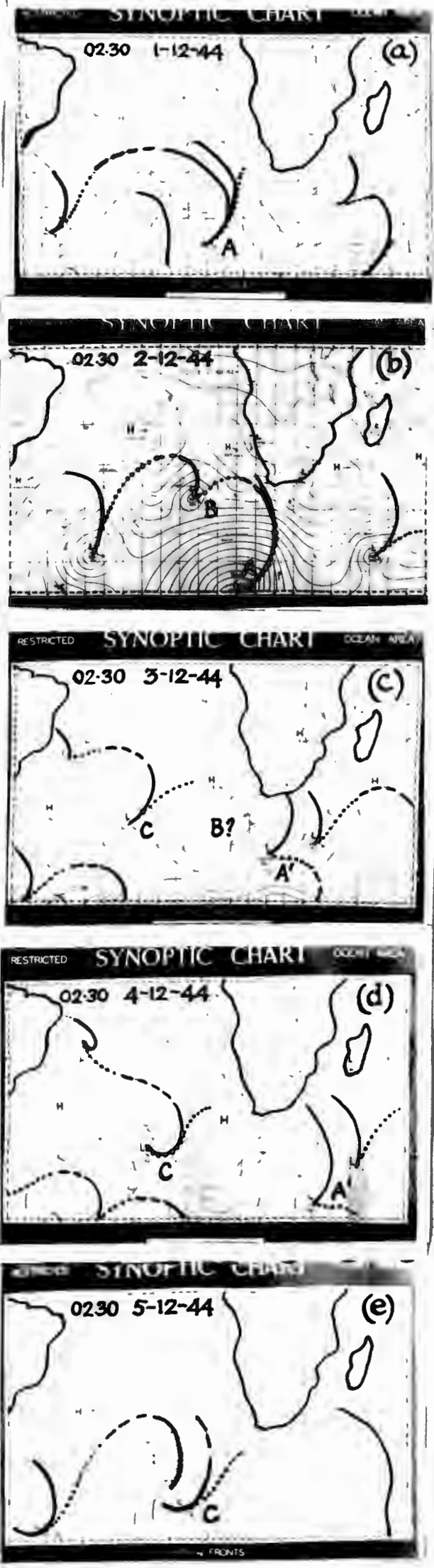

02·30 1-12-44
(a)
A
02·30 2-12-44
(b)
B
A
RESTRICTED
SYNOPTIC CHART
02·30 3-12-44
(c)
C
B?
A'
RESTRICTED
SYNOPTIC CHART
02·30 4-12-44
(d)
C
A'
02·30 5-12-44
(e)
C
FRONTS

FIG. 75.

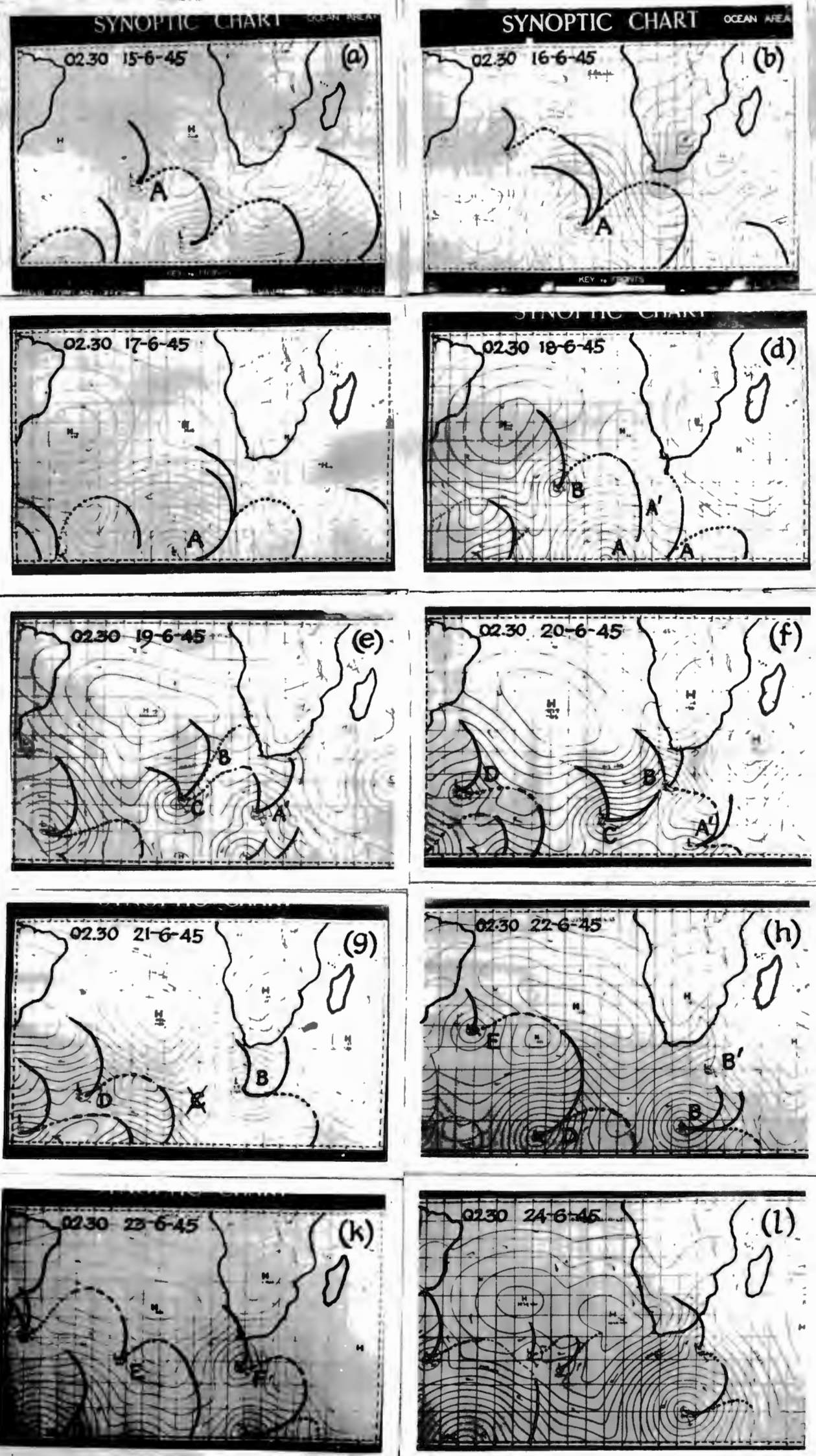

SYNOPTIC CHART
02.30 15-6-45
(a)
A
SYNOPTIC CHART
OCEAN AREA
02.30 16-6-45
(b)
A
02.30 17-6-45
A
02.30 18-6-45
(d)
B
A'
A
A
02.30 19-6-45
(e)
B
C
A'
02.30 20-6-45
(f)
D
B
C
A'
02.30 21-6-45
(g)
B
D
02.30 22-6-45
(h)
E
B'
B
D
02.30 23-6-45
(k)
E
F
02.30 24-6-45
(l)

FIG. 78.

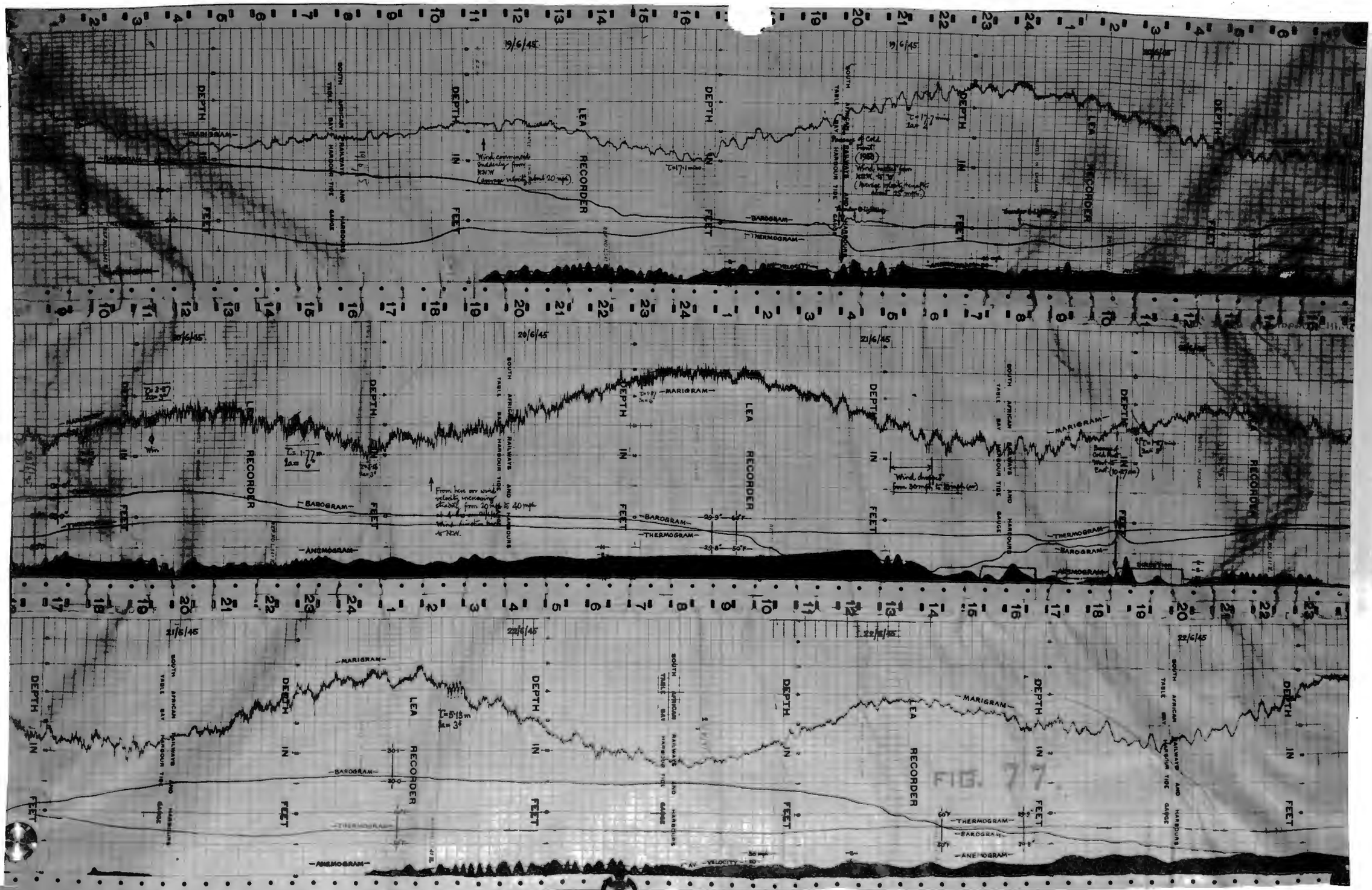

19/6/45
20/6/45
21/6/45
22/6/45
DEPTH IN FEET
LEA RECORDER
MARIGRAM
BAROGRAM
THERMOGRAM
ANEMOGRAM
SOUTH AFRICAN RAILWAYS AND HARBOURS TABLE BAY HARBOUR TIDE GAUGE
Wind commences Southerly from NNW (Average velocity about 20 mph).
From here on wind veers increasing steadily from 20 mph at 4 to 40 mph at 8 NW.
Wind decreases from 30 mph at 5 to light (at 7).
Wind backs from NNW to W (Average velocity thereafter about 25 mph).
Wind dies away (10-47 pm).
T=1·77 m
T=5·18 m
VELOCITY

FIG. 77.

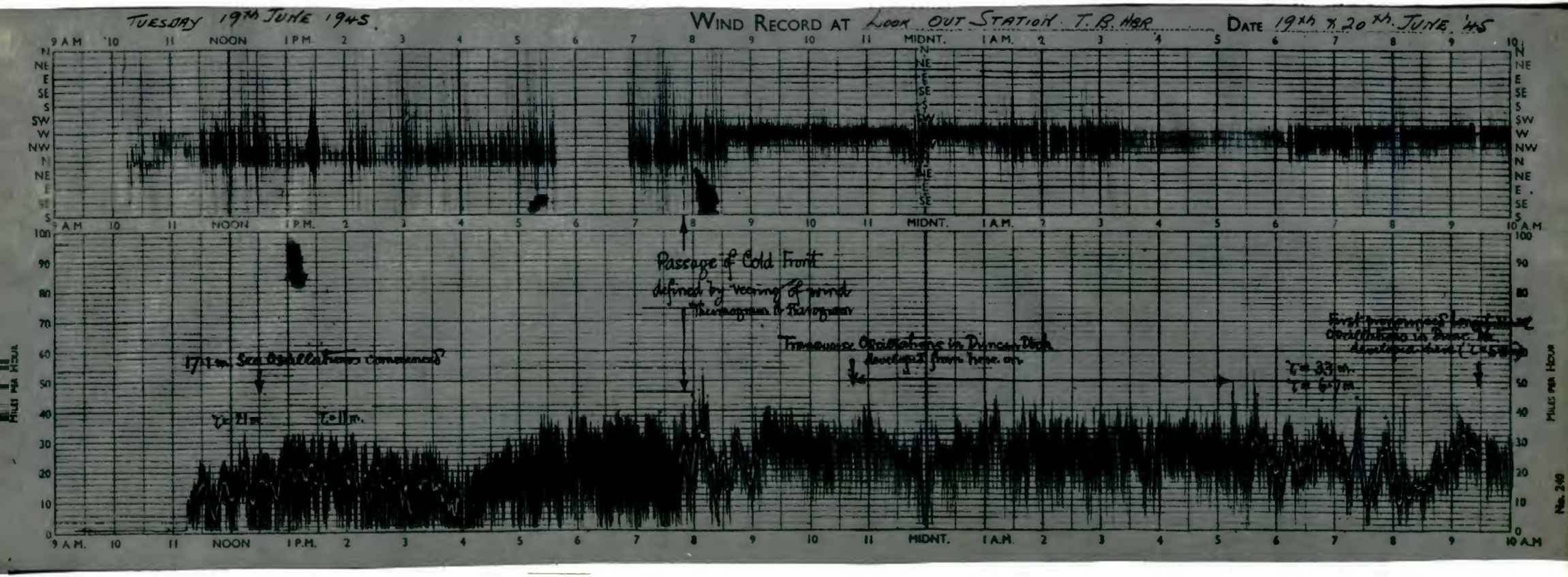


FIG. 78. ANEMOGRAM FOR 19/6/45.

FIG. 78.

FIG. 74. Reproductions of Synoptic Charts kindly furnished by Chief Naval Meteorological Officer (So. Atlantic)

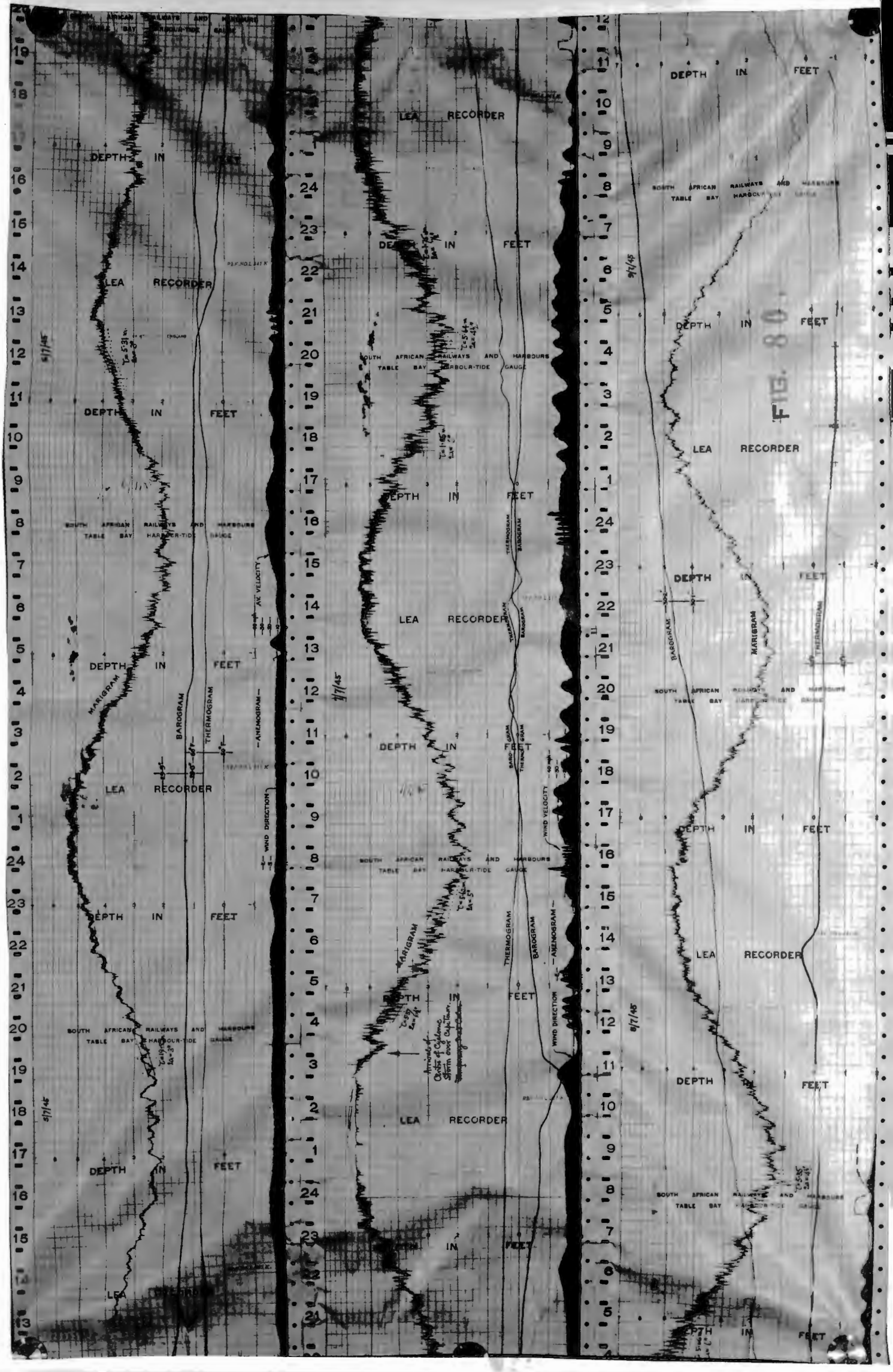
(a) Heavy Seas attacking Paarden Eiland Coast, 7/8/45
View looking south from point approx. half way between mouths of Diep & Salt Rivers.

Approx. Line of Original Marine Drive

(b) View looking north from same observation point as (a)

(c) Sea inundating land (Auckland Str.) via breach shown in (a). Arrowhead defines point from which (a) & (b) were photographed.

FIG. 79.


DEPTH IN FEET
LEA RECORDER
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR-TIDE GAUGE
MARIGRAM
BAROGRAM
THERMOGRAM
ANEMOGRAM
WIND VELOCITY
WIND DIRECTION
5/7/45
FIG. 80.

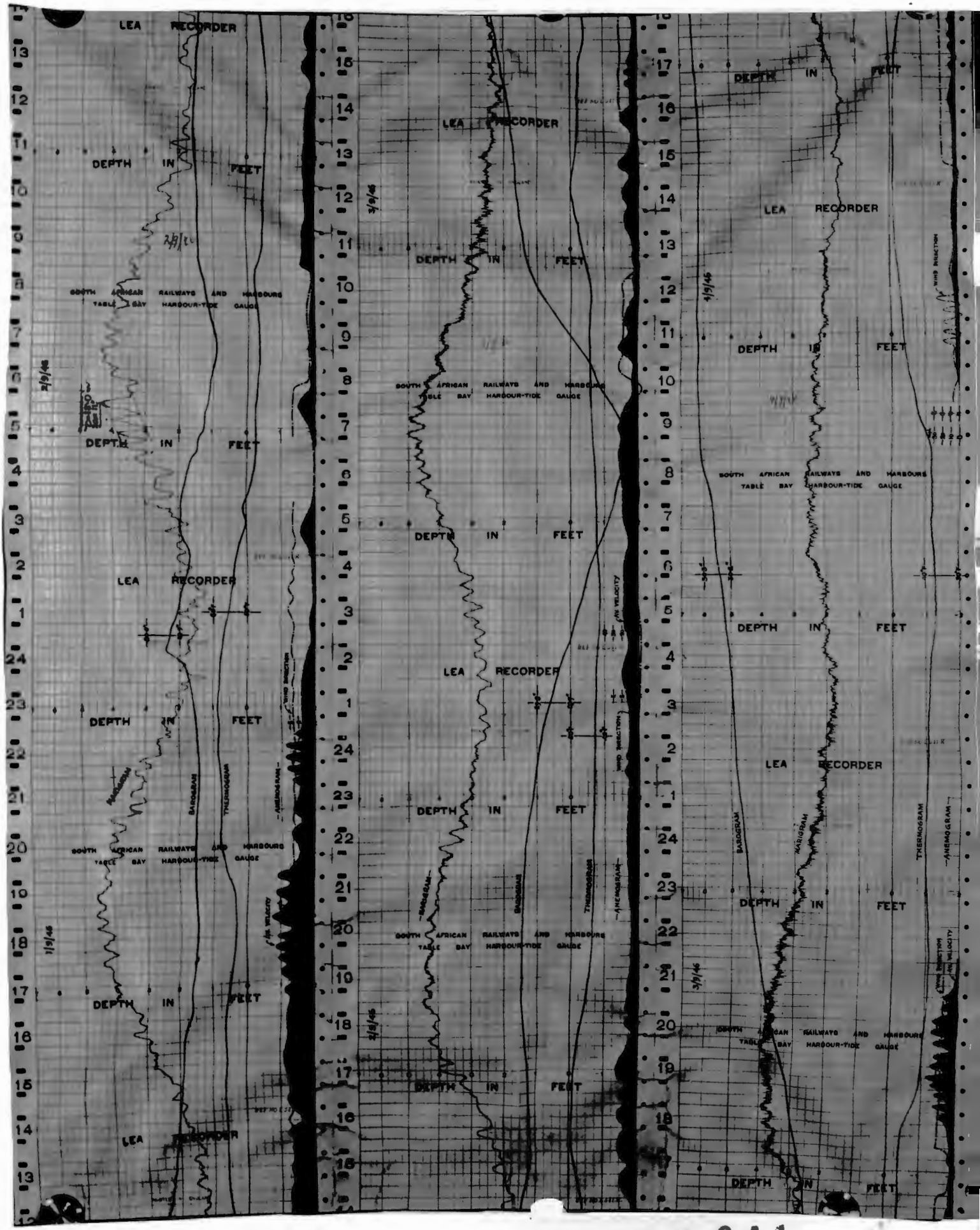

LEA RECORDER
DEPTH IN FEET
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR-TIDE GAUGE
BAROGRAM
THERMOGRAM
ANEMOGRAM
WIND VELOCITY
WIND DIRECTION

FIG. 81.

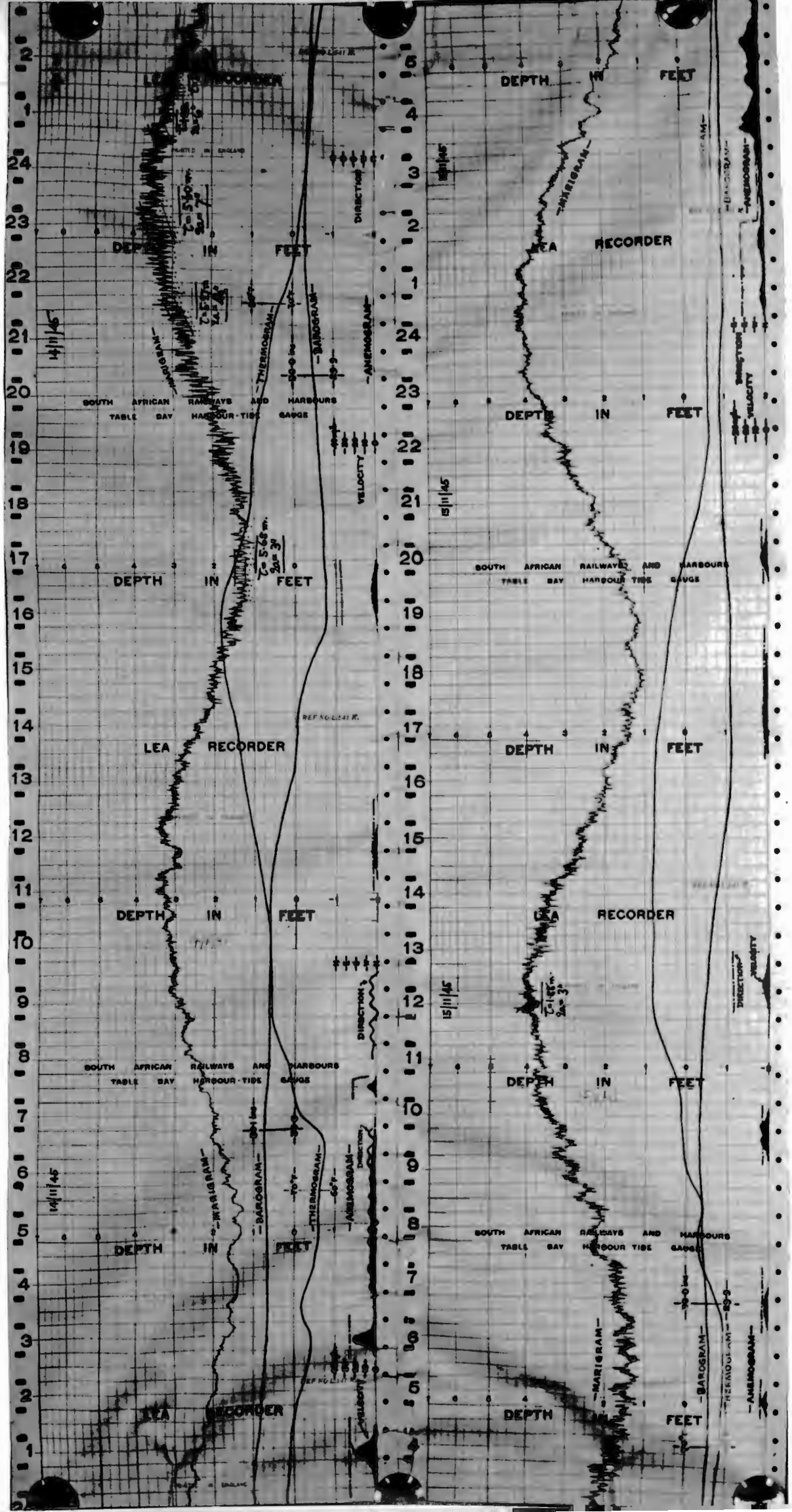

DEPTH IN FEET
LEA RECORDER
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR TIDE GAUGE
THERMOGRAM
BAROGRAM
ANEMOGRAM
DIRECTION
VELOCITY

FIG. 82.

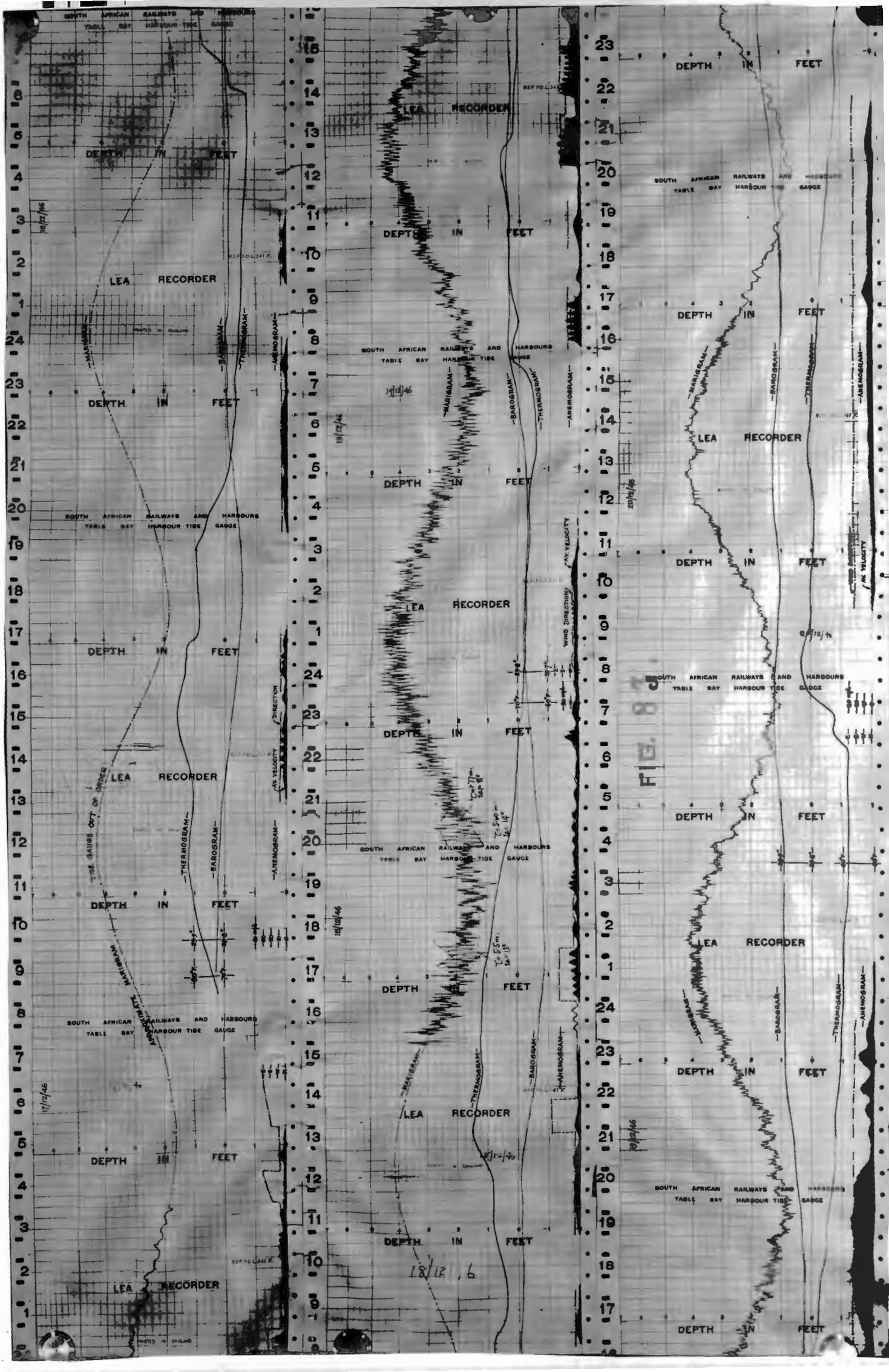

SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR TIDE GAUGE
LEA RECORDER
DEPTH IN FEET
BAROGRAM
THERMOGRAM
ANEMOGRAM
WIND DIRECTION
WIND VELOCITY
TIDE GAUGE OUT OF ORDER
MARIGRAM
HARBOUR MASTER
MADE IN ENGLAND

FIG. 8 3

FIG. 84. PHOTOGRAPH OF CLOUD FORMATION IN SKY ON 18/12/46.

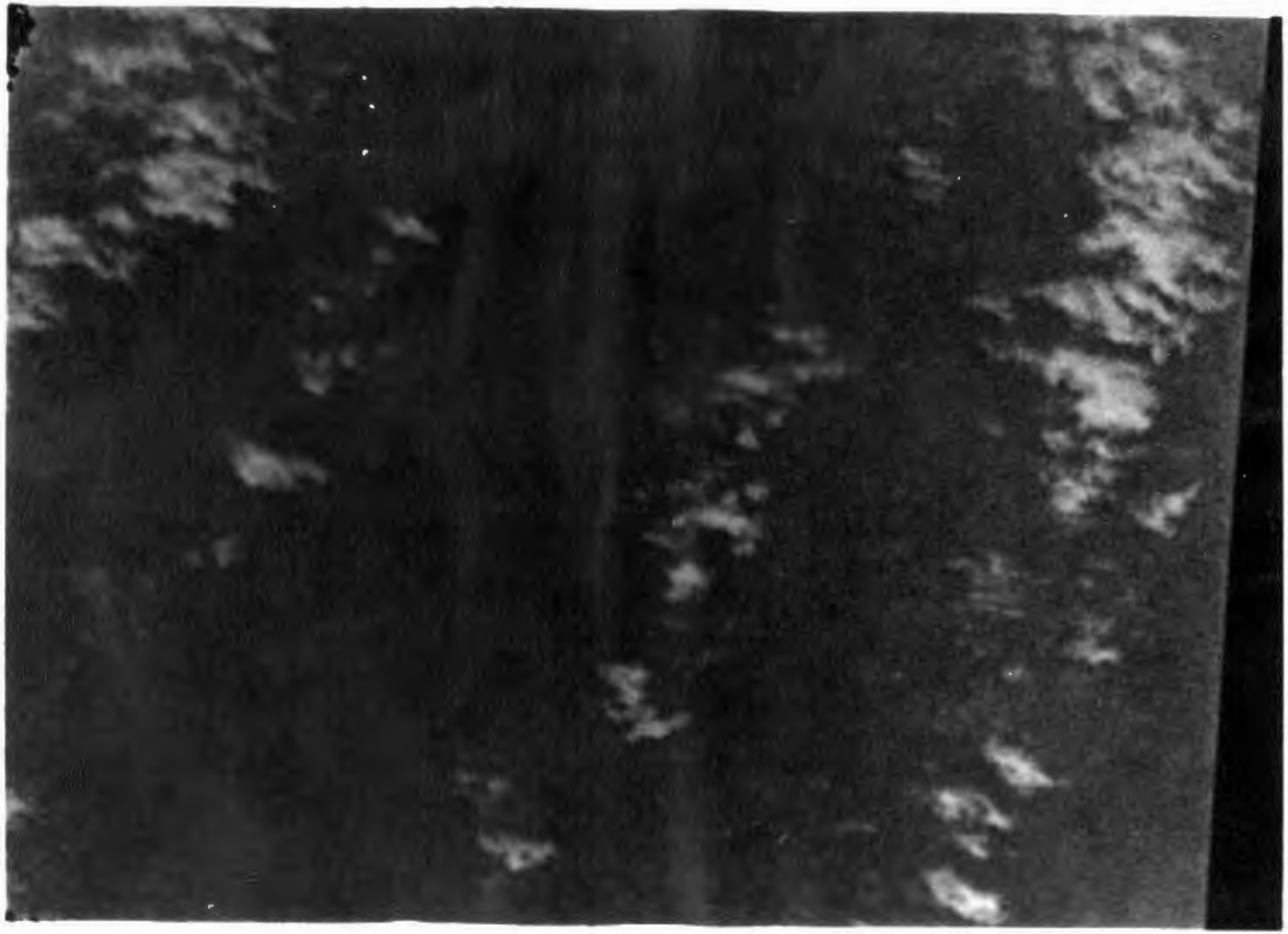


FIG. 84.

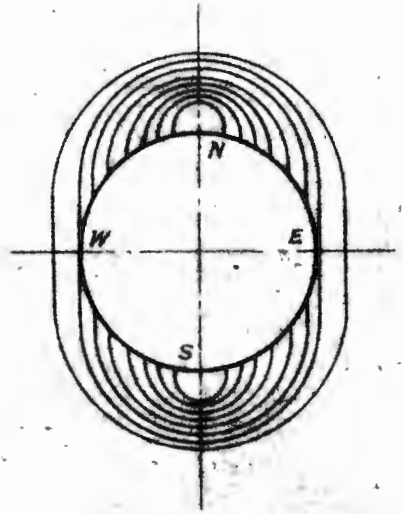


Fig. 85.

Cross-Section of Earth's Atmosphere showing Isentropic Layers of successively larger Entropy

after Brillouin

W.

FIG. 86.

SECULAR CHANGES IN PRESSURE, TEMPERATURE, & SEA-LEVEL

TABLE BAY HARBOUR — CAPE TOWN

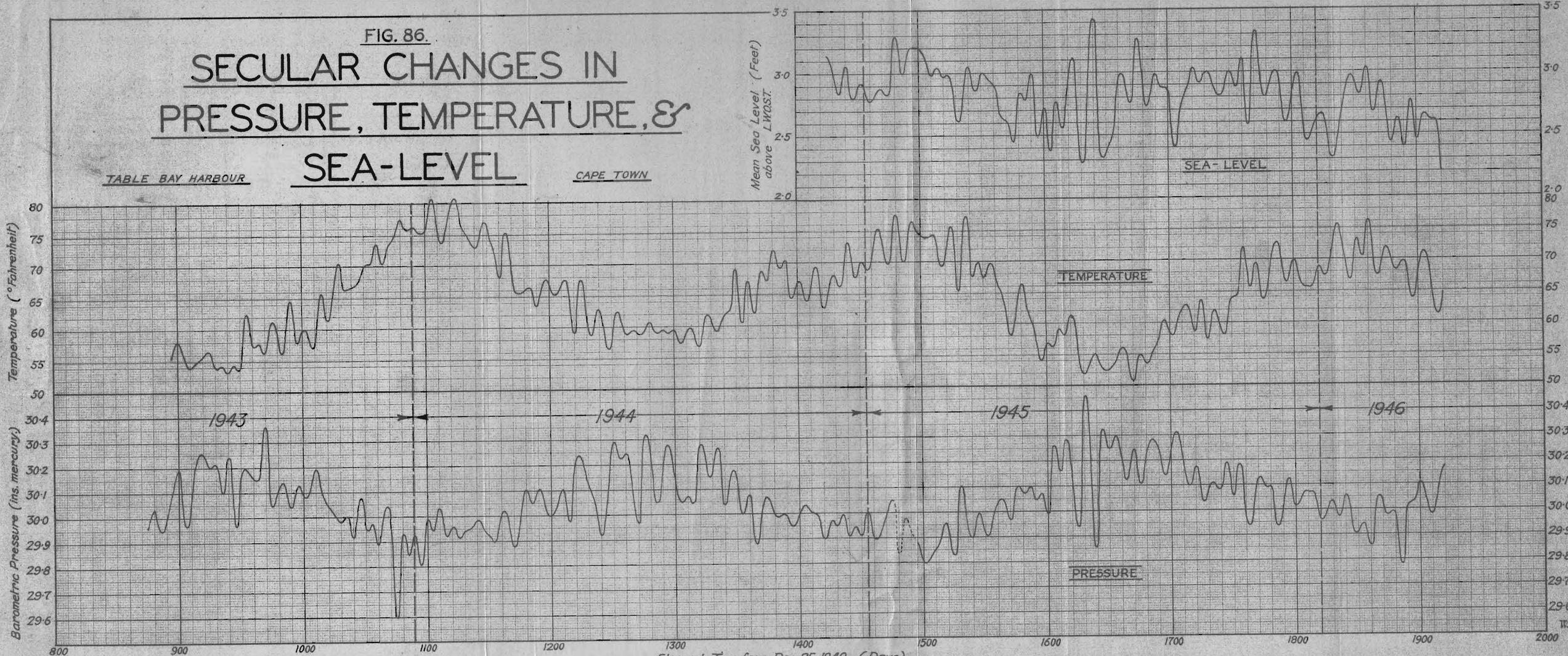
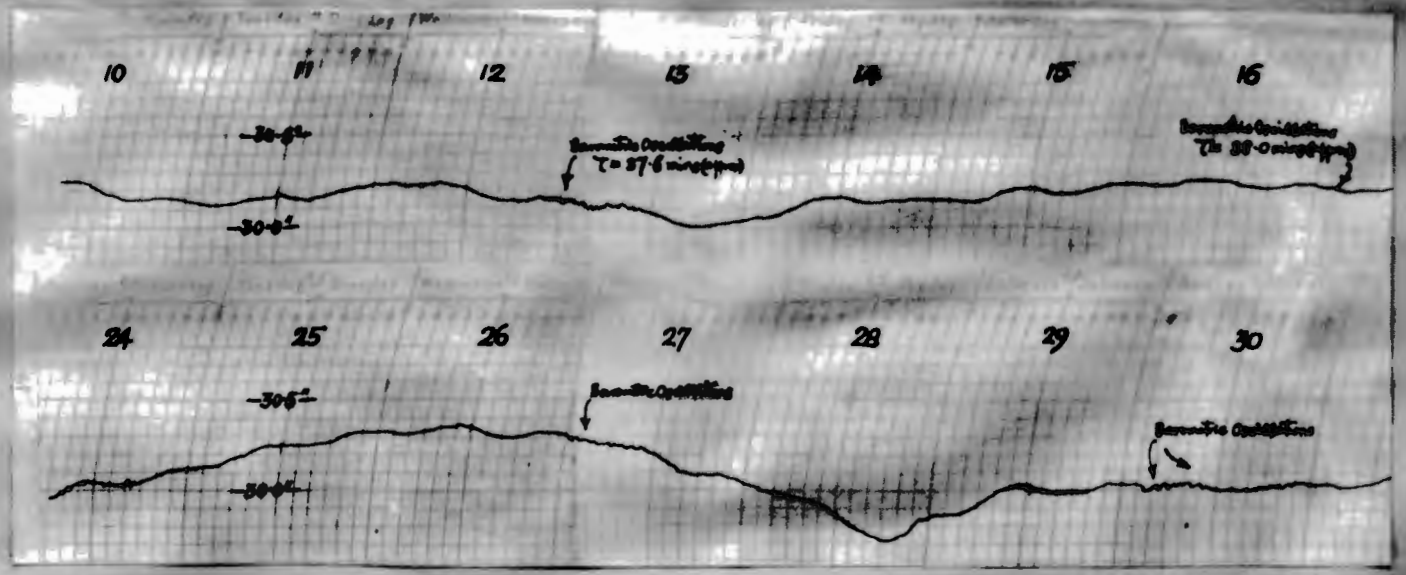
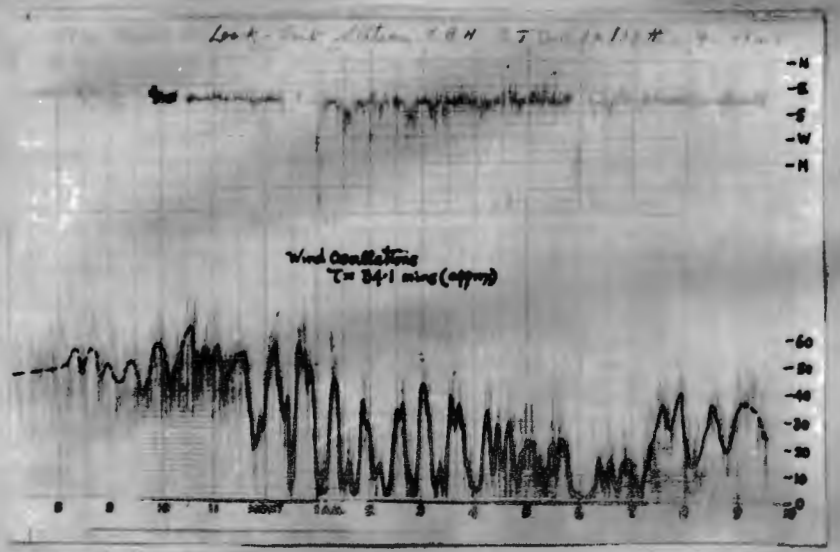


FIG. 86.

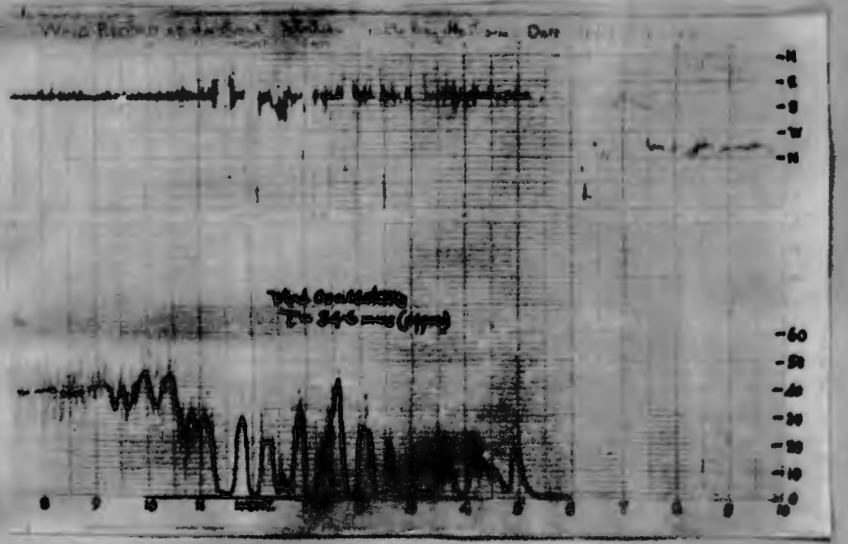
FIG. 87.



(a) Barograms for September 10-16 & 24-30, 1945.



(b) Anemogram for 12-13/9/45



(c) Anemogram for 16-17/9/45

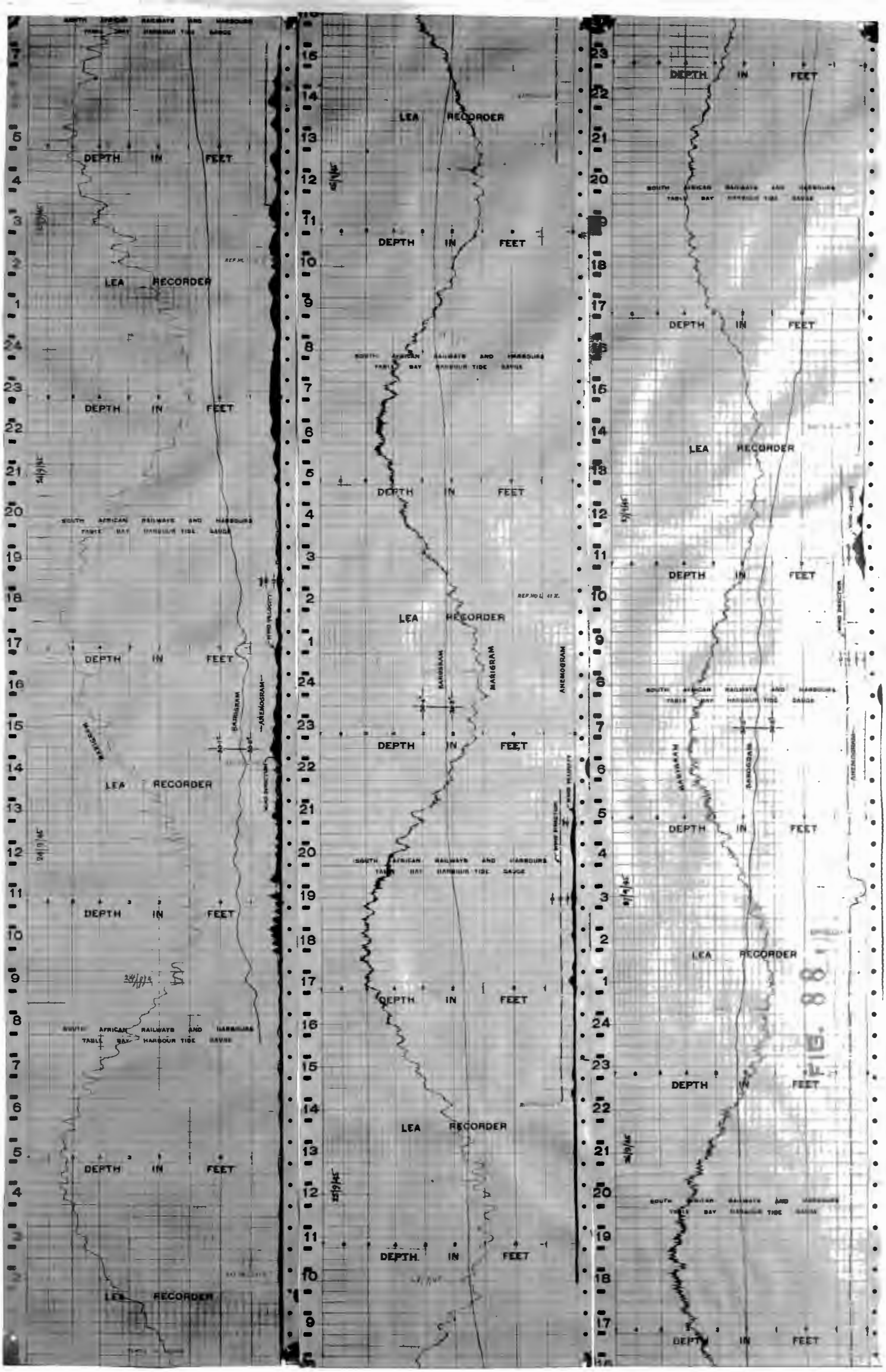

DEPTH IN FEET
LEA RECORDER
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR TIDE GAUGE
BAROGRAM
ANEMOGRAM
WIND DIRECTION
WIND VELOCITY

FIG. 8

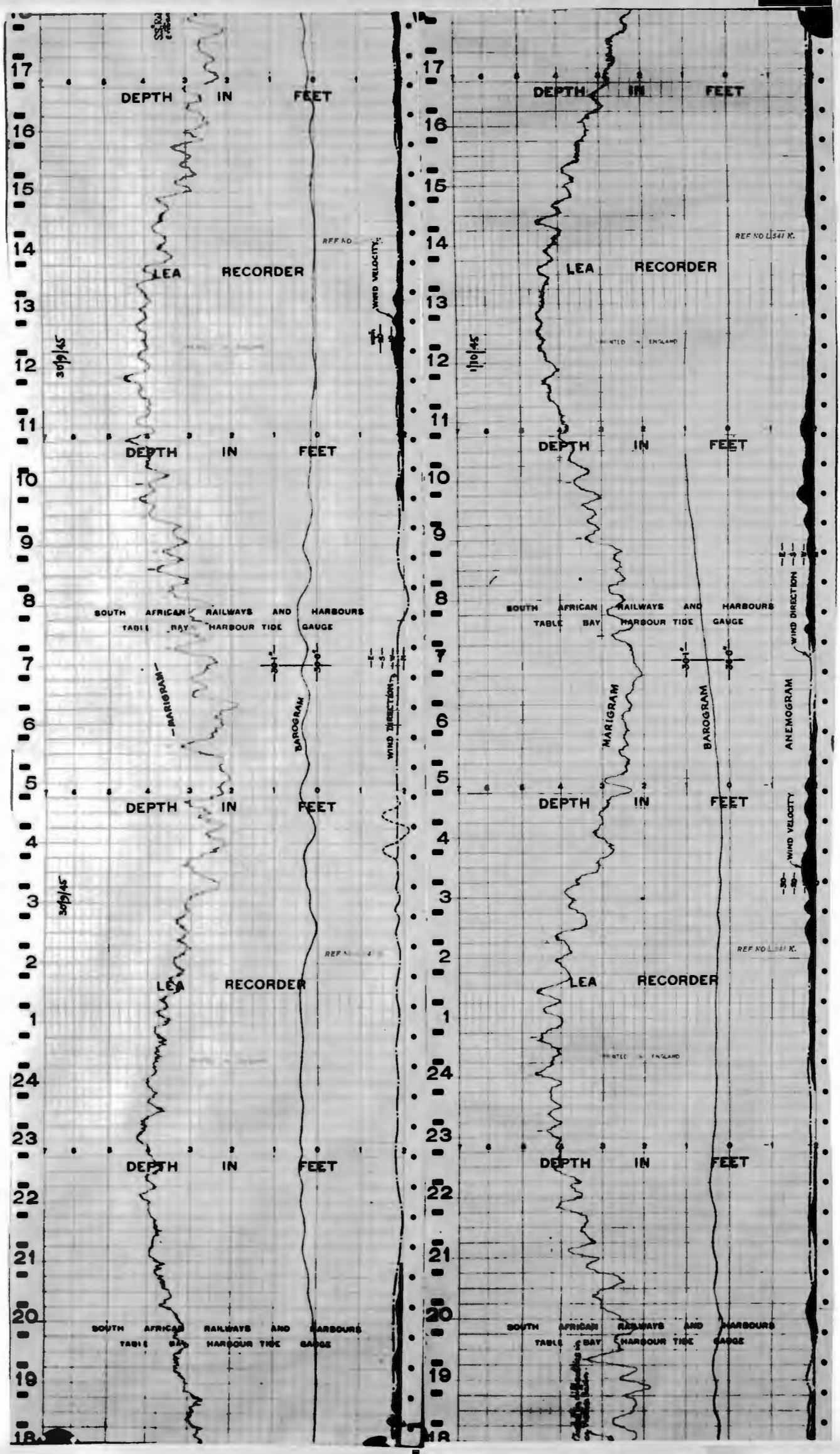

DEPTH IN FEET
LEA RECORDER
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR TIDE GAUGE
MARIGRAM
BAROGRAM
WIND DIRECTION
WIND VELOCITY
ANEMOGRAM

FIG. 89.

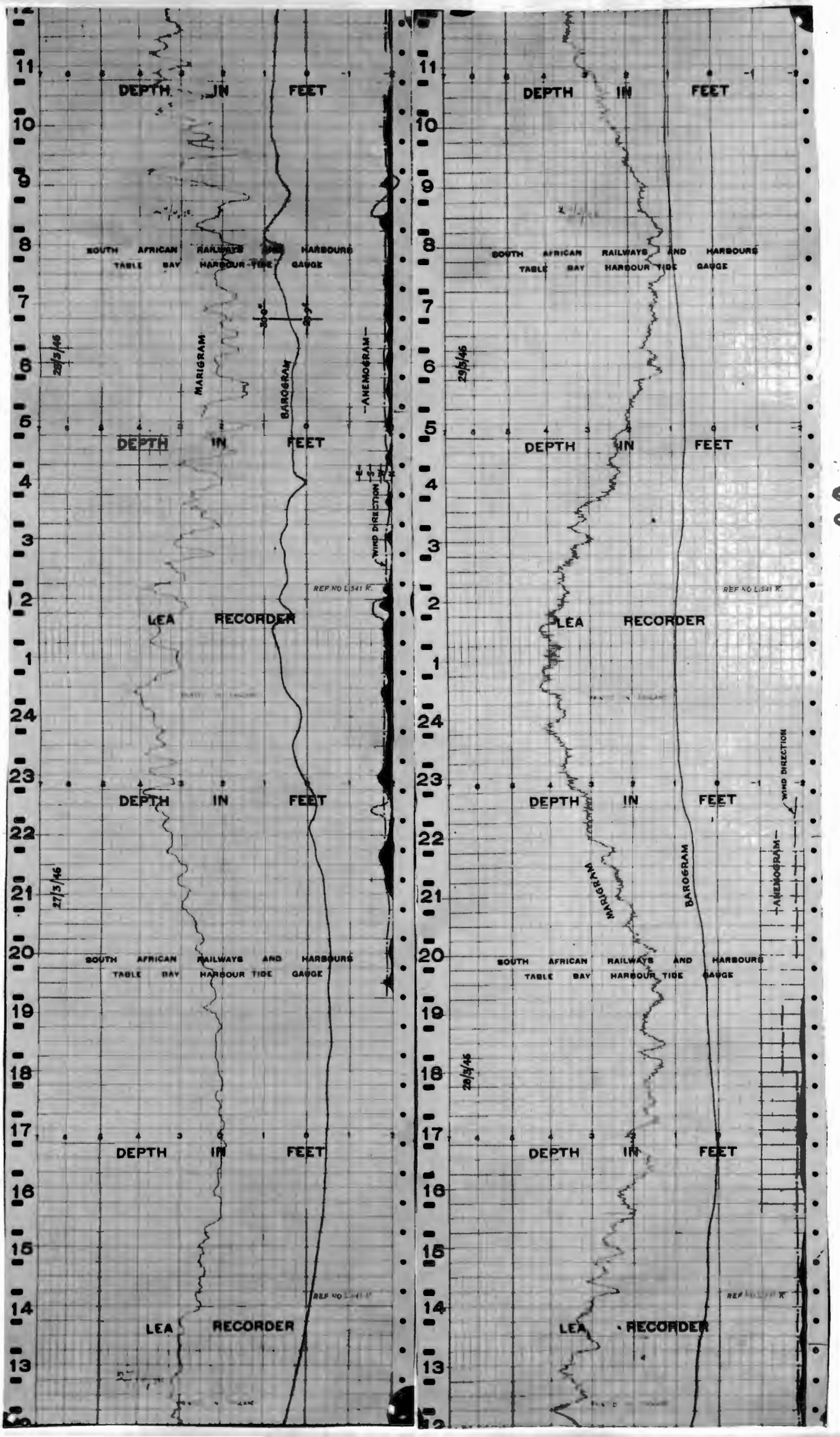

DEPTH IN FEET
SOUTH AFRICAN RAILWAYS AND HARBOURS
TABLE BAY HARBOUR TIDE GAUGE
MARIGRAM
BAROGRAM
ANEMOGRAM
WIND DIRECTION
REF NO L.541 K.
LEA RECORDER
28/3/46
27/3/46
29/3/46

FIG. 90.

Reproductions of Synoptic Charts kindly furnished by Chief Naval Meteorological Officer (So. Atlantic). FIG. 91.

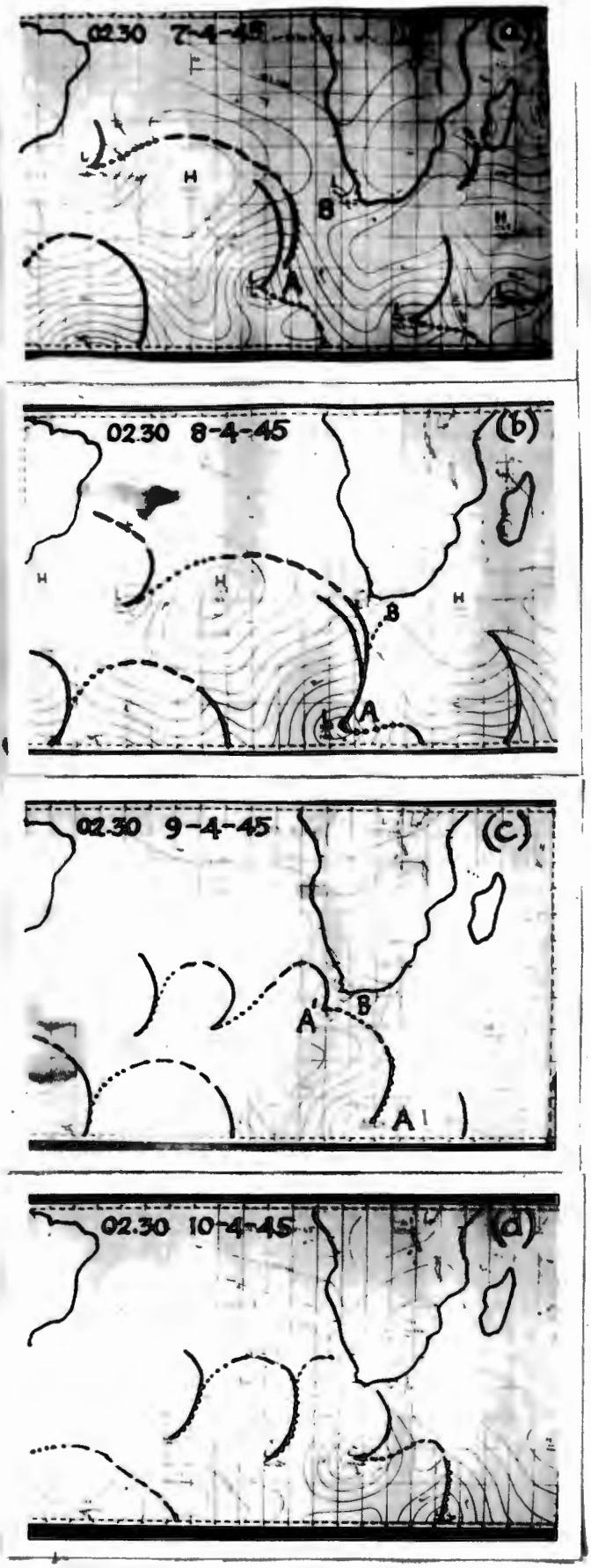


FIG. 92.

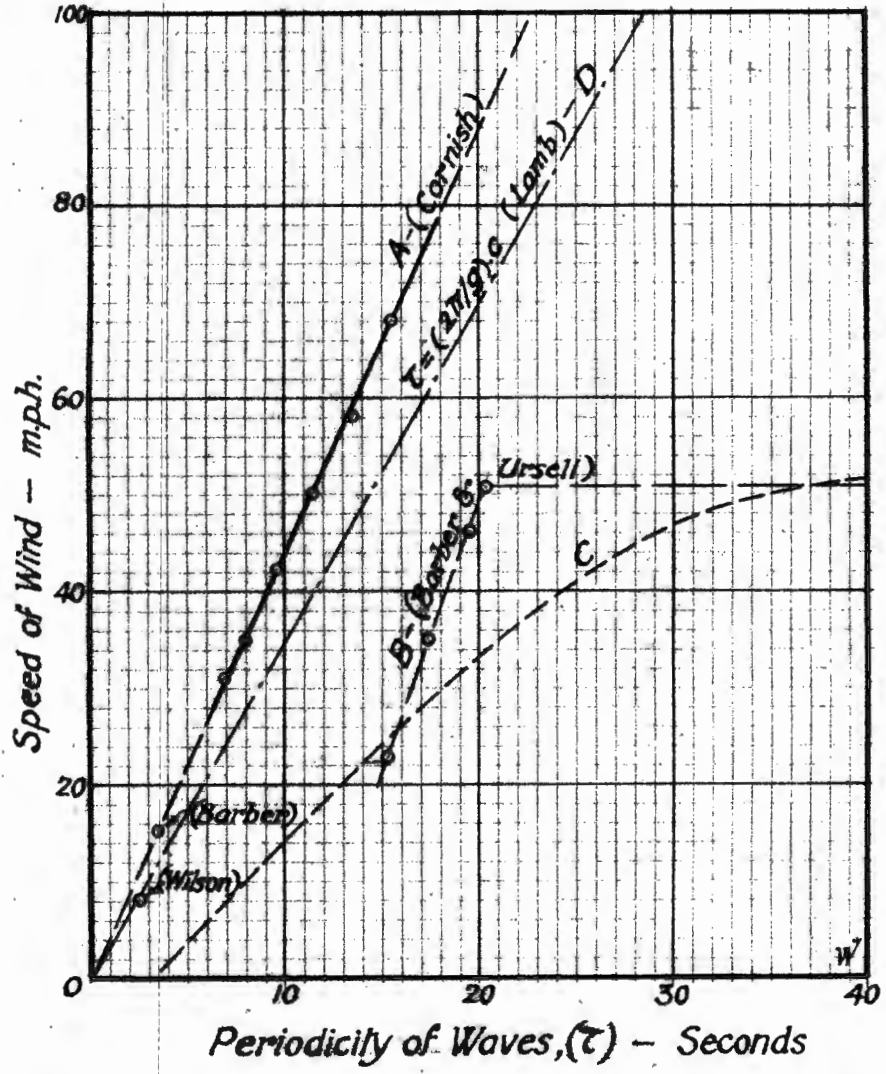
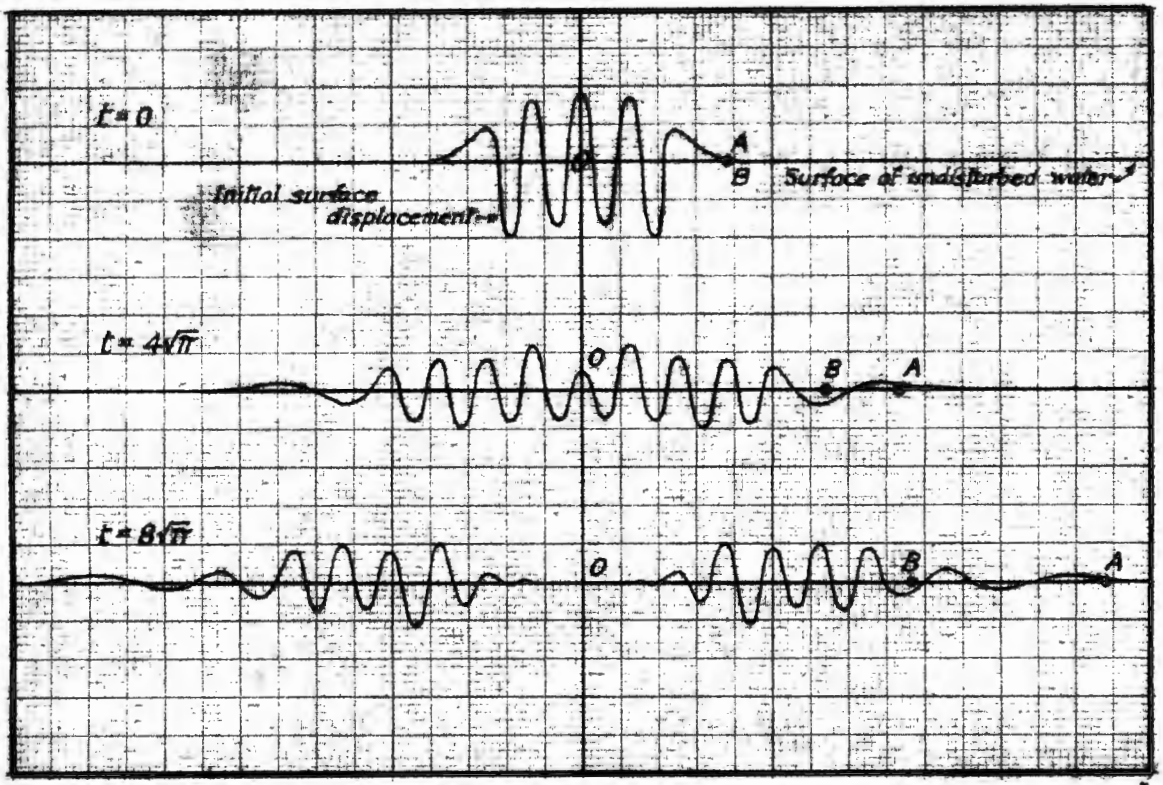


FIG. 93: RELATIONSHIP BETWEEN WIND & WAVE



Reproduced from Kelvin's Paper № 39; Math. & Phys. Papers, Vol. IV, (Cambridge), 1910. W.

Fig. 94: EMANATION OF WAVES FROM AN INITIAL SINUSOIDAL UNDULATION OF THE SEA

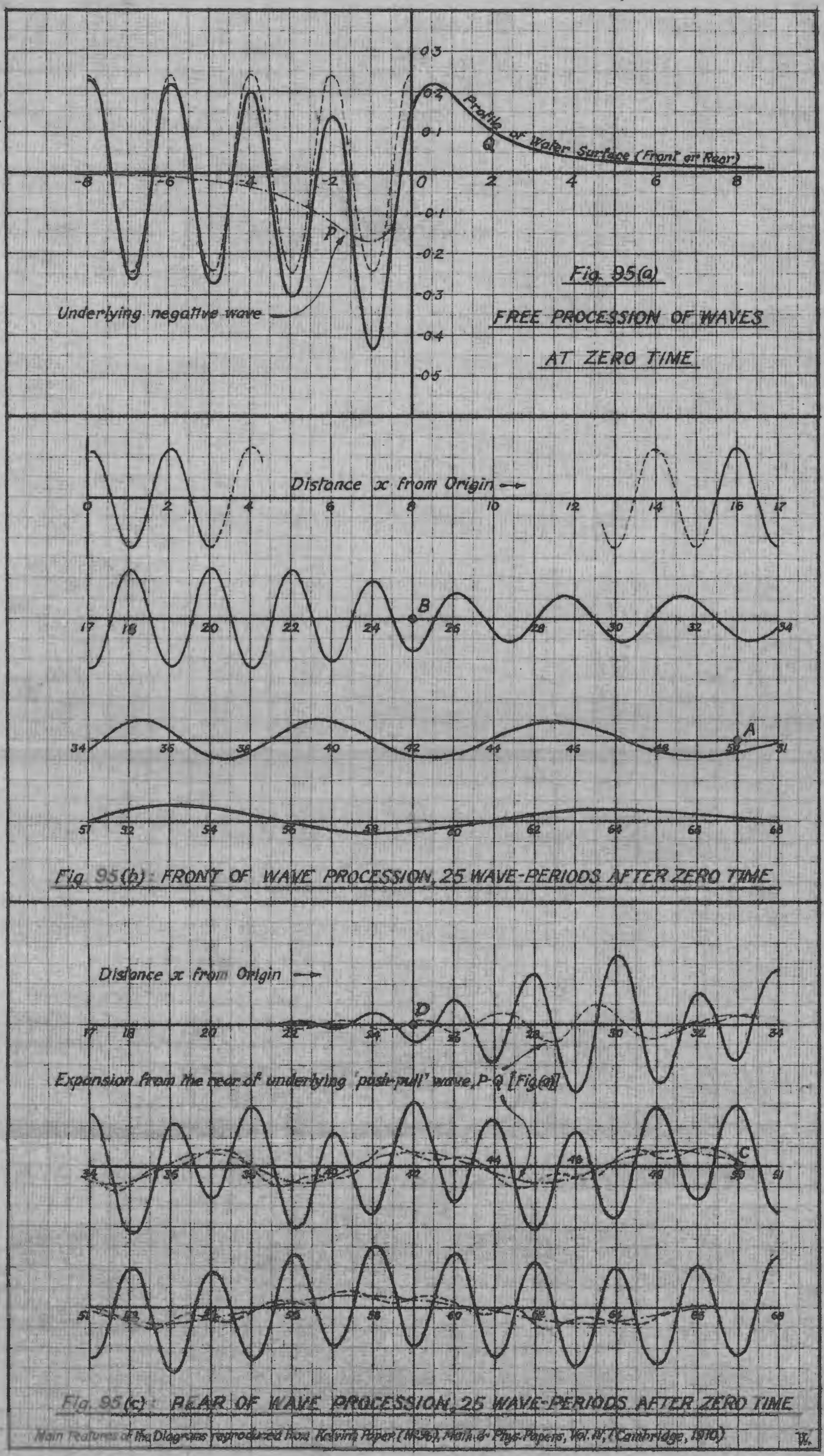


Fig. 95(a)

FREE PROCESSION OF WAVES

AT ZERO TIME

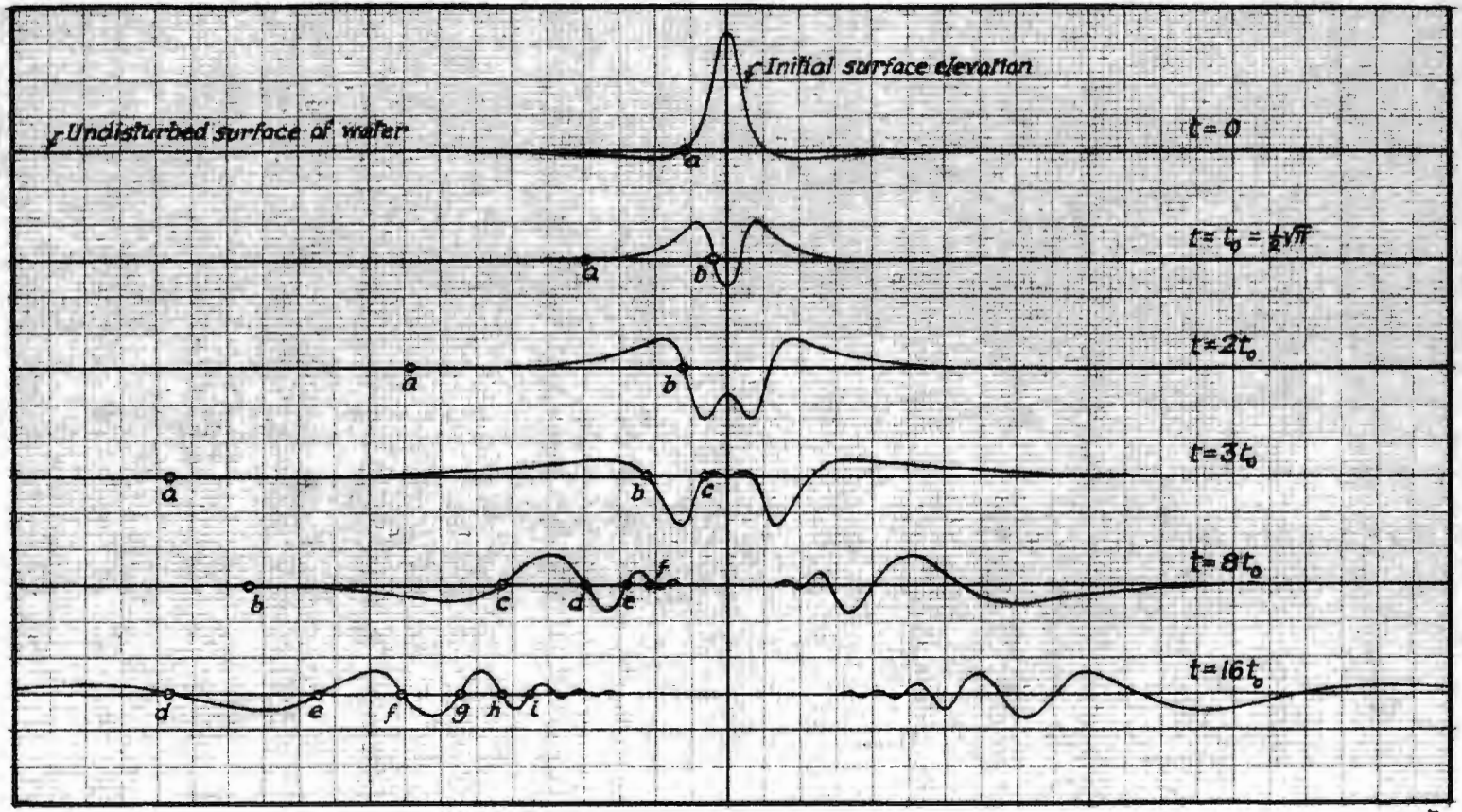
Fig. 95(b): FRONT OF WAVE PROCESSION, 25 WAVE-PERIODS AFTER ZERO TIME

Fig. 95(c): REAR OF WAVE PROCESSION, 25 WAVE-PERIODS AFTER ZERO TIME

Main features of the Diagrams reproduced from Kelvin's Paper (No. 36), Math. & Phys. Papers, Vol. III, (Cambridge, 1910)

W.

FIG. 95.



Reproduced from Kelvin's Paper № 39; Math. & Phys. Papers, Vol. IV, (Cambridge), 1910

W.

Fig 96 : EMANATION OF WAVES FROM AN INITIAL ELEVATION OF THE SEA.

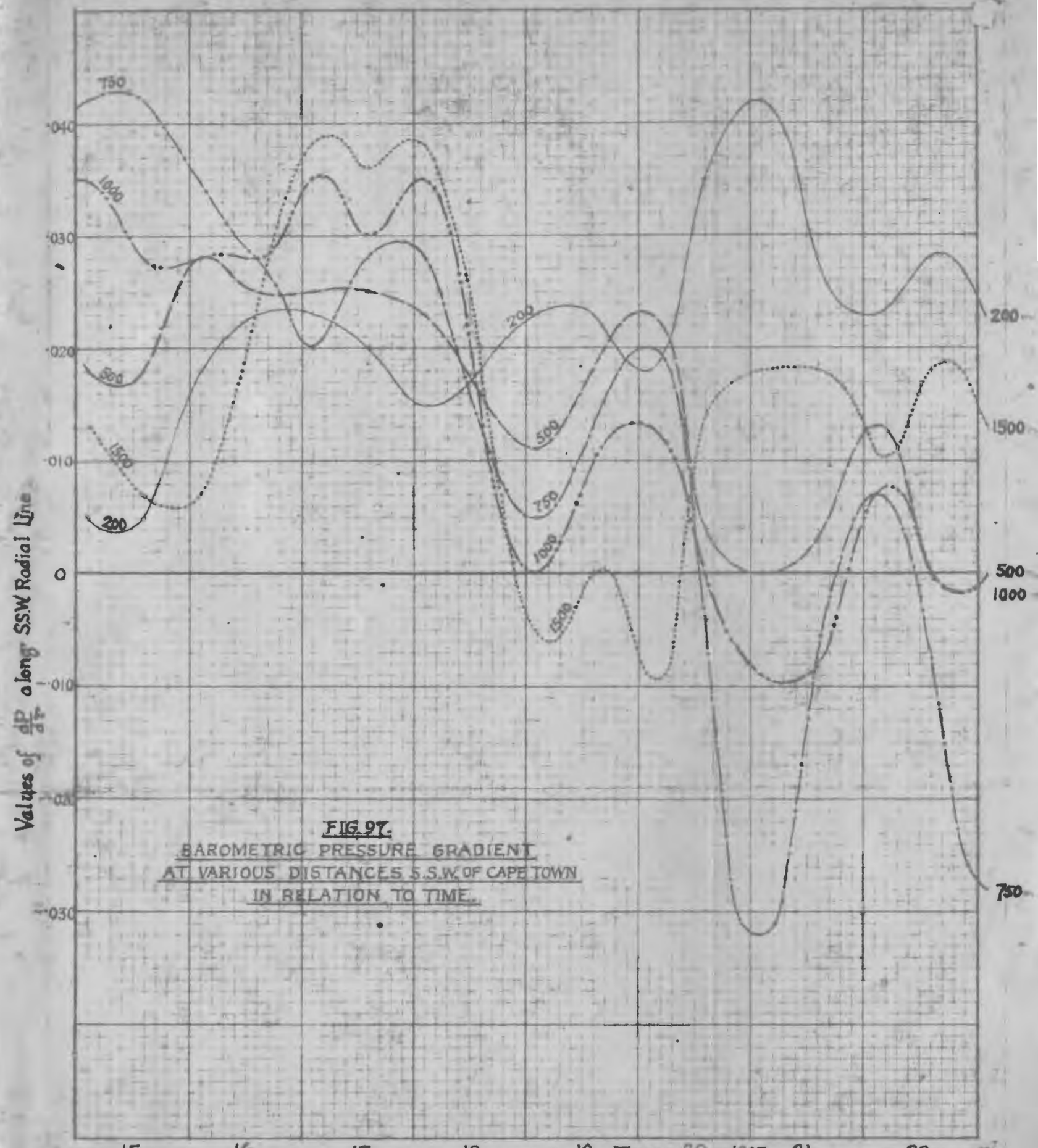


FIG. 97.
BAROMETRIC PRESSURE GRADIENT
AT VARIOUS DISTANCES S.S.W. OF CAPE TOWN
IN RELATION TO TIME.

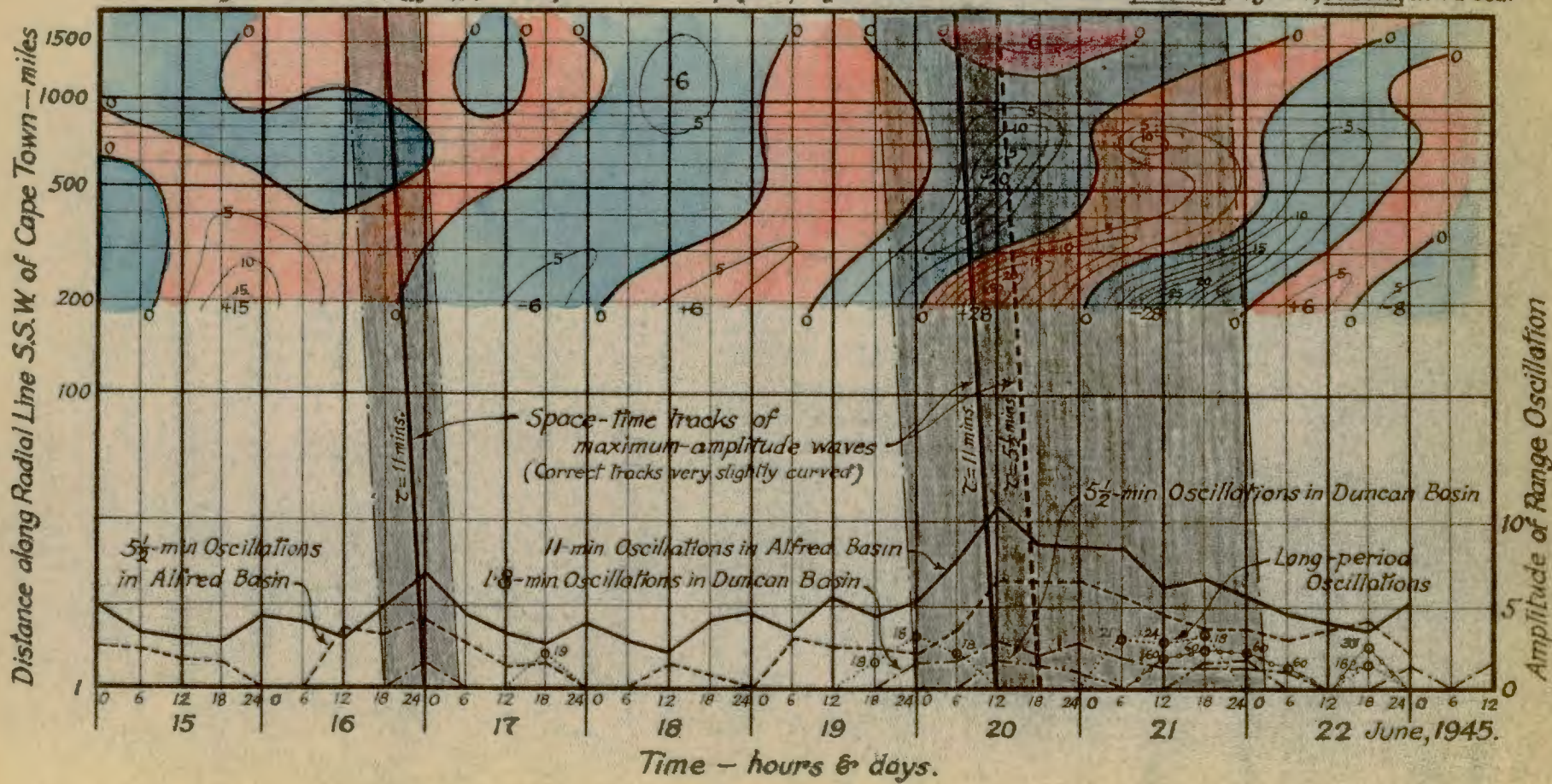
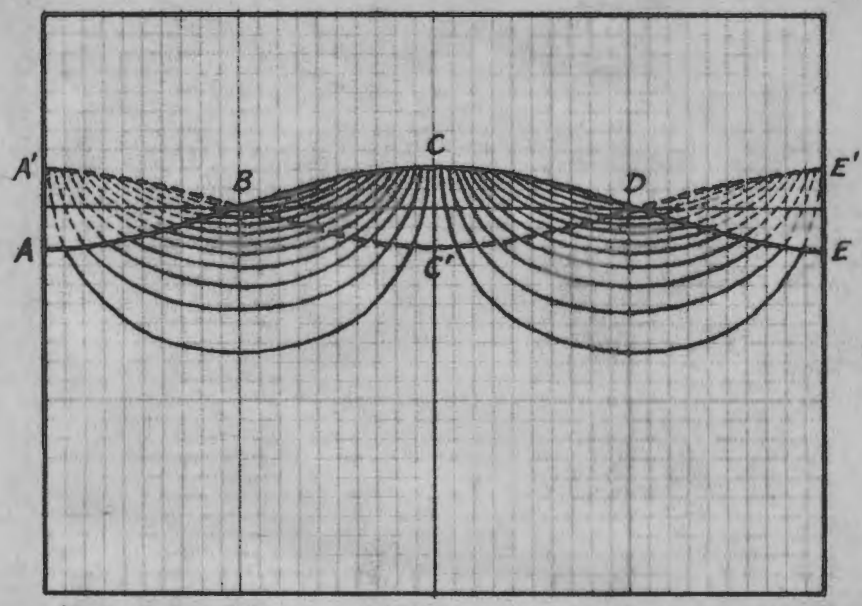


FIG. 98 : RANGE-POTENTIAL OF THE SOUTH ATLANTIC S.S.W. OF CAPE TOWN IN RELATION TO THE INCIDENCE OF RANGE IN TABLE BAY HARBOUR.

W.



Reproduced from Lamb, 'Hydrodynamics' (Cambridge), 1932, p.366.

Fig. 99: The Oscillating System of a Standing Wave.

FIG. 100

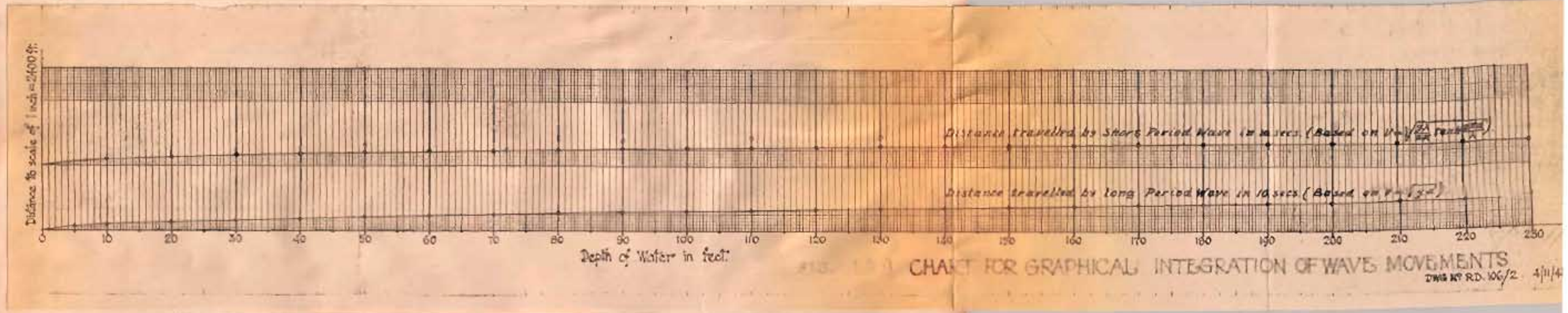


FIG. 100. CHART FOR GRAPHICAL INTEGRATION OF WAVE MOVEMENTS.

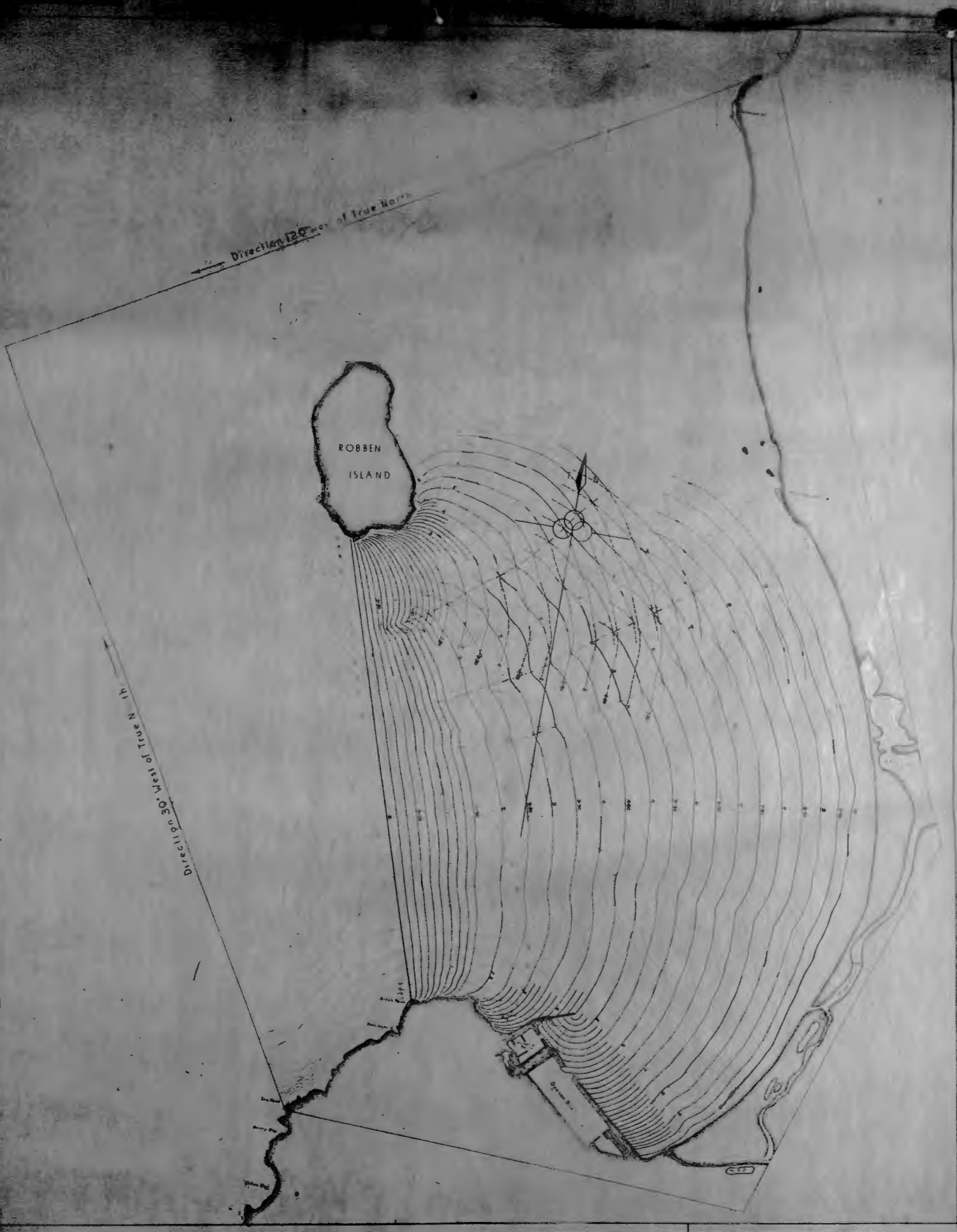


FIG. 101. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY, VIA THE WEST CHANNEL.

Scale 1 inch = 2500 feet.

For Chief Civil Engineer

RD. 106.

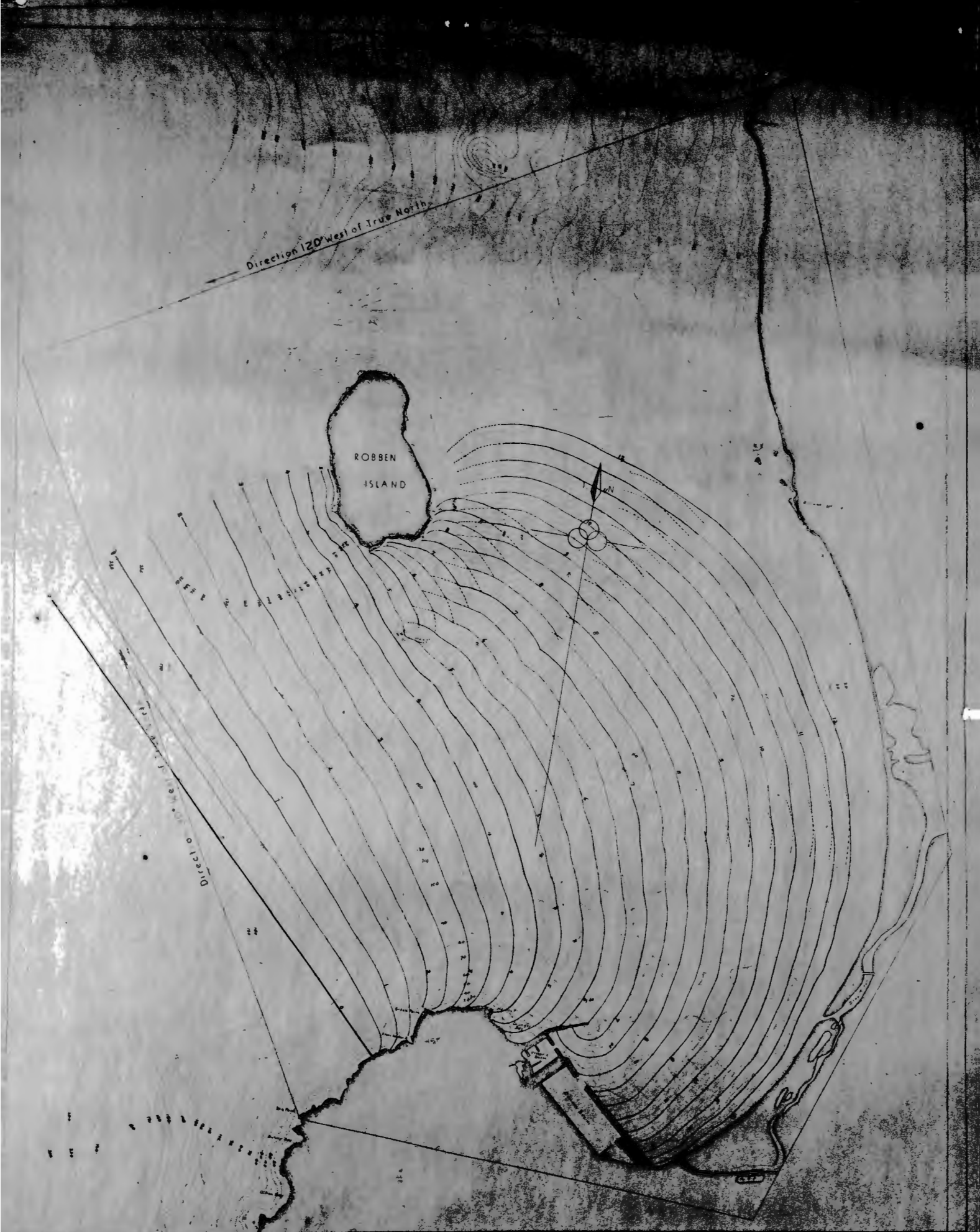


FIG. 102. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE SOUTH-WEST, VIA THE WEST CHANNEL.

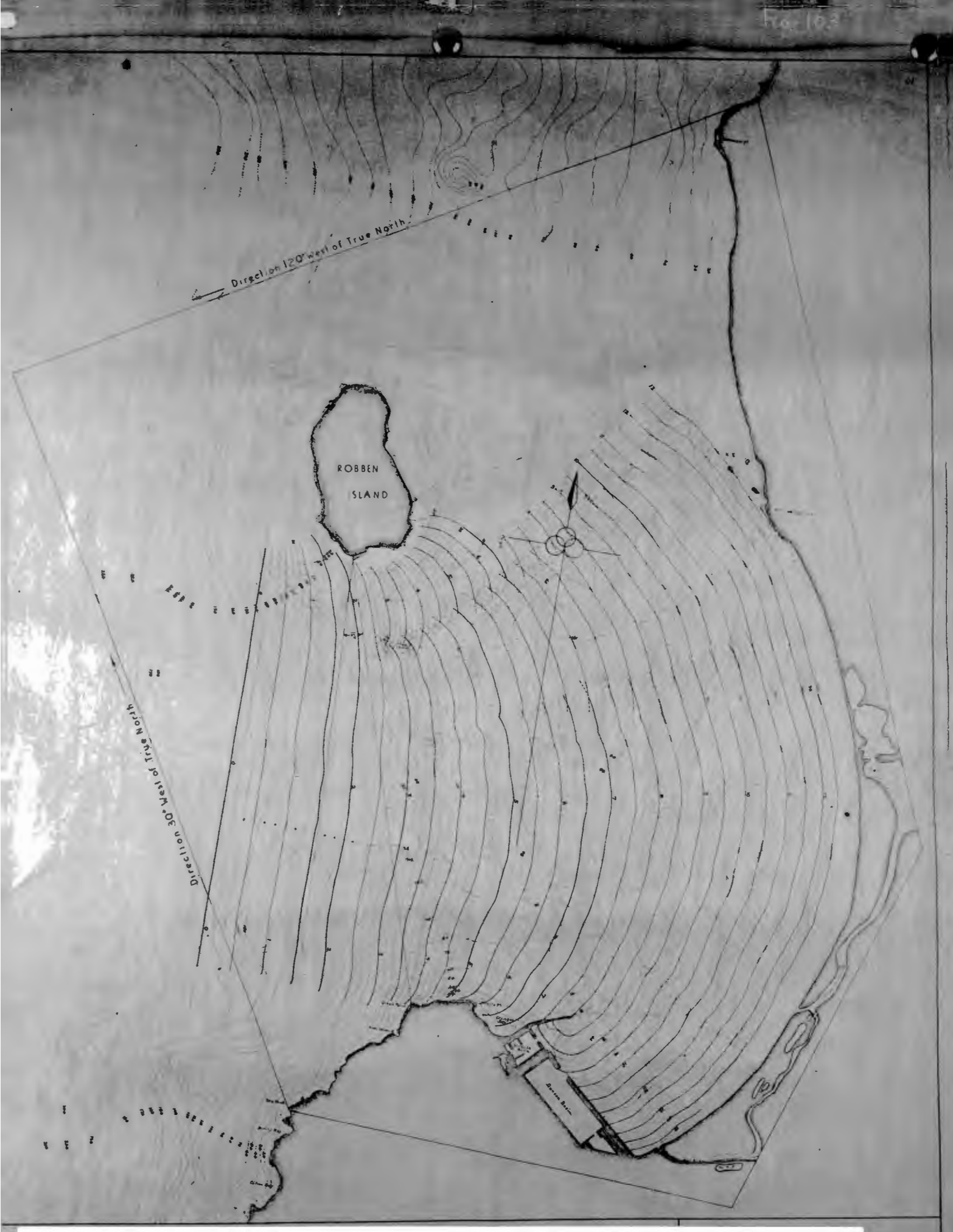


FIG. 103. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE WEST, VIA THE WEST CHANNEL.

For Chief Civil Engineer.

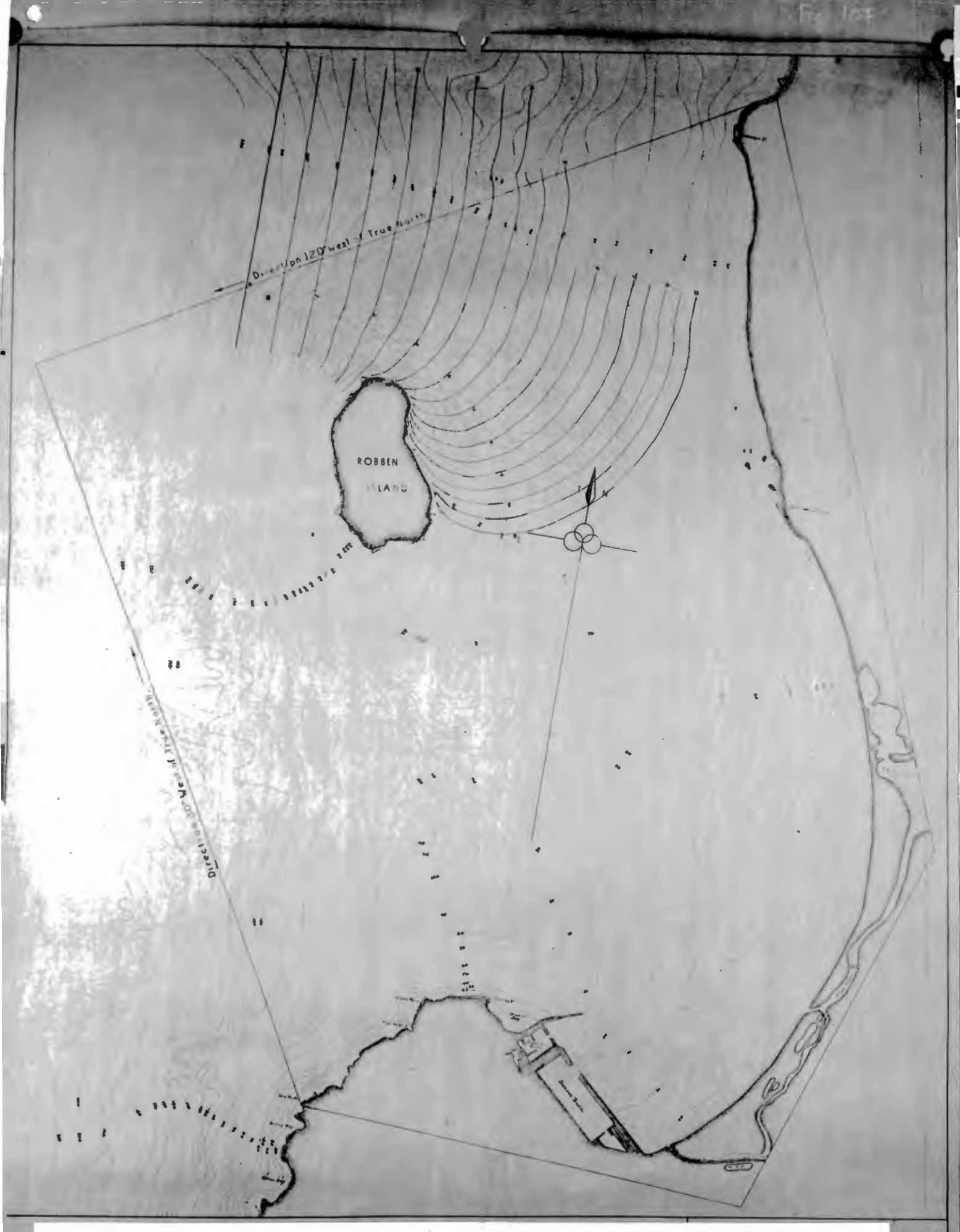


FIG. 104. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE WEST, VIA THE NORTH CHANNEL.

Scale. 1 inch = 2500 feet.

7.

For Chief Civil Engineer.

DWG. A.D.100.

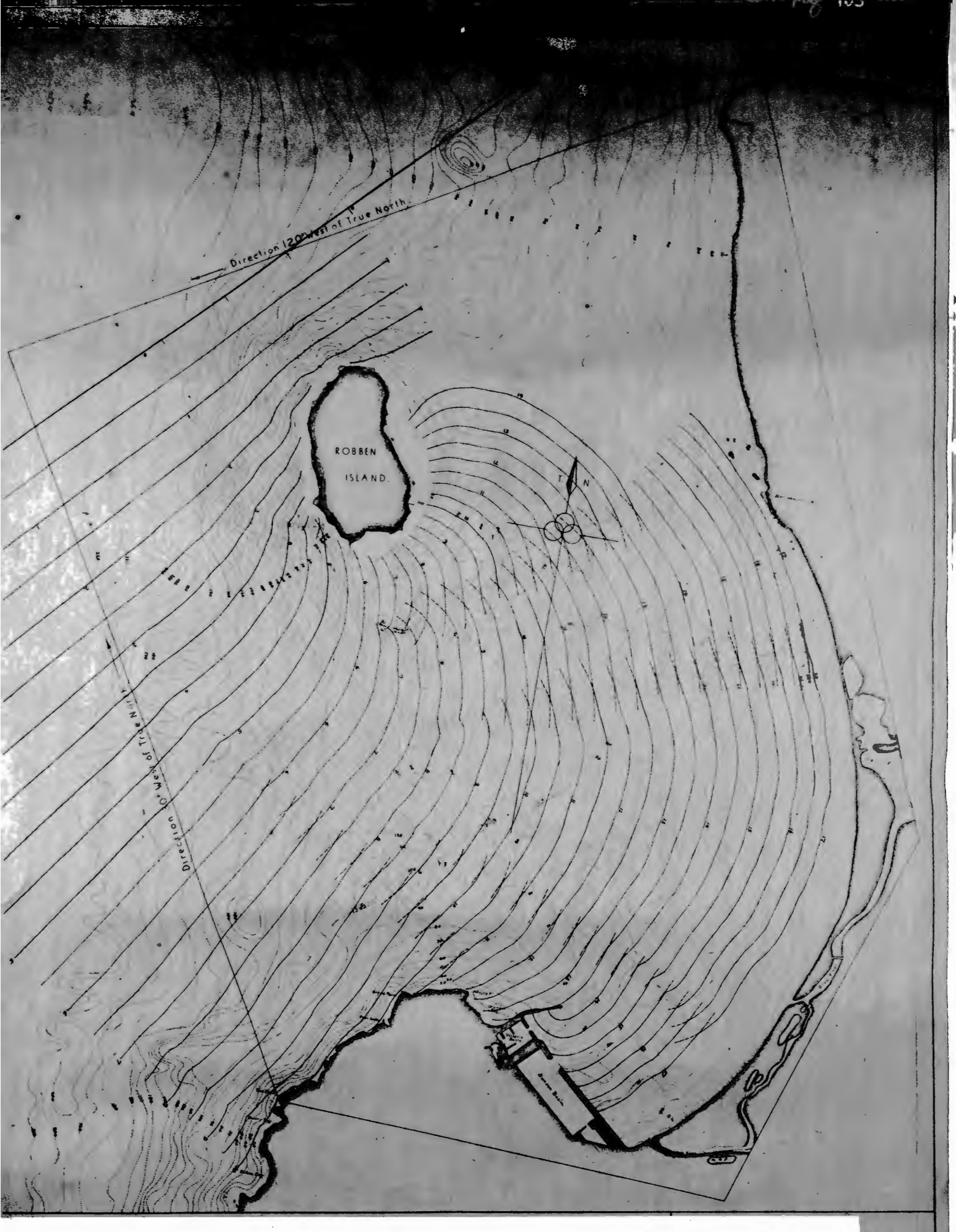


FIG. 105. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE NORTH-WEST, VIA THE WEST CHANNEL.

FIG. 106. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE NORTH-WEST, VIA THE NORTH CHANNEL.

For Chief Civil Engineer.

DWG

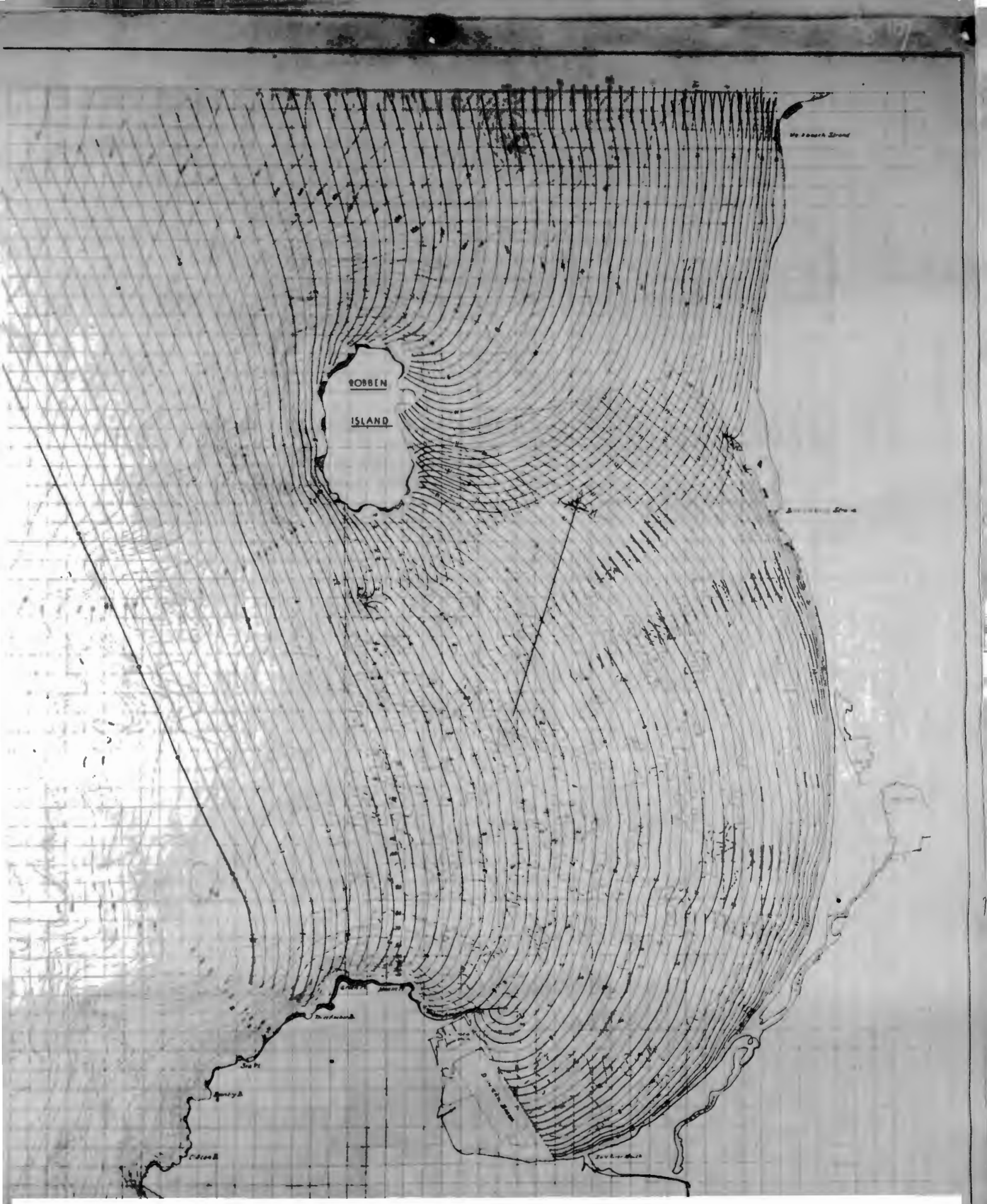


FIG. 107. GRAPHICAL CHARTING OF SHORT-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE SOUTH-WEST, FOR COMPARISON WITH AERIAL PHOTOGRAPHS (FIG. 21).

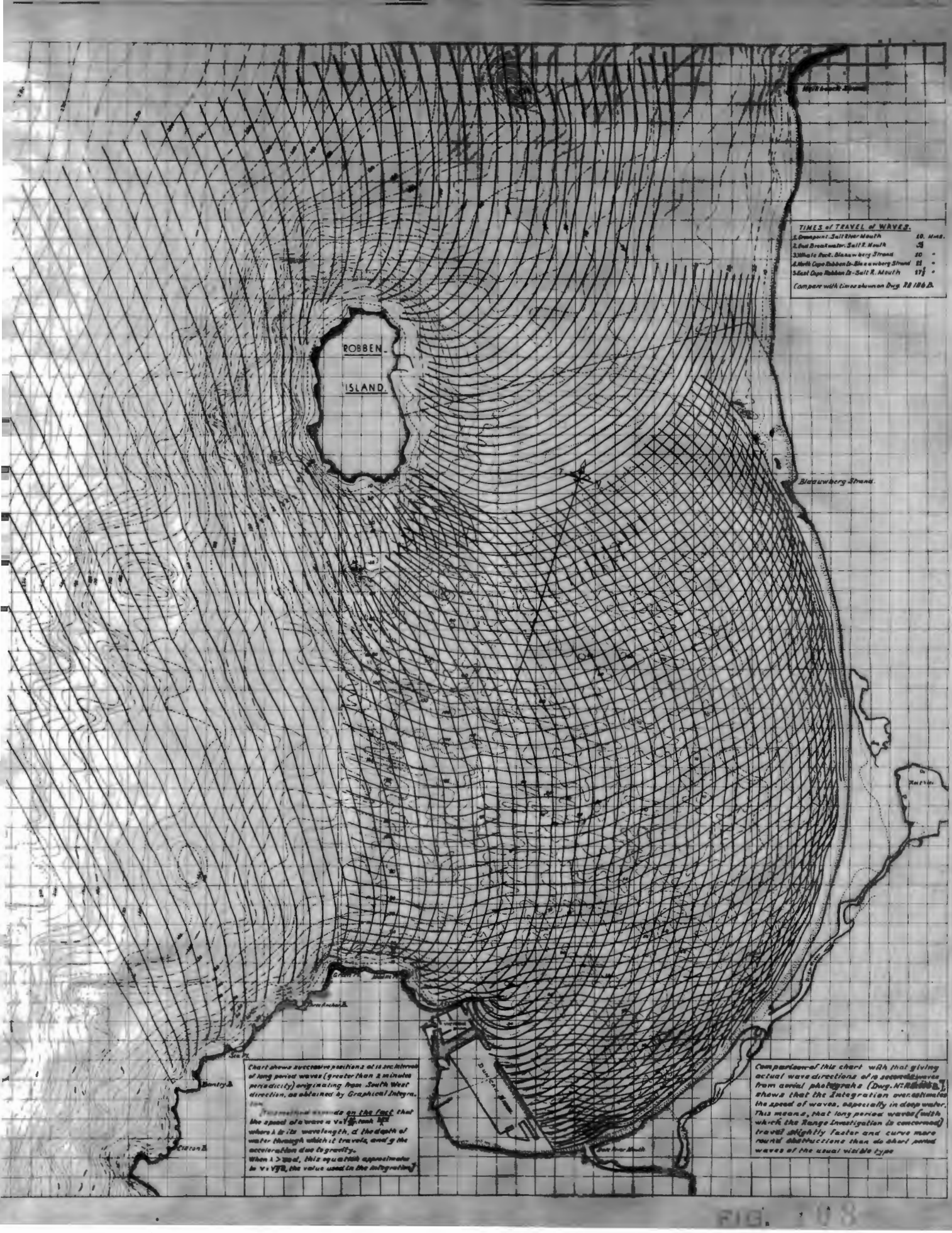


FIG. 108. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION INTO TABLE BAY FROM THE SOUTH-WEST, VIA BOTH CHANNELS.

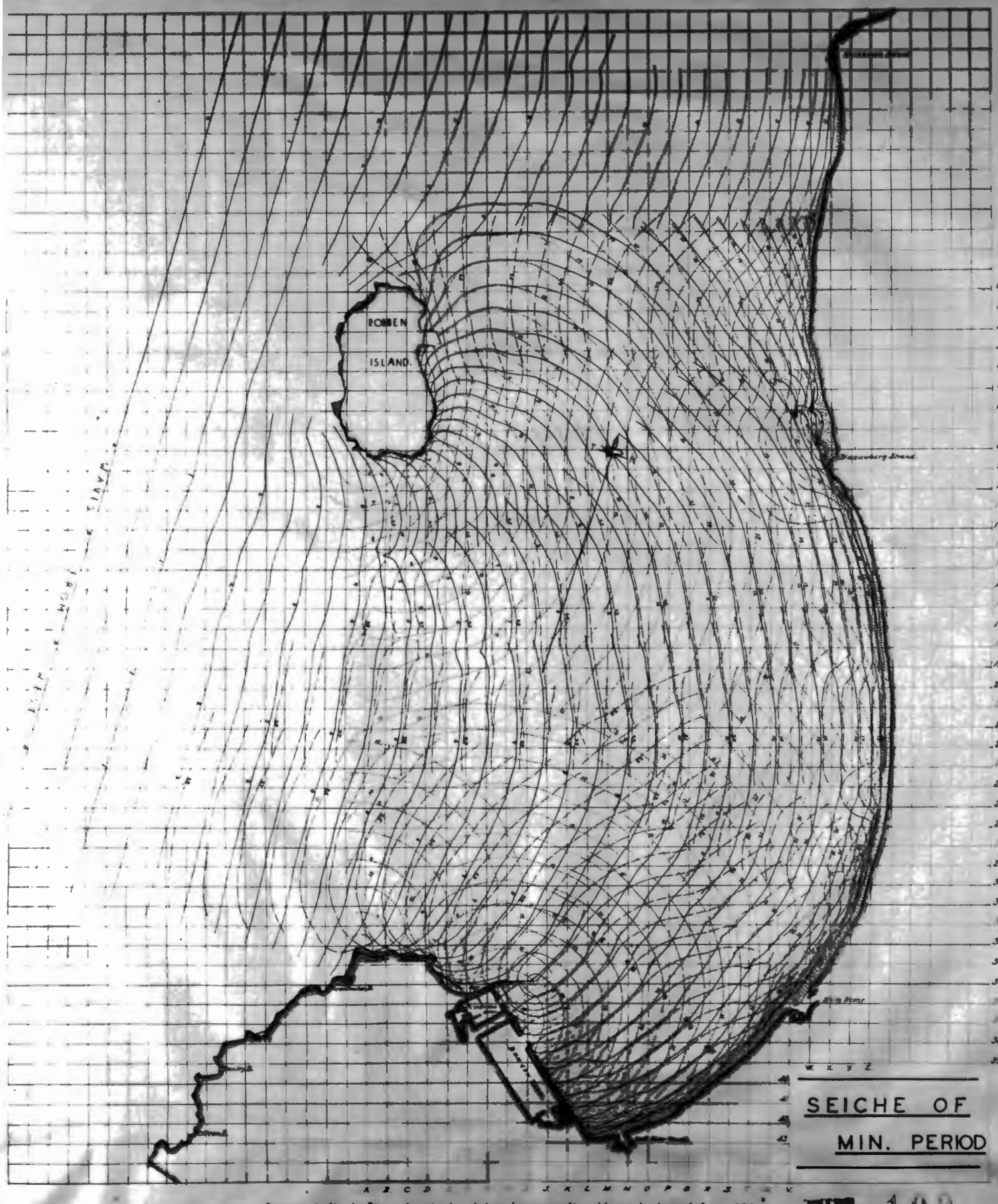


FIG. 109. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION AND REFLECTION IN TABLE BAY FROM THE WEST, VIA THE WEST CHANNEL.

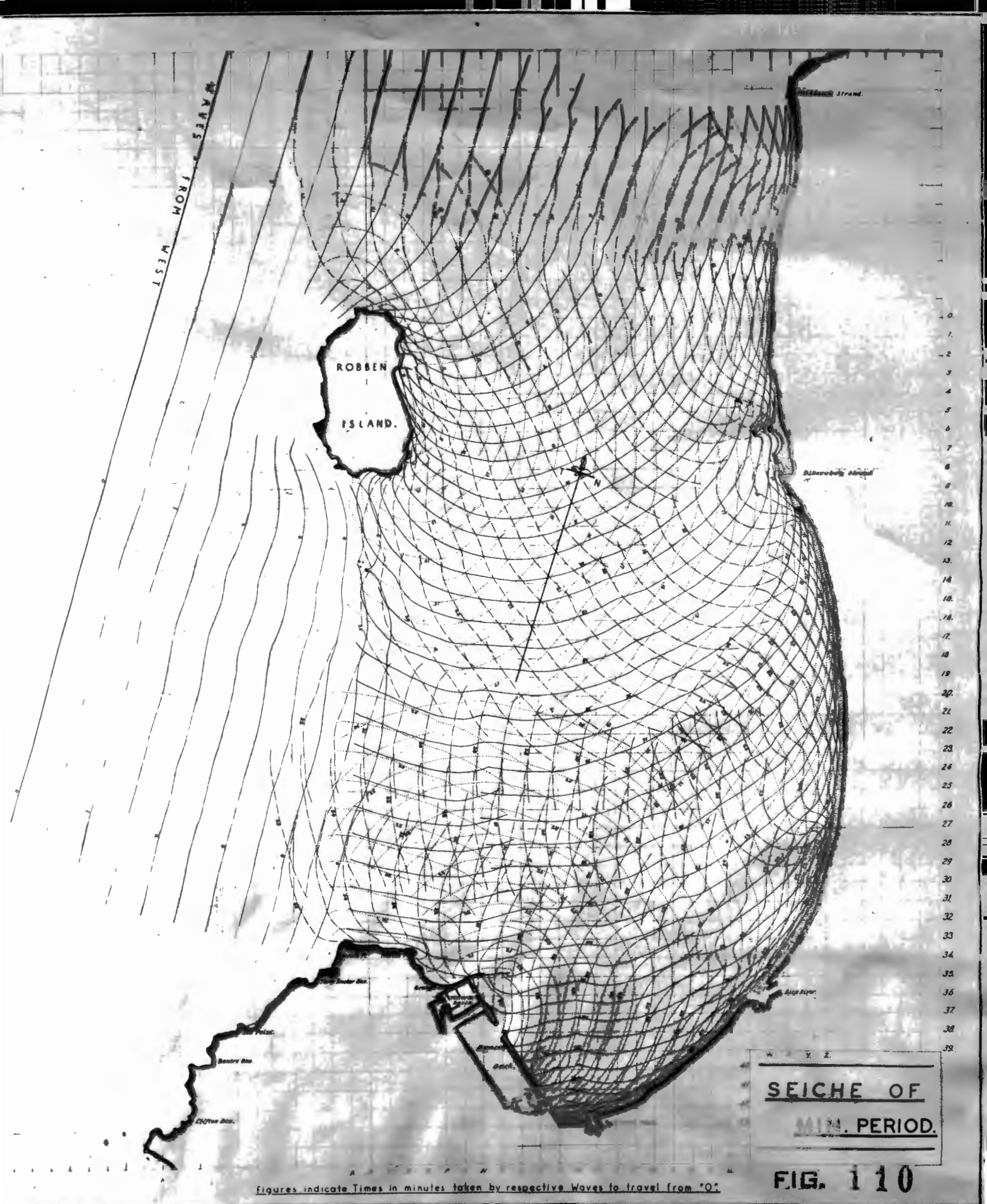


FIG. 110. GRAPHICAL CHARTING OF LONG-PERIOD WAVE PROGRESSION AND REFLECTION IN TABLE BAY FROM THE WEST, VIA THE NORTH CHANNEL.

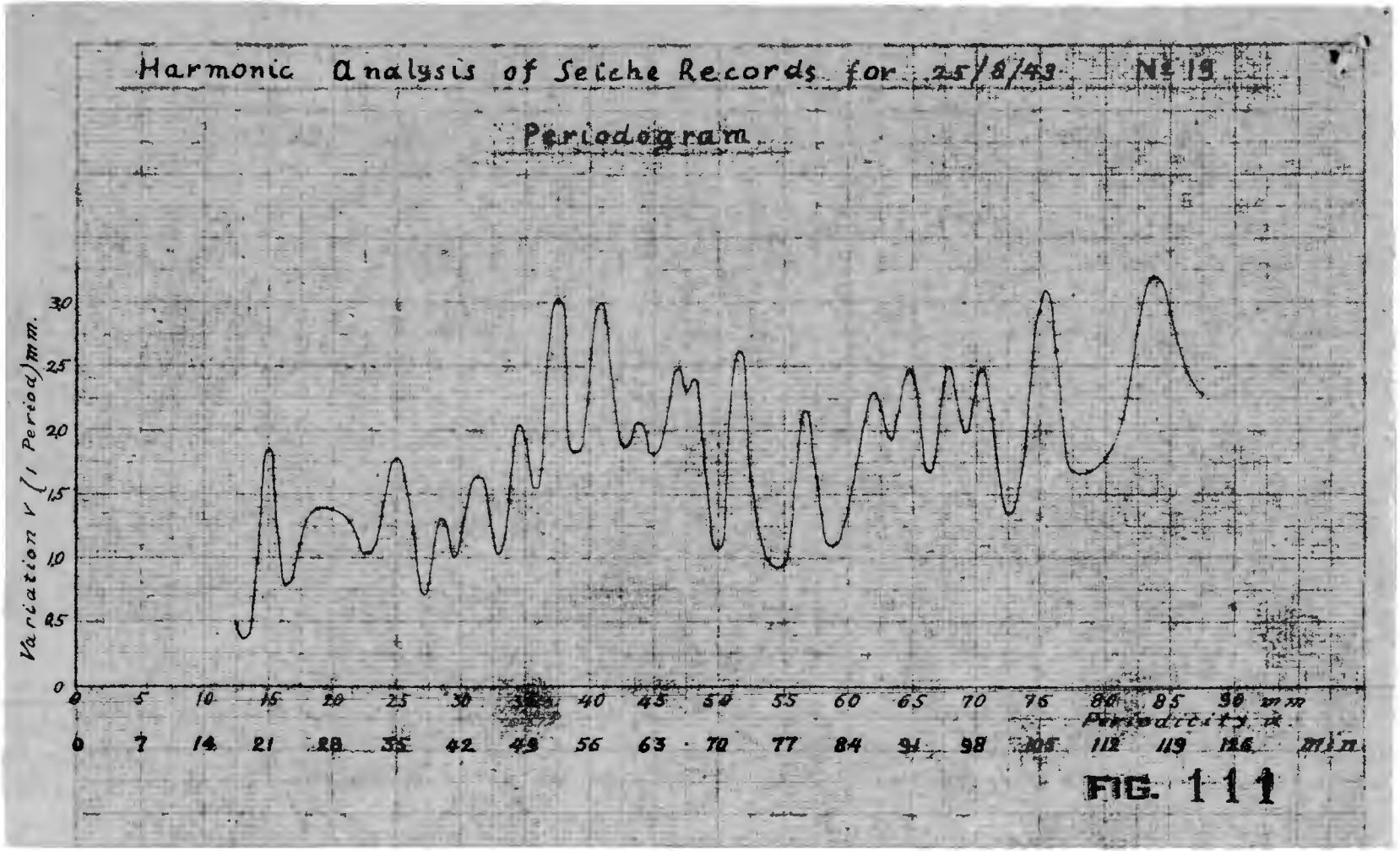
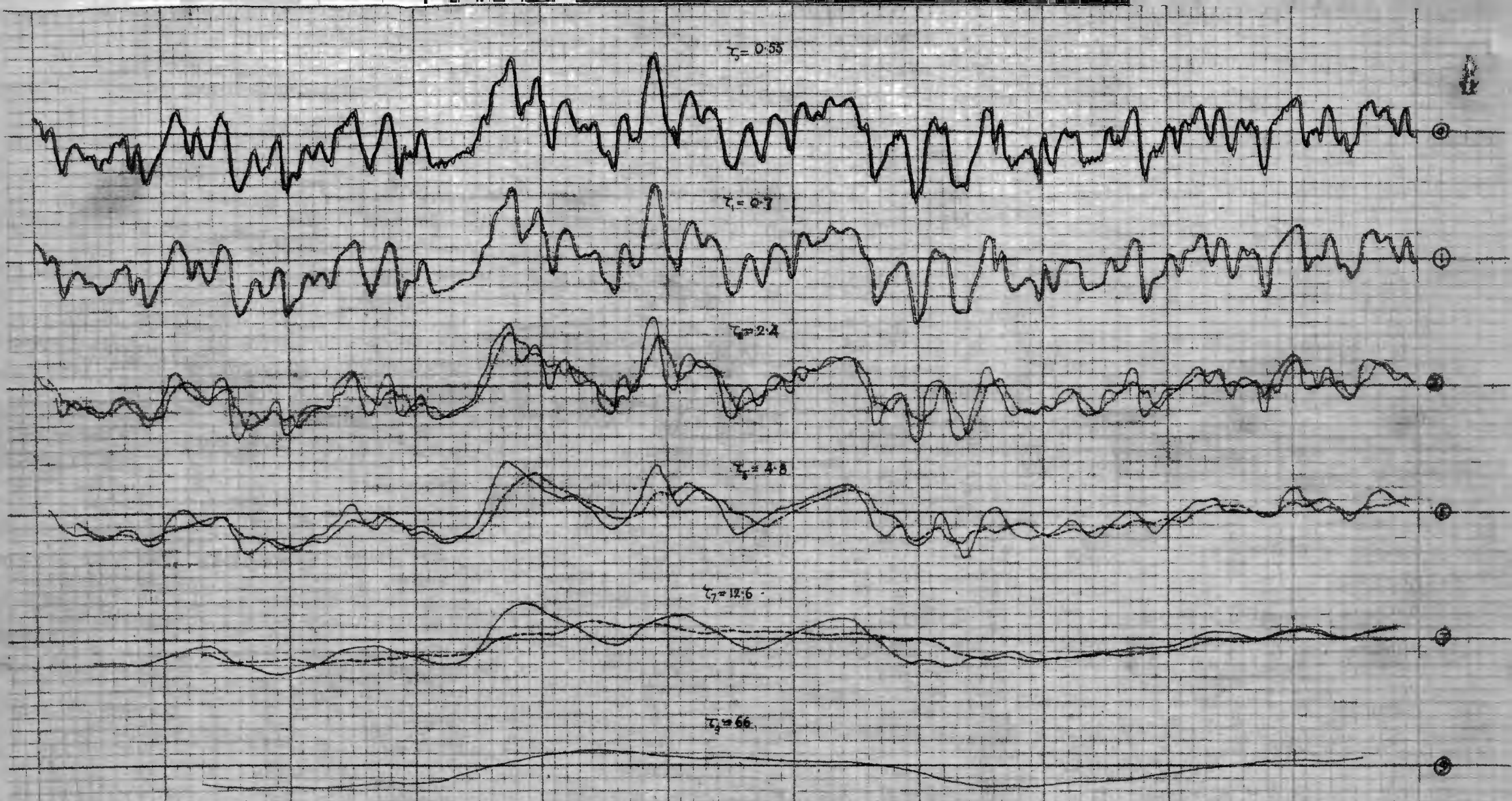

Harmonic Analysis of Seiche Records for 25/8/43 No 19
Periodogram
Variation V (1 Period) mm.
0
2.5
10
15
20
25
30
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 mm
Periodicity x
0 7 14 21 28 35 42 49 56 63 70 77 84 91 98 105 112 119 126 min

FIG. 111



COMPONENTS OF CURVE. Nº 19, Nov. 6, 1944 (Dwg. Nº R.D. 120 G)
1 Divn. = 0·885 mins

Components appear to be:—

a.	0·55 Divns.	≡ 0·49	Mins.	s.	6·3	≡ 5·58	
1.	0·7	"	≡ 0·62	"	"	66	≡ 58·4
2.	1·2	"	≡ 1·06	"	10.	33	≡ 29·2
3.	2·4	"	≡ 2·12	"			
4.	0·8	"	≡ 0·71	"			
5.	4·8	"	≡ 4·25	"			
6.	2·65	"	≡ 2·34	"			
7.	12·6	"	≡ 11·14	"			

FIG. 112 (a). HARMONIC COMPONENTS OF SEICHOGRAM NO. 19 OF 6/11/44 (EX FIG. 49) BY RESIDUATION ANALYSIS.

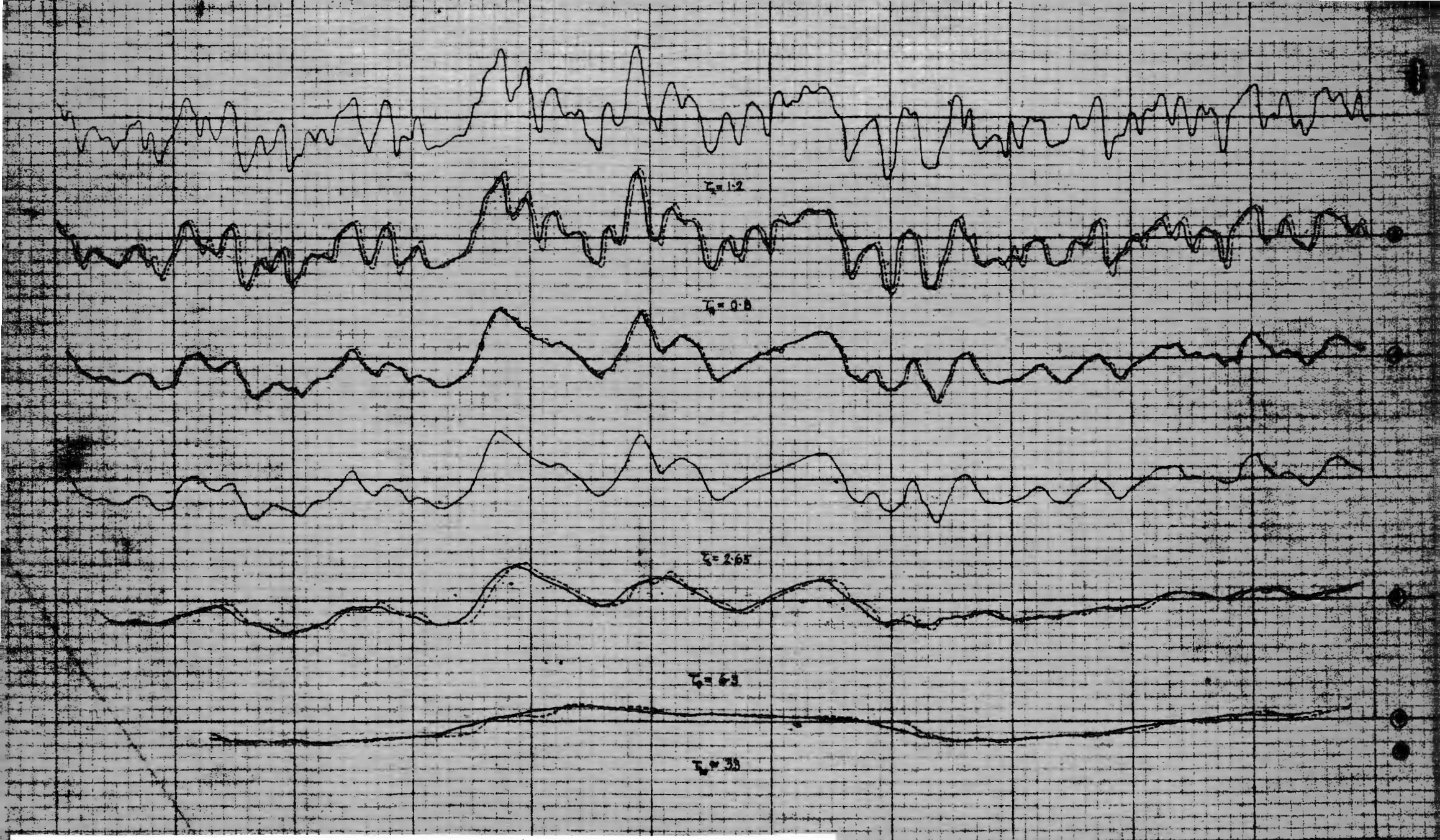


FIG. 112 (b). HARMONIC COMPONENTS OF SEICHOGRAM NO. 19 OF 6/11/44 (EX FIG. 49) BY RESIDUATION ANALYSIS.

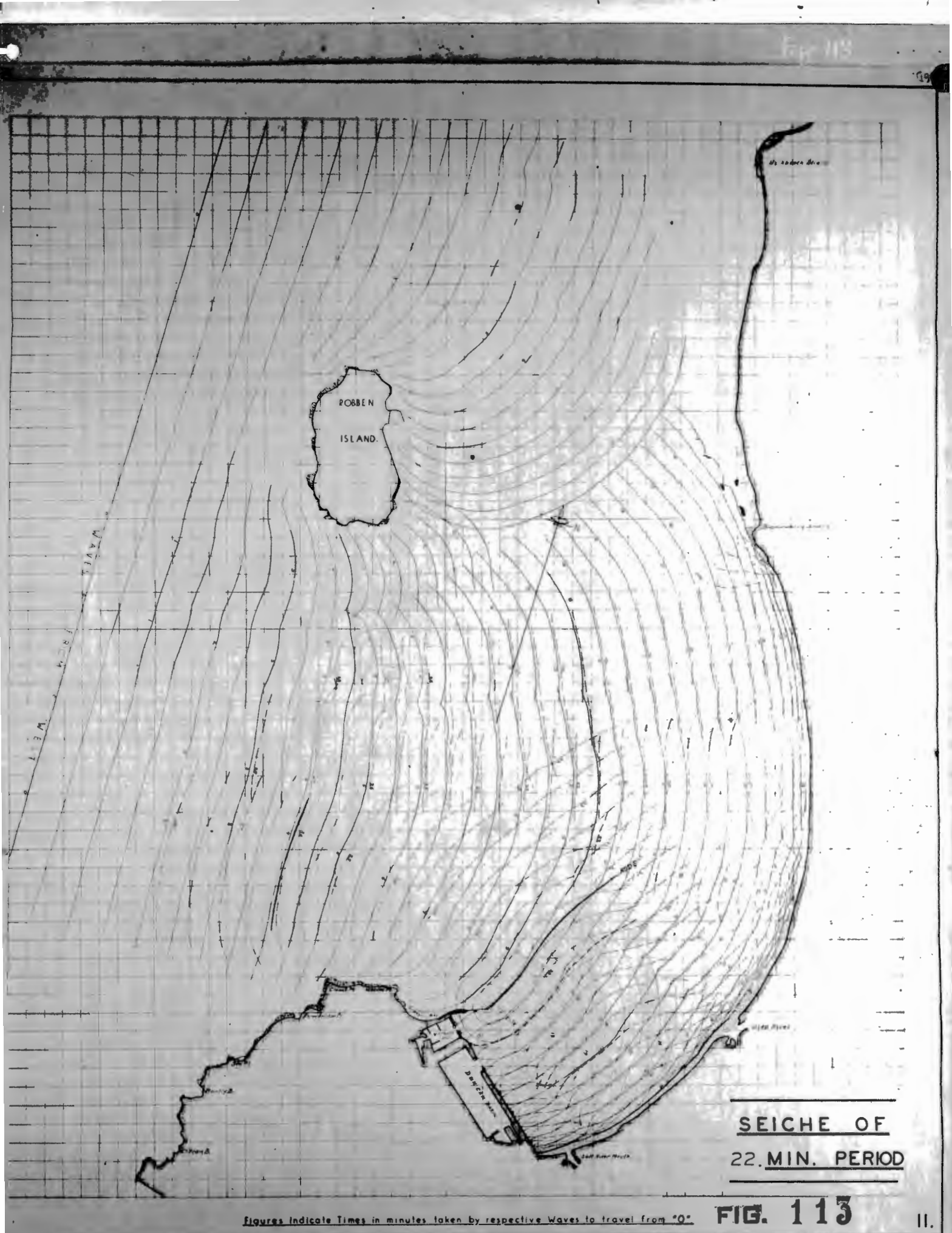
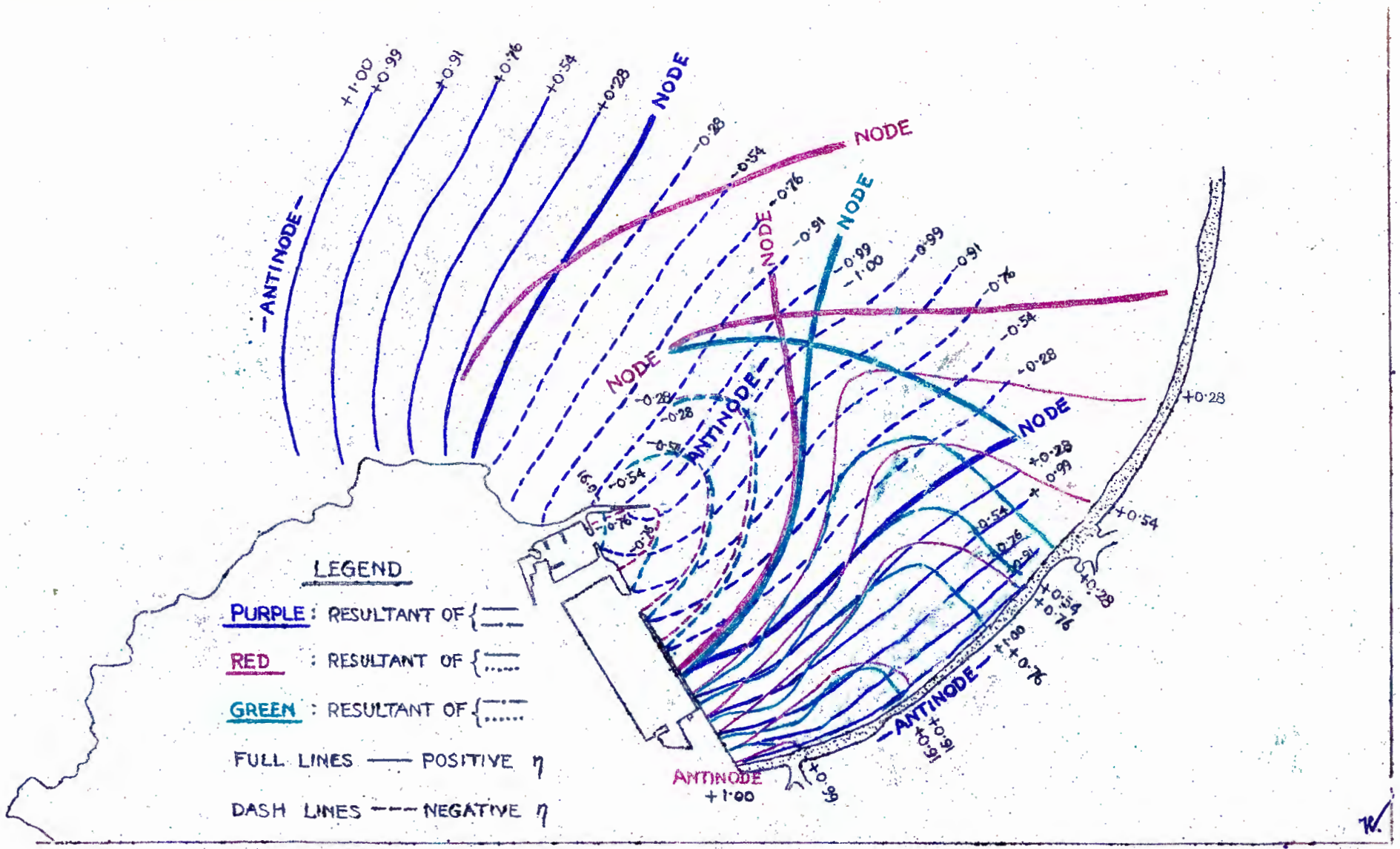
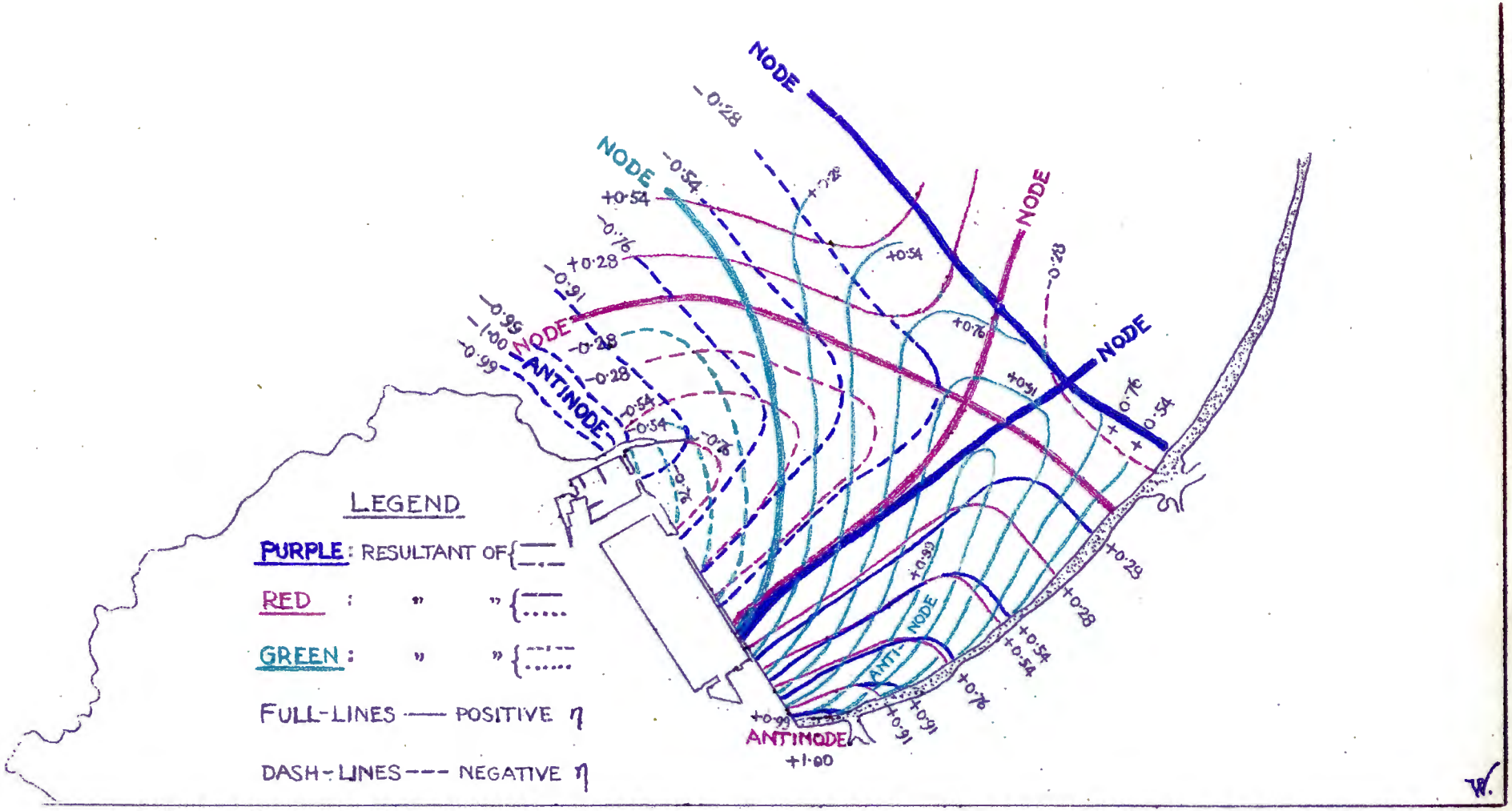


FIG. 113. GRAPHICAL DETERMINATION OF 22-MINUTE STANDING WAVE FROM WAVES THROUGH WEST-CHANNEL.



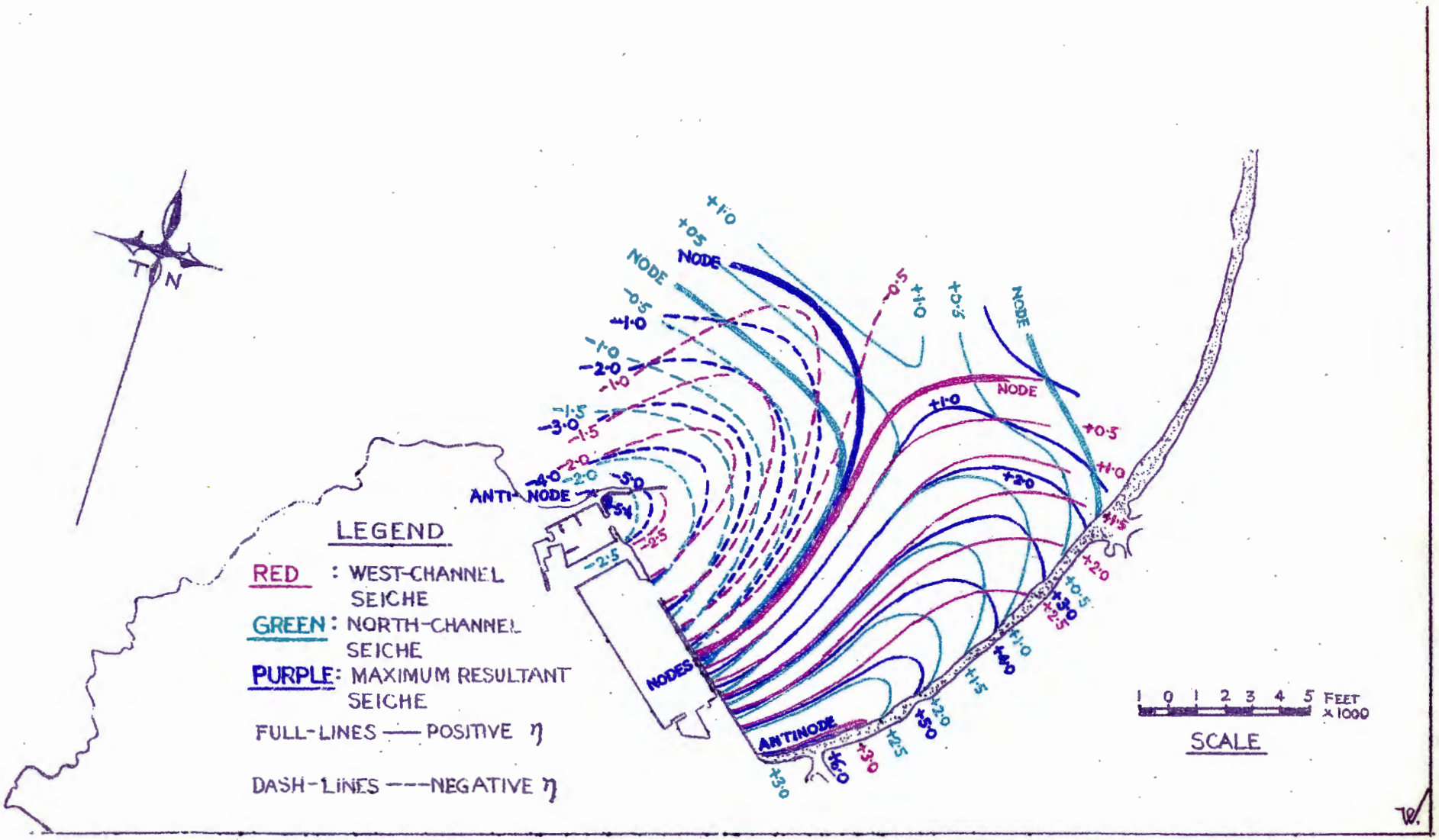
11 MINUTE SEICHE : COMPONENT STANDING-WAVES FROM WAVES THROUGH WEST CHANNEL

FIG. 114



11 MINUTE SEICHE: COMPONENT STANDING-WAVE FROM WAVES THROUGH NORTH CHANNEL

FIG. 115



NATURE OF 11 MINUTE SEICHE OUTSIDE HARBOUR IN TABLE BAY.

FIG. 116

FIG. 117. NATURE OF $2\frac{3}{4}$-MINUTE SEICHE OUTSIDE HARBOUR IN TABLE BAY.

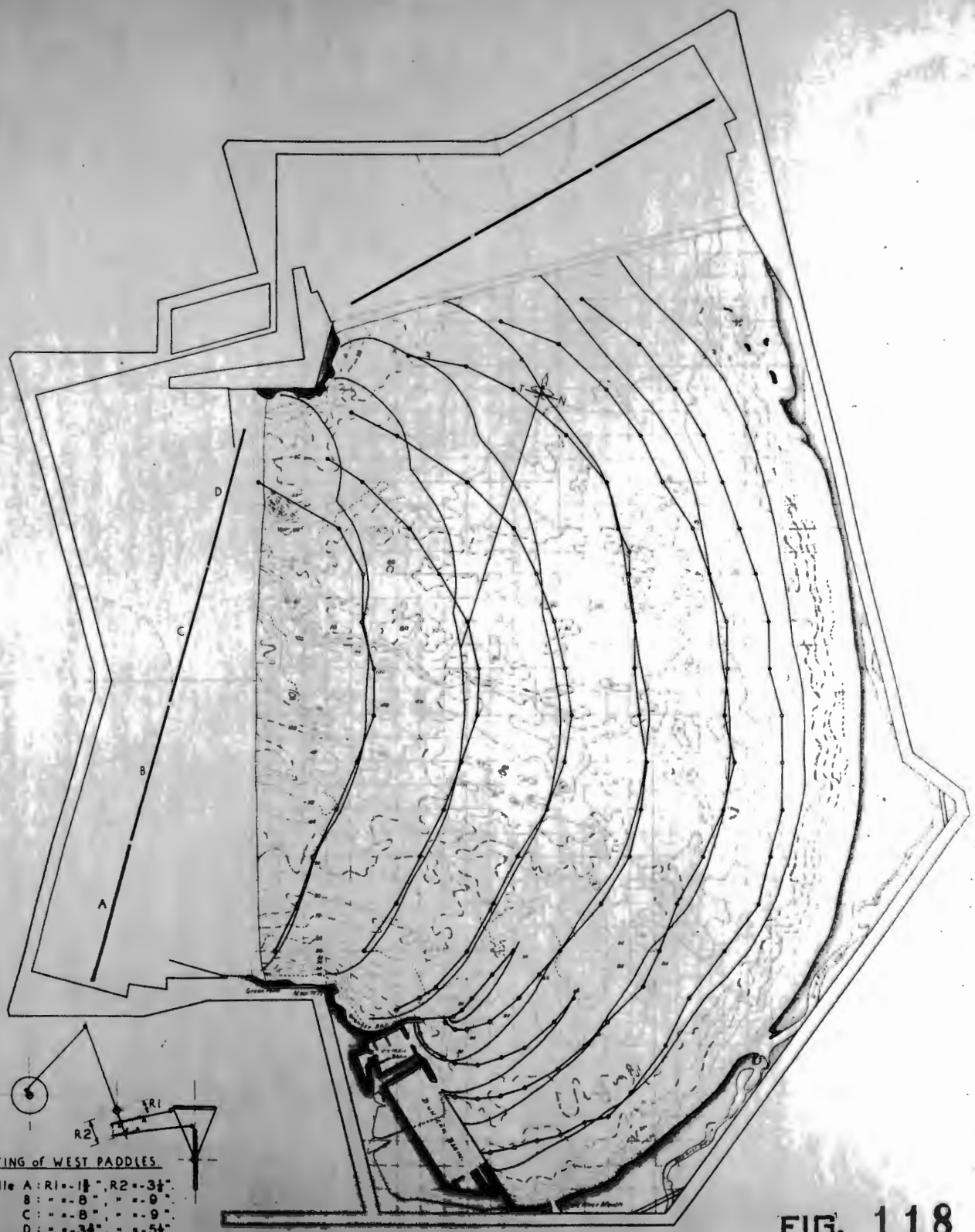


FIG. 118

FIG. 118. DYNAMICAL SIMILARITY TEST OF MODEL:
CHART OF WAVE PROGRESSION FROM THE WEST,
VIA THE WEST CHANNEL.

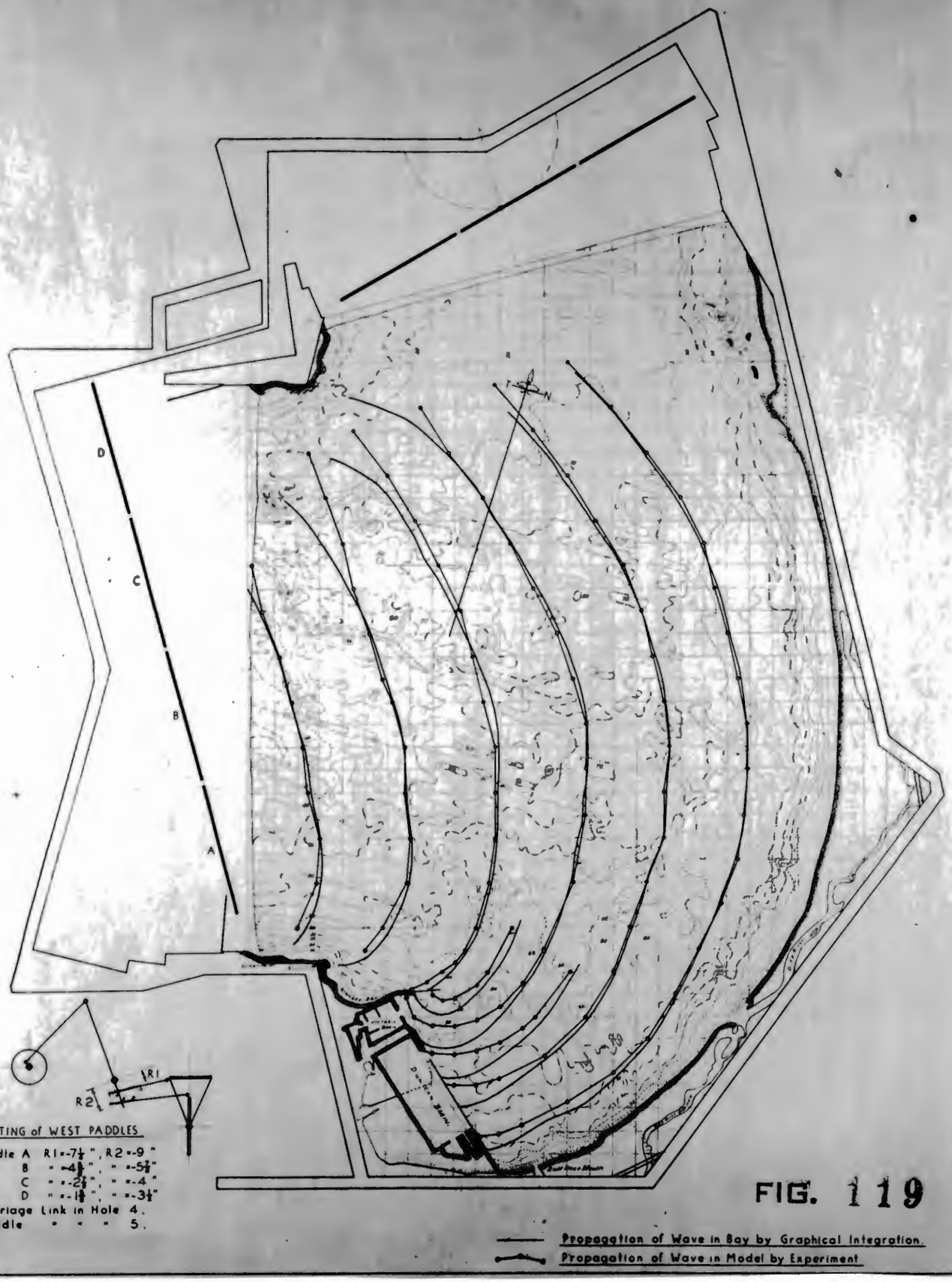


FIG. 119. DYNAMICAL SIMILARITY TEST OF MODEL:
CHART OF WAVE PROGRESSION FROM THE SOUTH-WEST,
VIA THE WEST CHANNEL.

FIG. 120

FIG. 120. DYNAMICAL SIMILARITY TEST OF MODEL:
CHART OF WAVE PROGRESSION FROM THE WEST
OR SOUTH-WEST, VIA THE NORTH CHANNEL.

FIG. 121. KYMATOGRAM FROM PADDLE ROTATION TESTS IN THE MODEL.

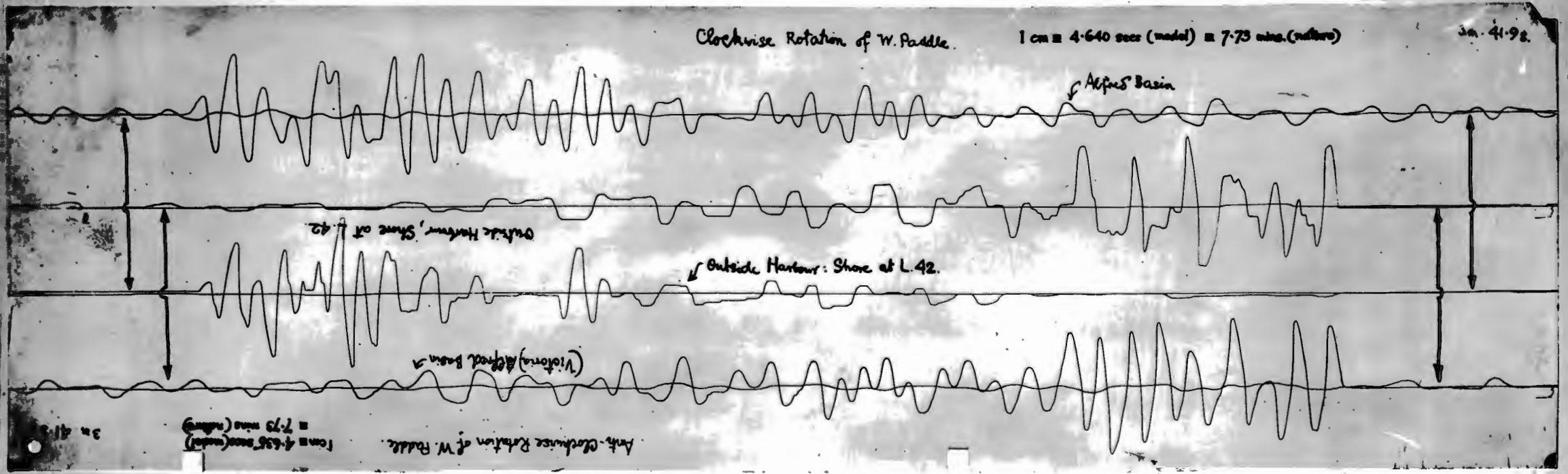


FIG. 121

PERIODOGRAMS FROM MODEL EXPERIMENTS ON EXISTING HARBOUR

Designed to determine Paddle Settings

February, 1945

(Wave Direction, West)

FIG. 122

Range of Seiche in Model - 2a (a = amplitude) - [relative]

Periodicity of Seiche - τ (mins.)

Eccentric Radius - r (ins.)

Eccentric Radius West Paddle

Eccentric Radius North Paddle

LEGEND

- Between Nº 1 & 2 Jetties, Victoria Dk
- Corner A Berth, Dunedin Dock
- Centre Alfred Basin
- Breakwater Right corner near Eastern
- Outside Eastern Mole, near shore

PERIODOGRAMS
FROM
MODEL EXPERIMENTS
ON
EXISTING HARBOUR
Paddle Settings as for Westerly Waves
November 1945

FIG. 123(a)

Range: N°7 Quay, Victoria Dk.

Range: 'O' Berth, Duncan Dock

Range: 'E' Berth, Duncan Dk.

Eccentric Radius, West Paddle

Eccentric Radius, North Paddle

2nd Harmonic (T = 1·8m) present

Range of Seiche in Model - 2a (a = amplitude) - [Relative]

Eccentric Radius - r (ins.)

Periodicity of Seiche - T (minutes)

0·2 0·4 0·6 0·8 1·0 1·2 1·4

1·5 2·5 3·5 4·5 5·5 6·5 7·5 8·5 9·5 10·5 11·5 12·5 13·5 14·5

0 1·0 2·0 3·0 4·0 5·0

PERIODOGRAM
FROM
MODEL EXPERIMENTS
TO DETERMINE
CRITICAL PERIODS
BETWEEN BREAKWATER AND SHORE.
(BASIN ENTRANCES SEALED).
PADDLE SETTINGS AS FOR WESTERLY WAVES
(OLD SHAFTING IN USE).
JANUARY 1946.

FIG. 123(b)

——— 35½, G¾ (BREAKWATER BIGHT)
— — — — 37½, I½ (OPP. DUNCAN D. ENTR.)
—·—·—·— 39½, J¾ (OUTSIDE EAST MOLE)
- - - - - - 42⅝, L⅛ (SHORE END)

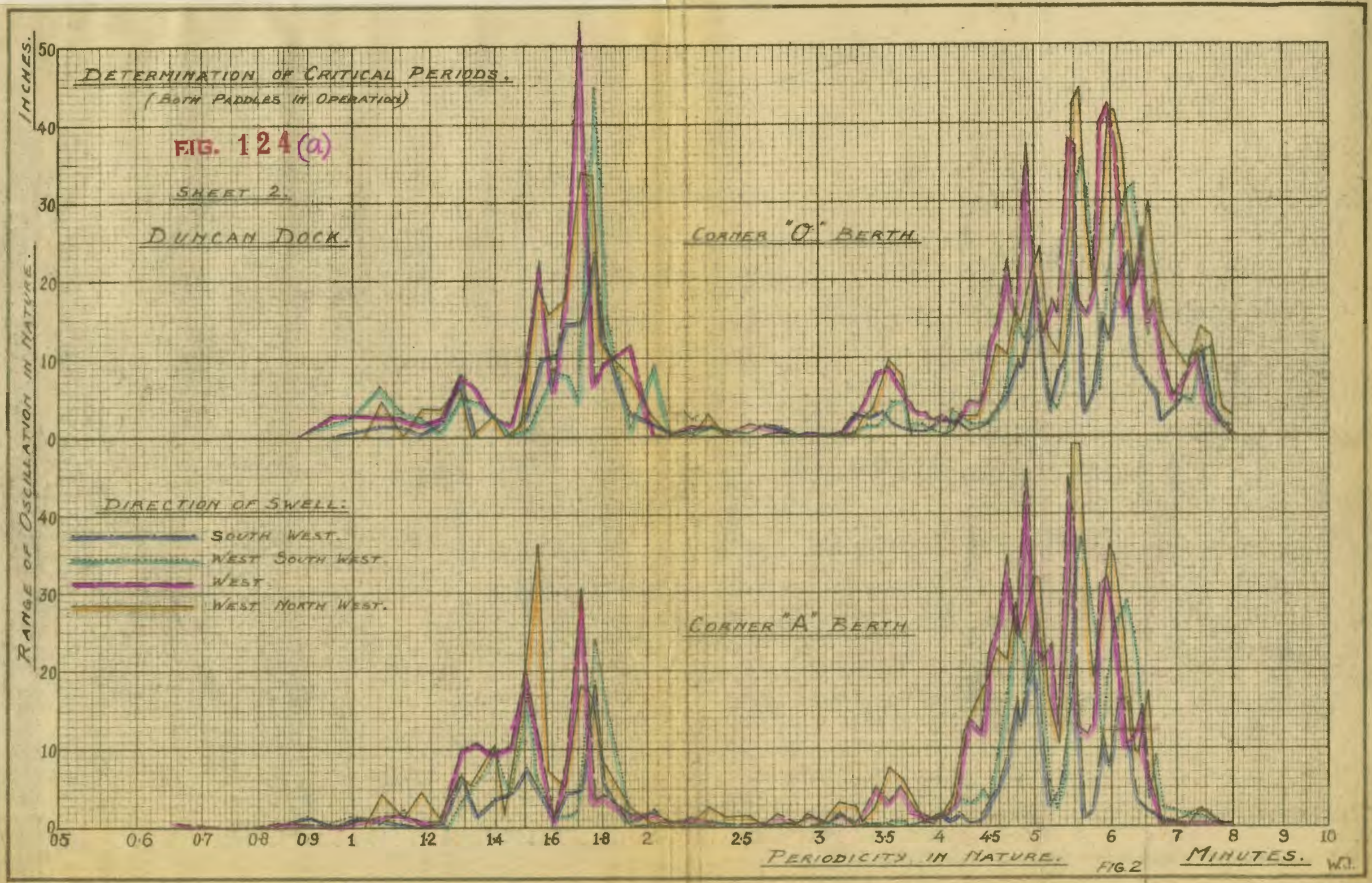
Range of Seiche in Model — 2a (a = Amplitude) — (relative)

0 0.5 1 1.5 2 2.5 3 3.5

1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5

Periodicity of Seiche - τ (Mins.)

FIG. 124 (a). EXPERIMENTAL PERIODOGRAMS FOR THE DUNCAN BASIN WITH SWELLS FROM FOUR DIRECTIONS.



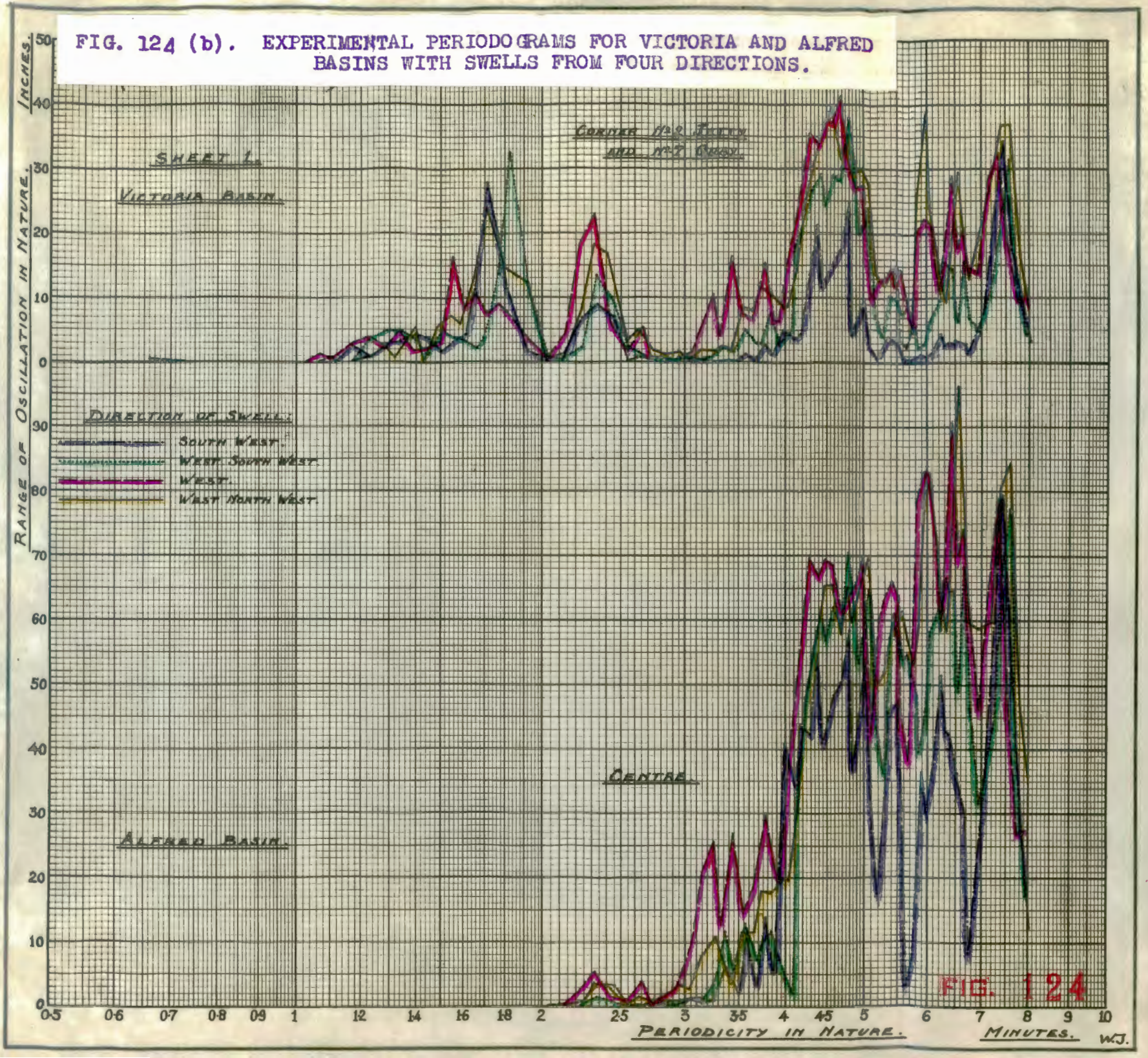


FIG. 124 (b). EXPERIMENTAL PERIODOGRAMS FOR VICTORIA AND ALFRED BASINS WITH SWELLS FROM FOUR DIRECTIONS.
RANGE OF OSCILLATION IN NATURE. INCHES.
SHEET La
VICTORIA BASIN
CORNER N.2 JETTY AND N.7 QUAY
DIRECTION OF SWELL:
SOUTH WEST.
WEST SOUTH WEST.
WEST.
WEST NORTH WEST.
CENTRE
ALFRED BASIN
FIG. 124
PERIODICITY IN NATURE.
MINUTES.
W.J.

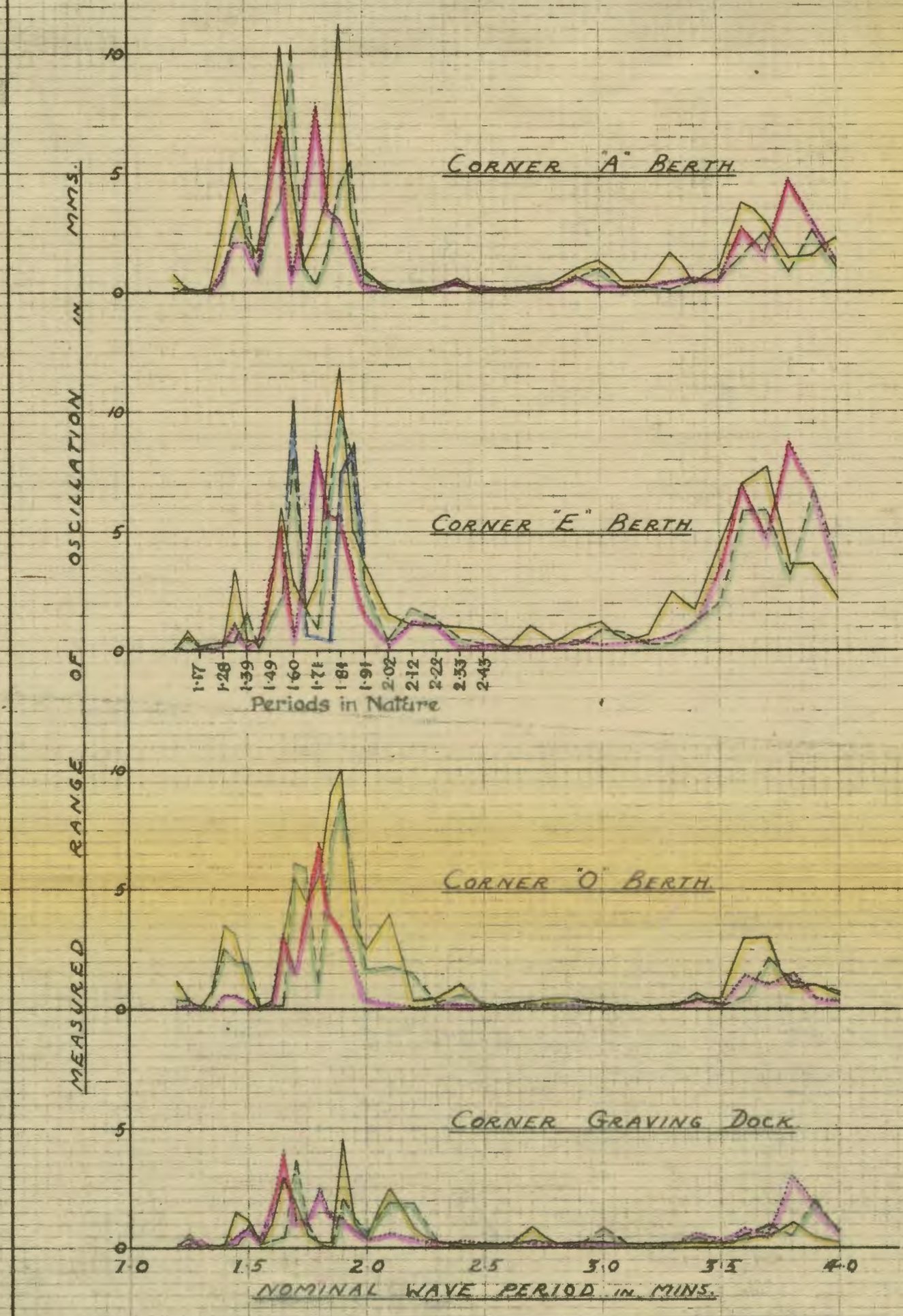


FIG. 125. EXPERIMENTAL PERIODOGRAMS FOR THE FOUR CORNERS OF THE MODEL DUNCAN BASIN.

FIG. 125

FIG. 126. EXPERIMENTAL PERIODOGRAMS FOR MODEL HARBOUR: CONDITIONS AS OF NOV., 1941.

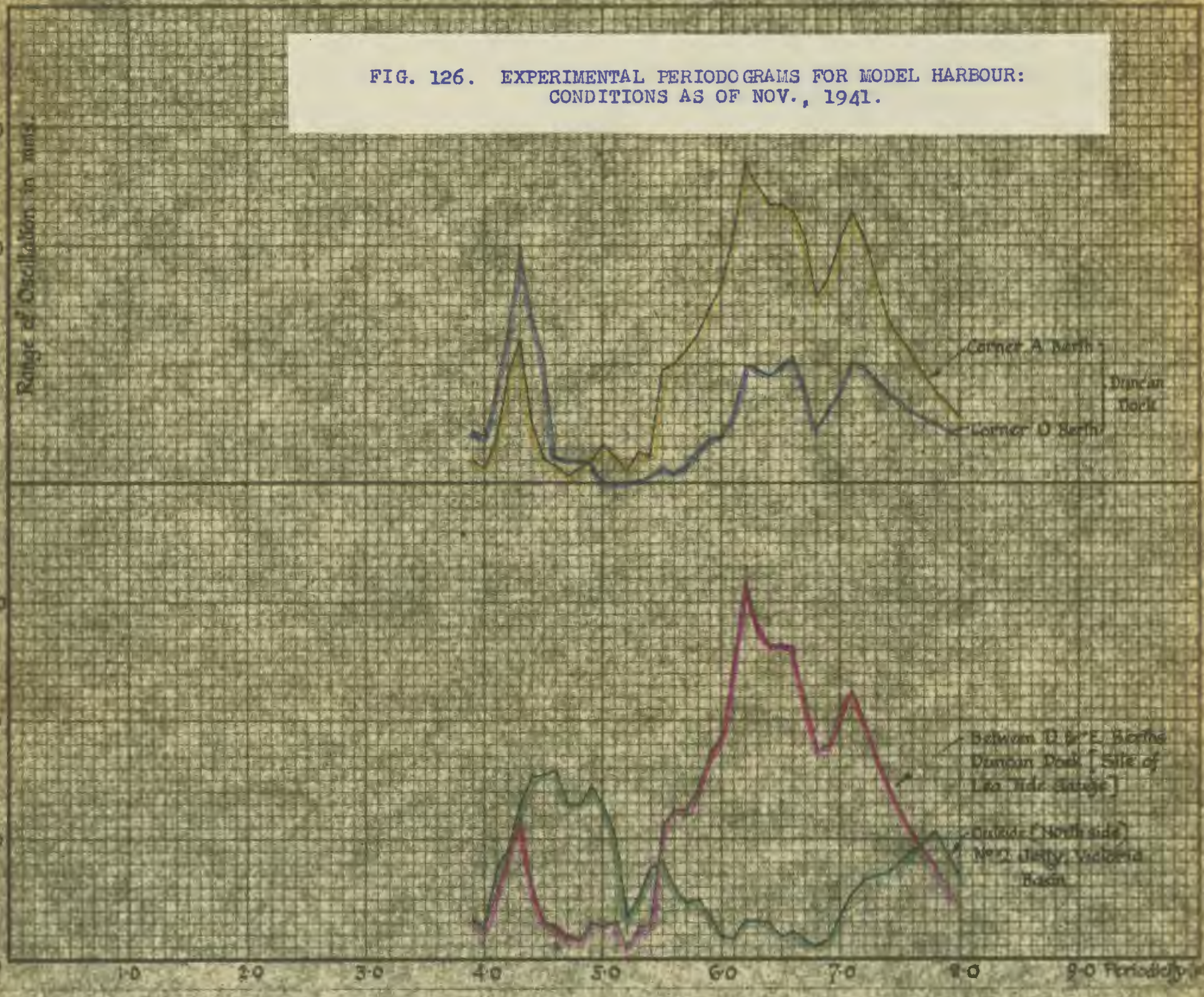
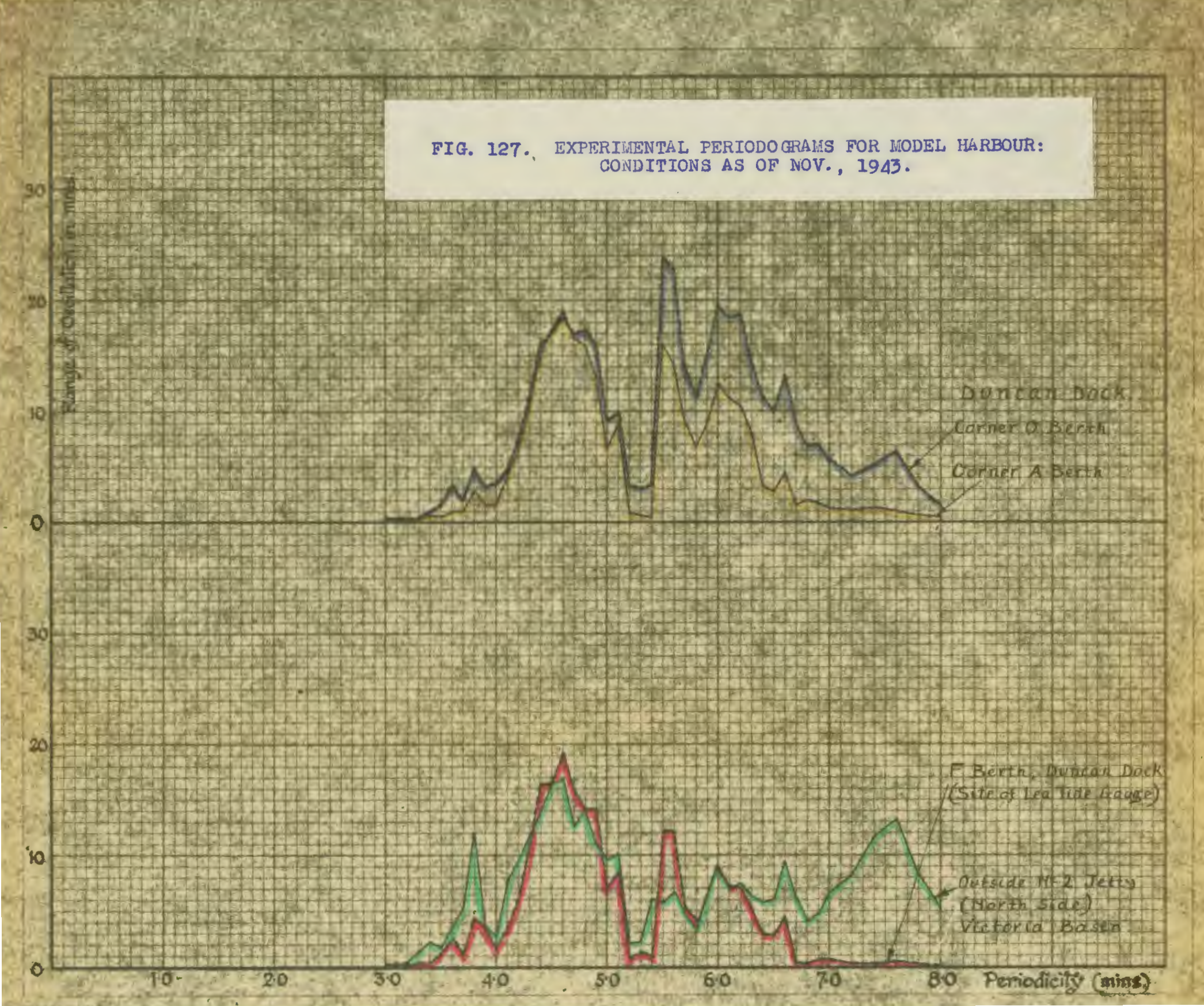
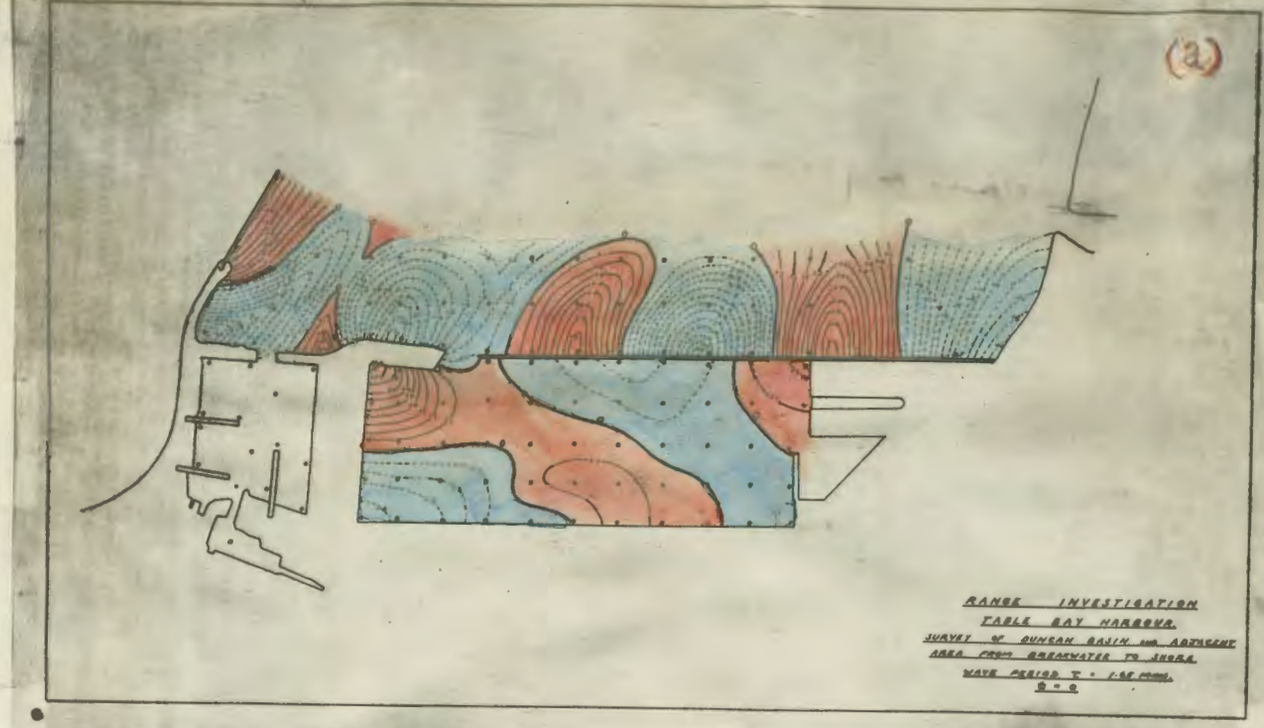
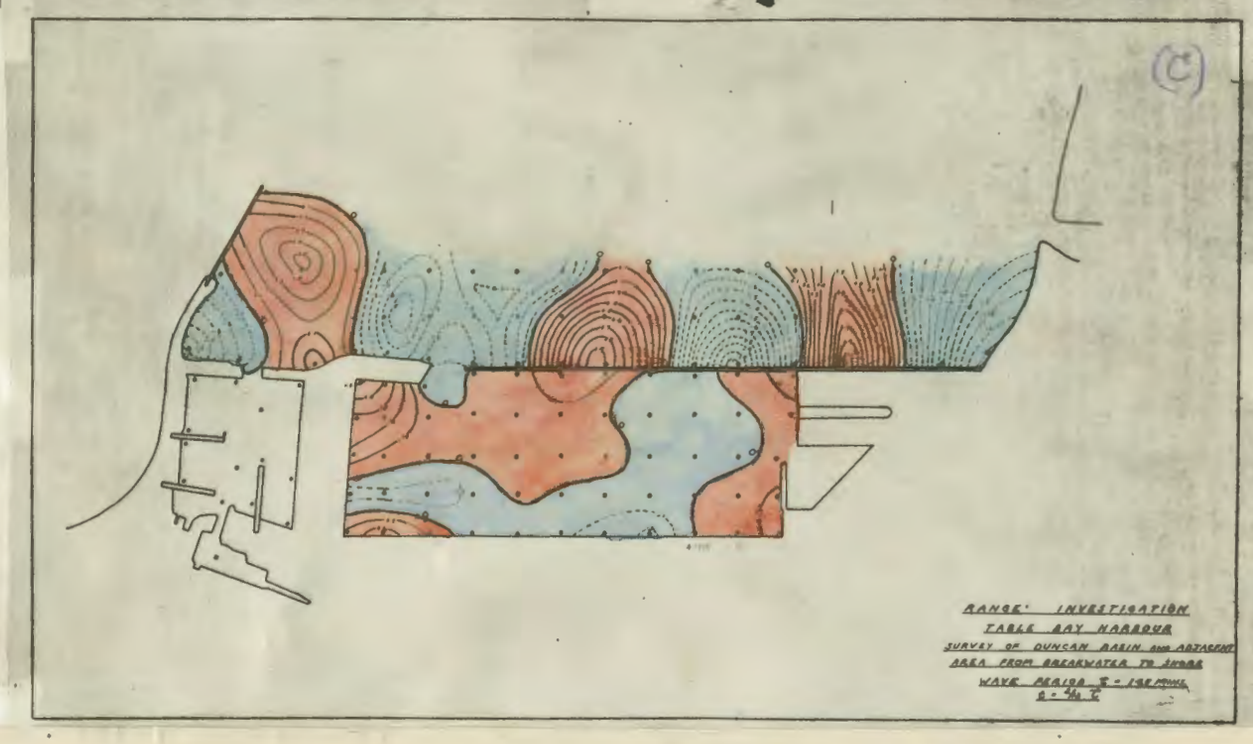
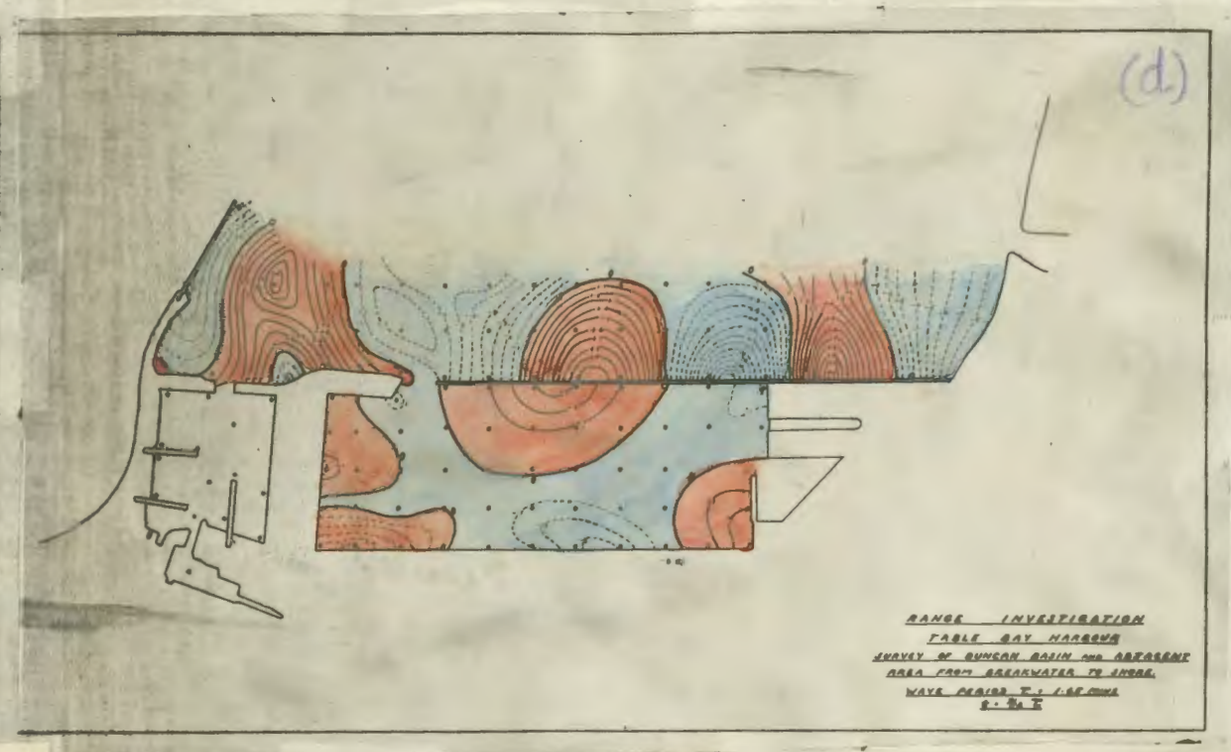


FIG. 127. EXPERIMENTAL PERIODOGRAMS FOR MODEL HARBOUR: CONDITIONS AS OF NOV., 1943.









FIGS. 128 (a) to (f). SURFACE FEATURES OF THE 1.65 MINUTE CRITICAL OSCILLATION IN MODEL DUNCAN BASIN.

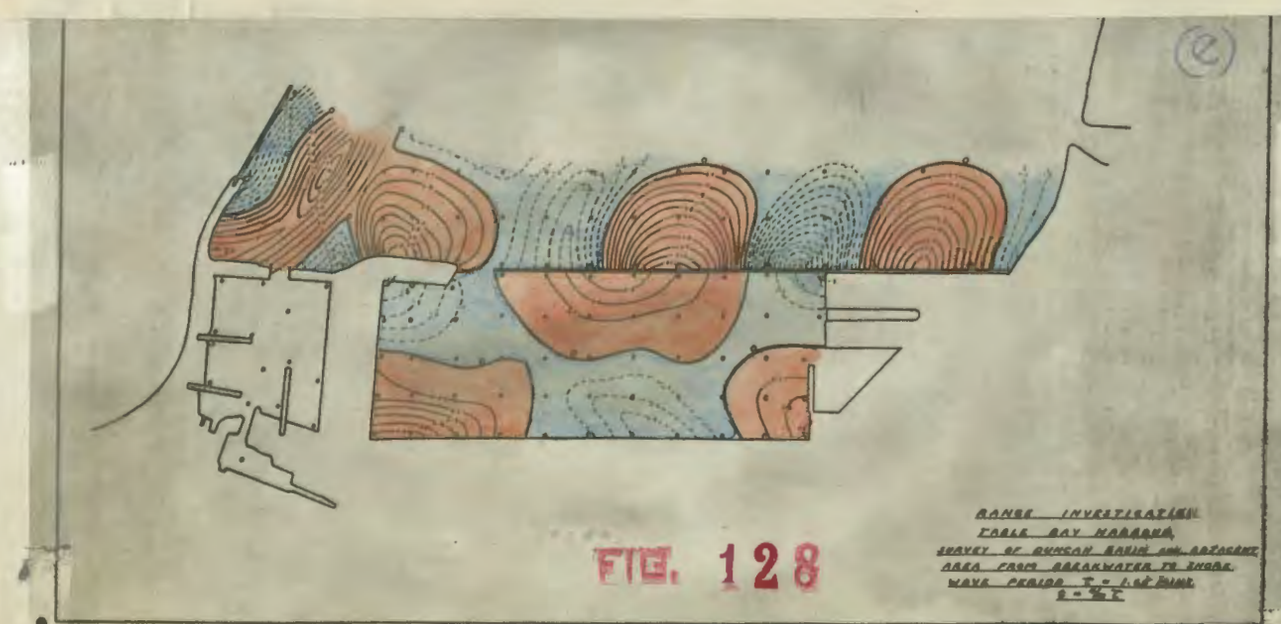


FIG. 128

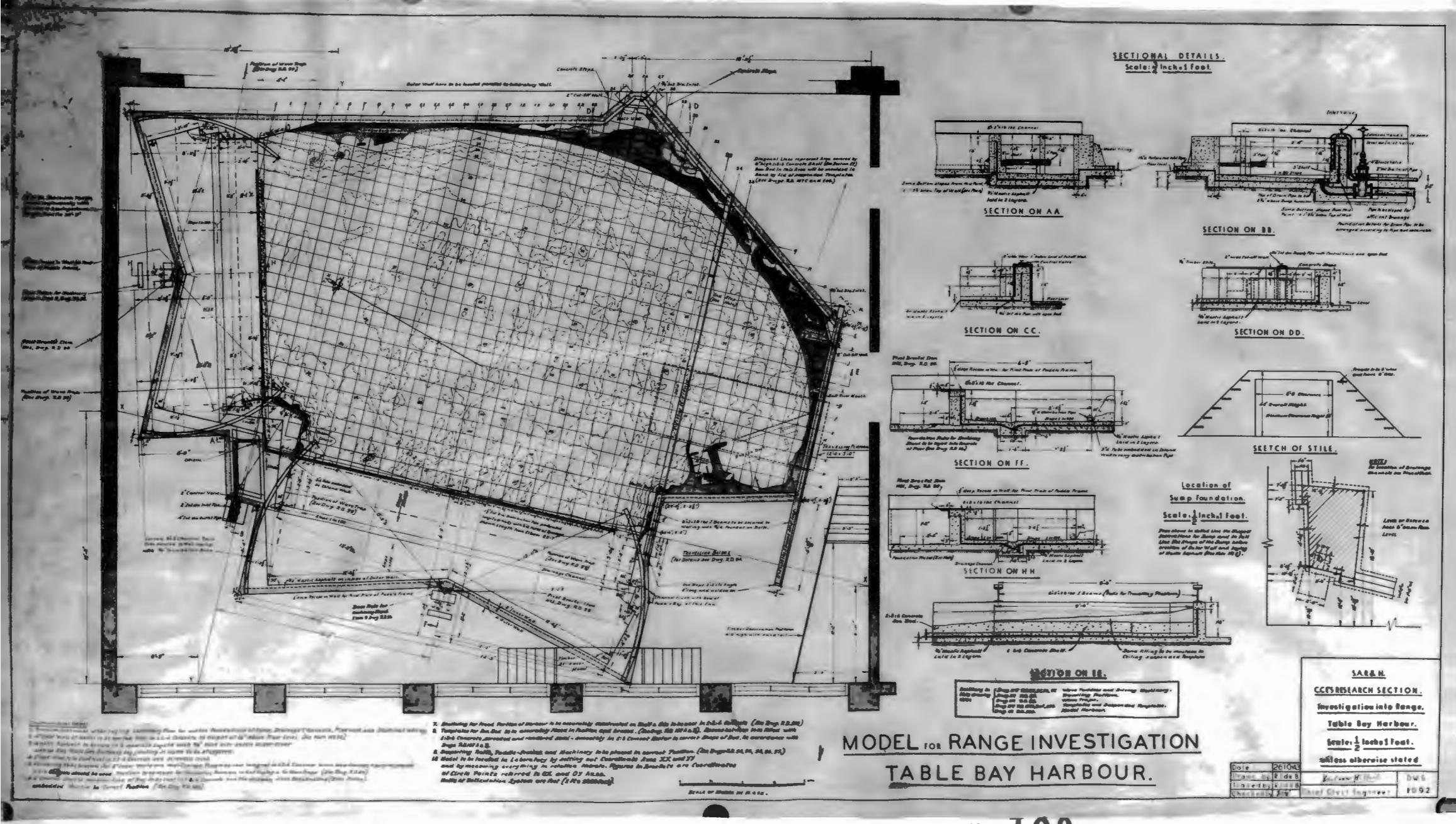
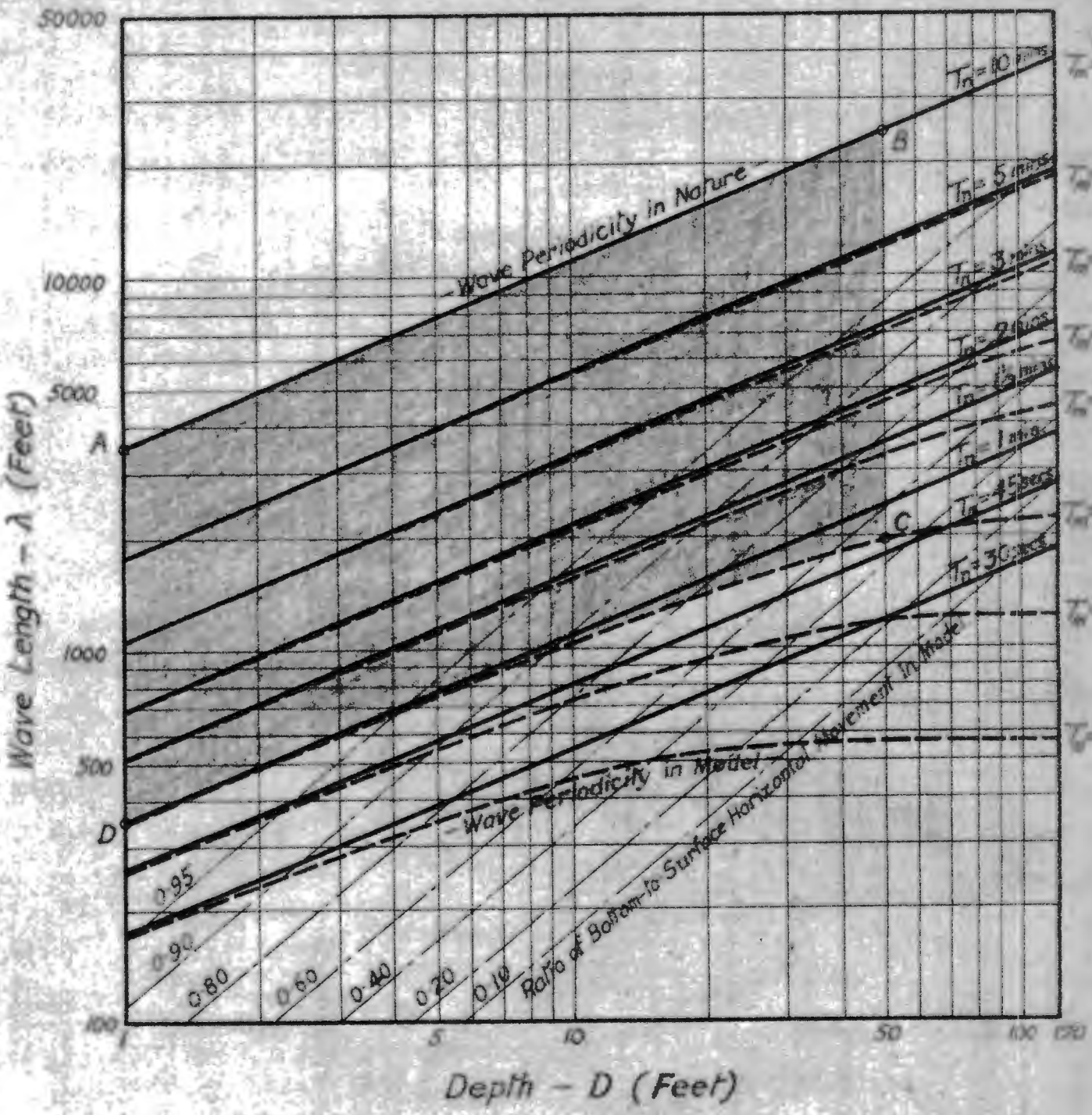

SECTIONAL DETAILS.
Scale: ½ Inch=1 Foot.
SECTION ON AA
SECTION ON BB.
SECTION ON CC.
SECTION ON DD.
SECTION ON FF.
SKETCH OF STILE.
SECTION ON HH
Location of Sump Foundation.
Scale: ½ Inch=1 Foot.
SECTION ON EE.
MODEL FOR RANGE INVESTIGATION
TABLE BAY HARBOUR.
S.A.R.& H.
C.C.F.S. RESEARCH SECTION.
Investigation into Range.
Table Bay Harbour.
Scale: ½ Inch=1 Foot.
unless otherwise stated
Date 26.10.43
Drawn by R de B
Traced by R de B
Checked by J.W.
Chief Civil Engineer
DWG 1092

FIG. 129



Distortion of Time in Range-Action Model
of Table Bay Harbour;
Cape Town.
Fig. 130

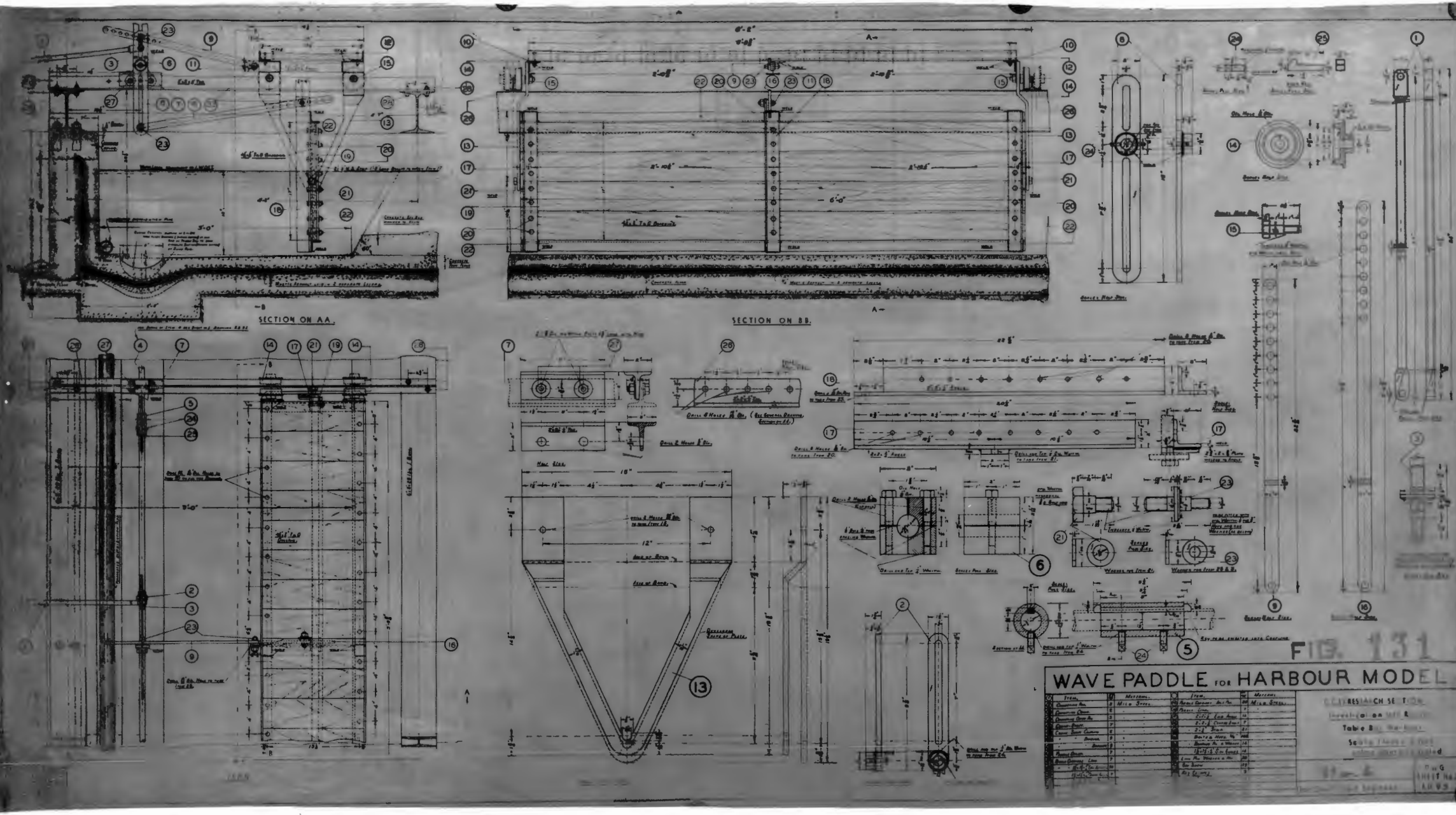

SECTION ON AA.
SECTION ON BB.
FIG. 131
WAVE PADDLE FOR HARBOUR MODEL

FIG. 132. VIEW OF MODEL SHOWING THE WEST-CHANNEL PADDLE IN FOREGROUND.

FIG. 132

FIG. 133. VIEW OF MODEL AS FROM POINT NEAR ROBBEN ISLAND SHOWING WEST-CHANNEL PADDLE.

FIG. 134. VIEW OF NORTH-CHANNEL PADDLE AS FROM POINT NEAR ROBBEN ISLAND.

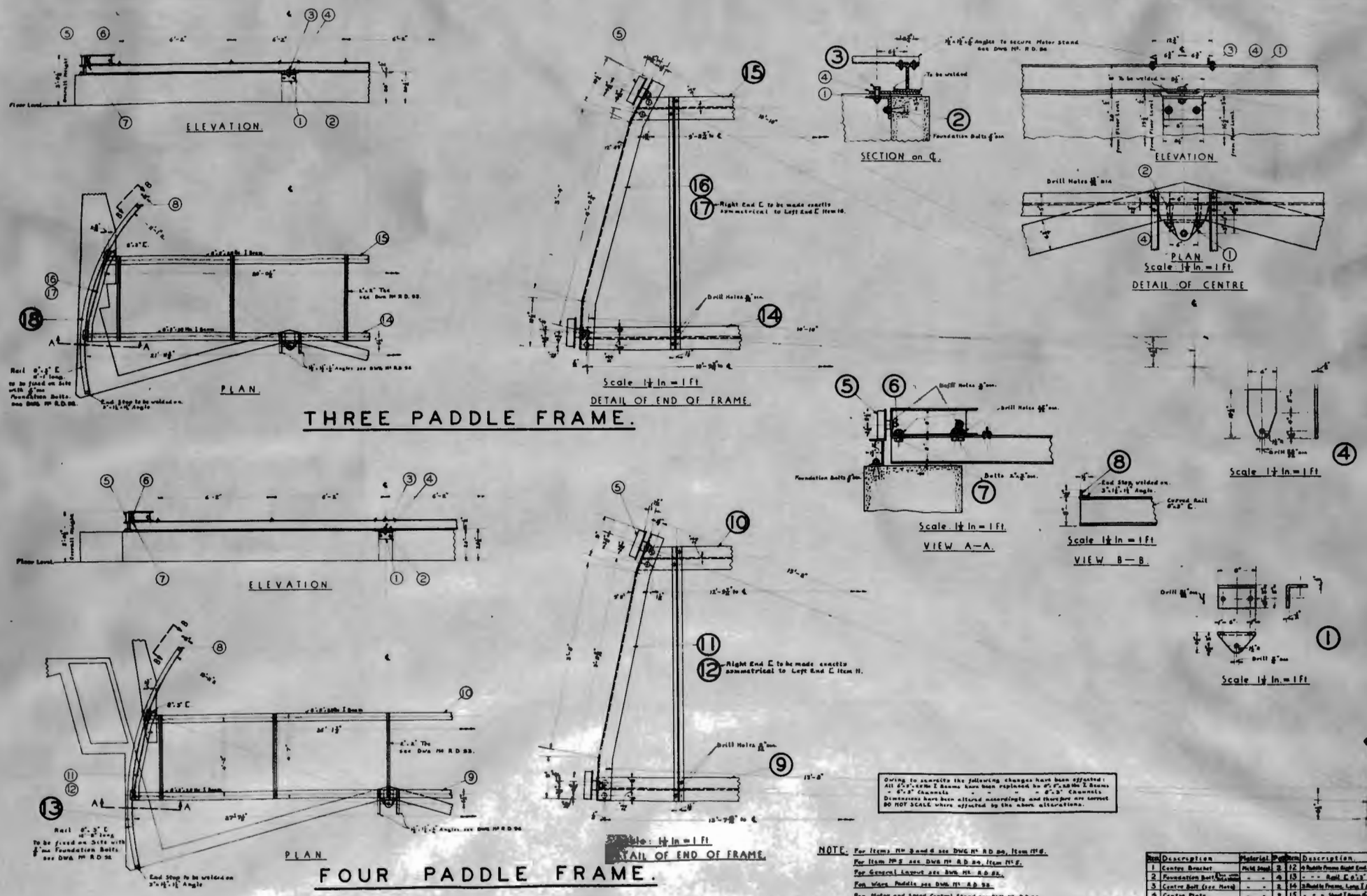


FIG. 135

PADDLE FRAMES FOR HARBOUR MODEL.

NOTE: For Items Nos 9 and 11 see DWG No RD 94, Item No 16.
For Item No 5 see DWG No RD 94, Item No 6.
For General Layout see DWG No RD 85.
For Wave Paddle see DWG No RD 93.
For Motor and Speed Control Stand see DWG No RD 96

Owing to necessity the following changes have been effected:
All 6'-0"-norm I Beams have been replaced by 6'-0"-50 lbs I Beams
" 6'-0" Channels " " " 8'-0" Channels
Dimensions have been altered accordingly and therefore are correct
DO NOT SCALE where effected by the above alterations.

Item	Description	Material	No	Item	Description	Material	No
1	Centre Bracket	Mild Steel	2	12	4 Paddle Frame Right End C of L	Mild Steel	1
2	Foundation Bolt 6" diam with Nut & Washer	- -	4	13	- - - Rail C of L	- -	1
3	Centre Bolt (See Note)	- -	2	14	2 Paddle Frame Long I Beam	- -	1
4	Centre Plate	- -	2	15	- - - Short I Beam	- -	1
5	Wheel (See Note)	Cast Steel	8	16	- - - Left End C of L	- -	1
6	Wheel Bolt (see Note)	Mild Steel	8	17	- - - Right End C of L	- -	1
7	Frame Bolt Rotameter Bolt	- -	16	18	- - - Rail C of L	- -	1
8	End Stop	- -	6				
9	4 Paddle Frame Long I Beam	- -	1				
10	- - - Short I Beam	- -	1				
11	- - - Left End C of L	- -	1				

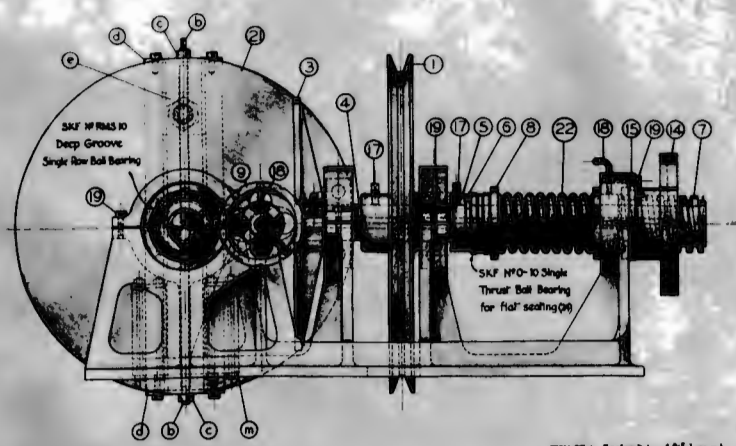
S A R & H
C C E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour.

Date 24/9/45
Drawn by WEQJ
Traced by WEQJ
Checked by [illegible]

SCALE ½ In = 1 Ft
unless otherwise stated

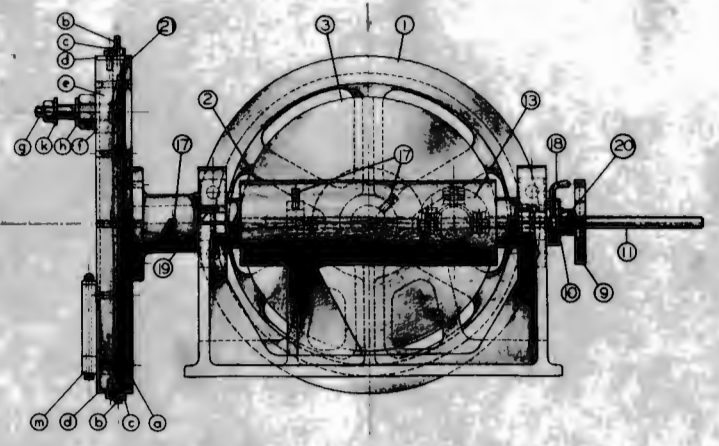
[illegible] Chief Civil Engineer

DWG No RD 95

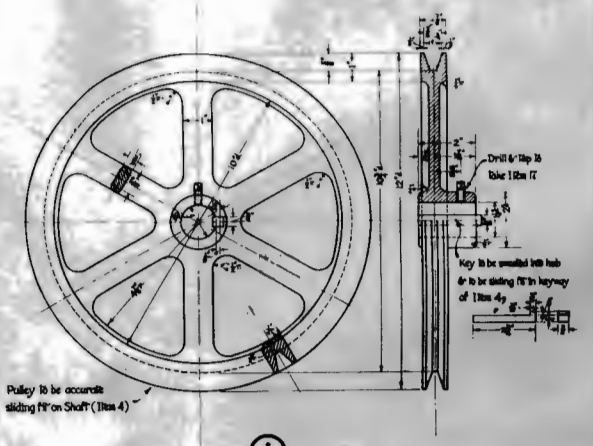


—ELEVATION—

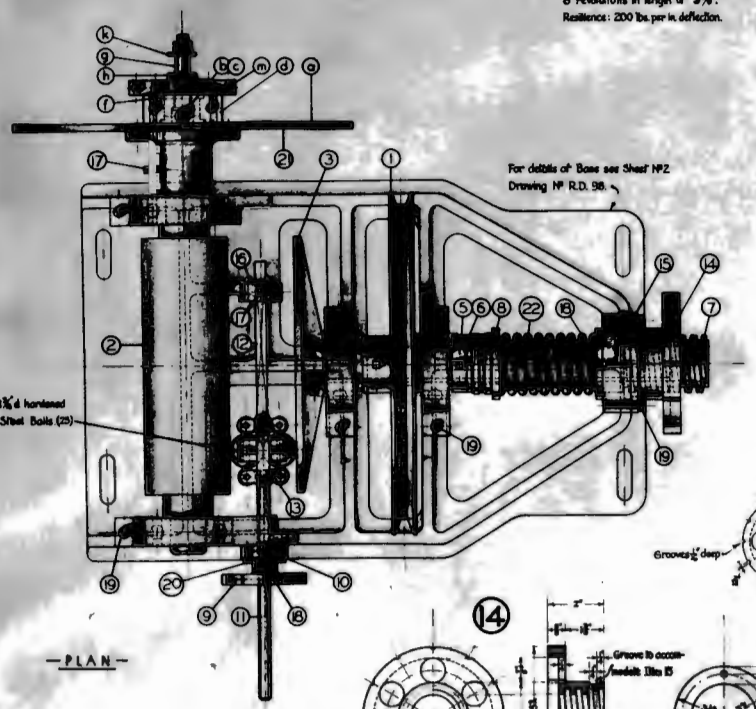
ITEM 22: Spring to be of 3/16" d. round coiled to inside diam. of 1 7/16" with 8 revolutions in length of 3 3/8". Resilience: 200 lbs. per in. deflection.



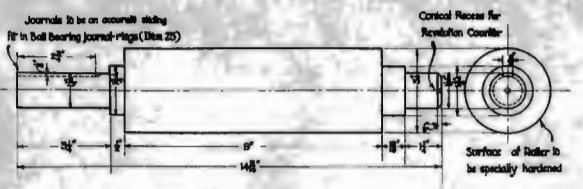
—END VIEW—



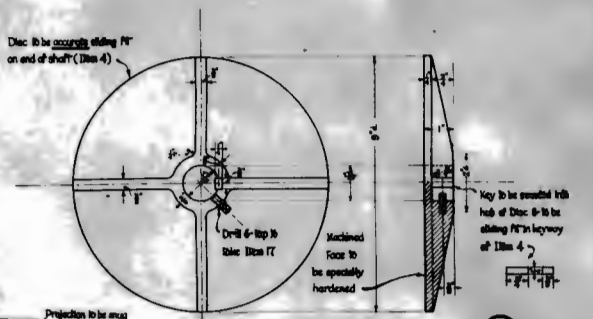
①



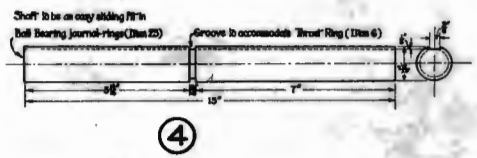
—PLAN—



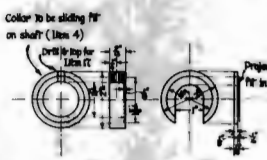
②



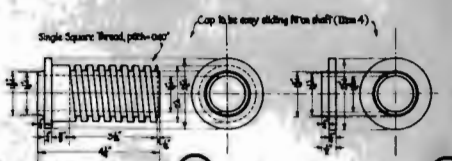
③



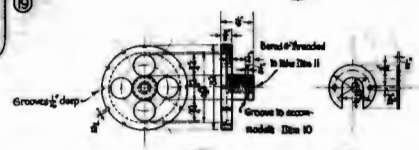
④



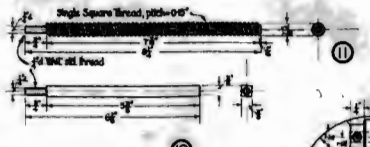
⑤ ⑥



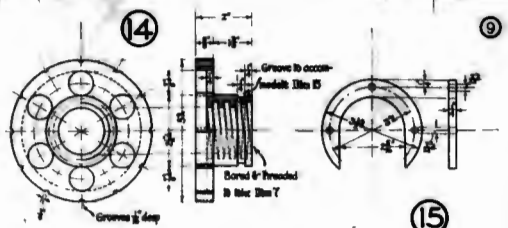
⑦ ⑧



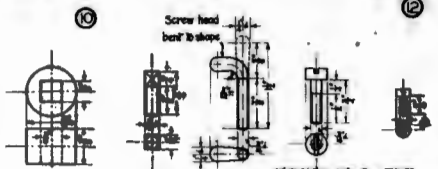
⑨ ⑩



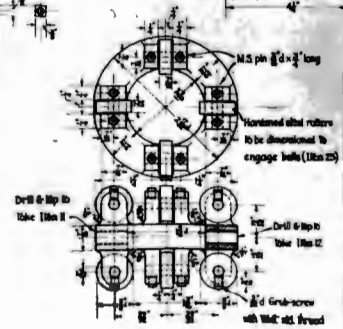
⑪ ⑫



⑭ ⑮



⑯ ⑰ ⑱ ⑲ ⑳



⑬ SCALE: FULL SIZE

—SCALES: FULL SIZE—

PARTS FOR ONE COMPLETE MACHINE

Item	Description	Material	N°off	Item	Description	Material	N°off
1	Pulley Wheel	Cast Steel	1	15	Thrust Plate	Mild Steel	1
2	Roller	Axle Steel	1	16	Bush	Brass	1
3	Disc	Cast Steel	1	17	Set Screw	Mild Steel	5
4	Disc Shaft	Mild Steel	1	18	Locking Screw	" "	2
5	Collar	" "	1	19	Cheese-head Screw	" "	7
6	Thrust Ring	" "	1	20	" " "	" "	2
7	Compressor Cap	" "	1	21	Adjustable Eccentric	See Dwg. R.D.98	1
8	Spring Cap	" "	1	22	Compression Spring	Spring Steel	1
9	Hand Wheel	" "	1	23	Ball Bearing	SKF N° RMS 10	4
10	Thrust Plate	" "	1	24	Thrust Ball Bearing	SKF N° 0-10	1
11	Threaded Shaft	" "	1	25	1¾" diam. Ball	SKF Steel	2
12	Square Shaft	" "	1				
13	Ball Holder	" "	1				
14	Hand Wheel	" "	1				

SCALE: HALF SIZE unless otherwise stated

S.A.R. & H.
C.C.P.'S RESEARCH SECTION
Investigation into Range
Table Bay Harbour

Chief Civil Engineer

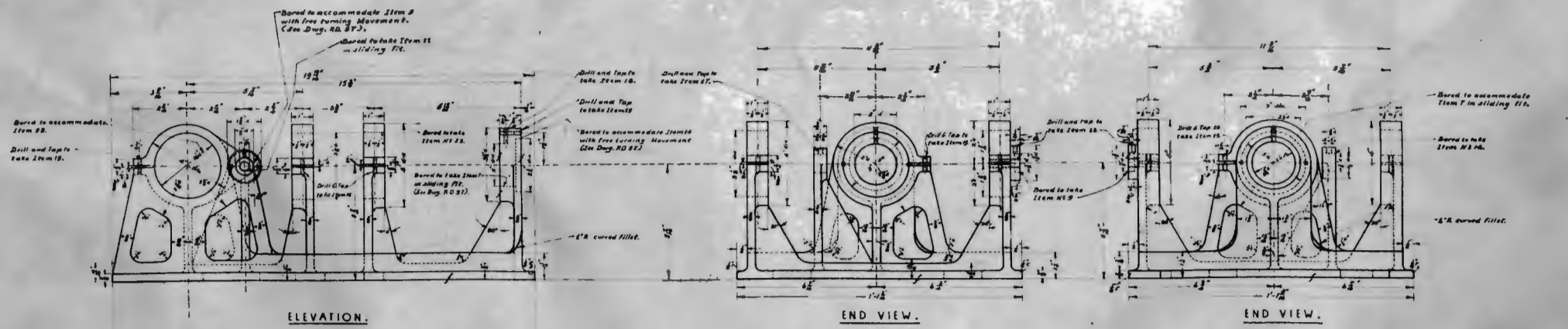
DWG. N° R.D. 97

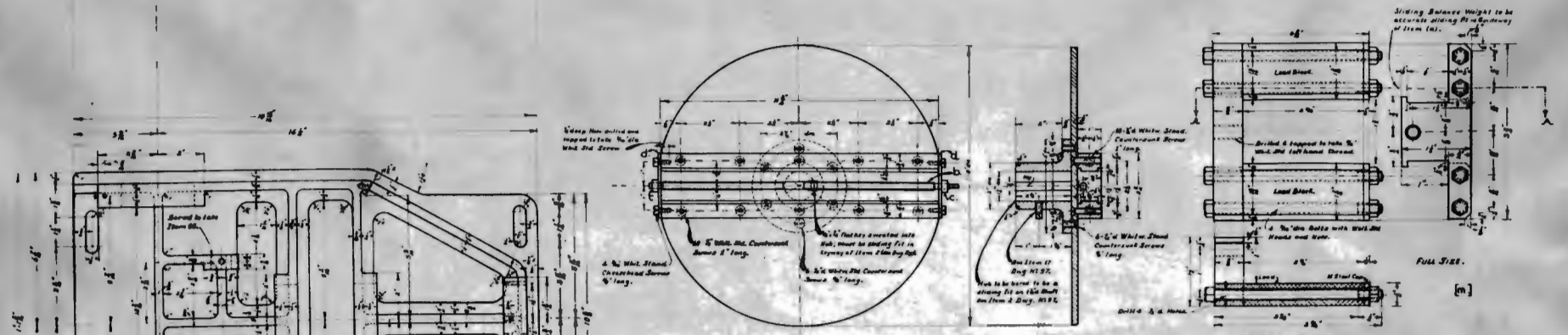
Date	4/9/58
Drawn by	J.R.S.
Traced by	J.R.S.
Checked by	M.G.S.

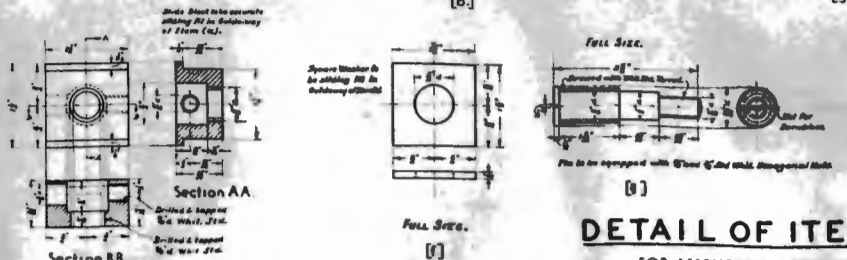
-GENERAL · ASSEMBLY-

FIG. 136(a)

ADJUSTABLE · ECCENTRIC · & · SPEED · CONTROL · FOR · WAVE · PADDLE · (SHEET N° 1)







DETAIL OF BASE.

SCALE. HALF SIZE.
MATERIAL
CAST STEEL.

DETAIL OF ITEM 21.

FOR ASSEMBLY SEE SHEET No 1.
DWG RD 97.

PARTS FOR ONE COMPLETE MACHINE.

Item	Description	Material	Finish	Item	Description	Material	Finish
a	Flywheel	Mild Steel	1	h	Washer	Mild Steel	1
b	Spindle Screw	"	1	k	Washer	"	1
c	Collar	"	2	m	Balance Weight	"	1
d	End Plate	"	2				
e	Slide Block	"	1				
f	Spacer Washer	"	1				
g	Crank Pin	"	1				

SCALE HALF SIZE.
unless otherwise stated.

SAR&H.
CCE'S RESEARCH SECTION
Investigation into Range
Table Bay Harbour.

Sd. Leon Hill. C.
for Chief Civil Engineer
DWG. RD 98

Date	7.8.43
Drawn by	[illegible]
Traced by	R.J.S
Checked	[illegible]

FIG. 136(b)

ADJUSTABLE ECCENTRIC & SPEED CONTROL for WAVE PADDLE [illegible] SHEET No 2]

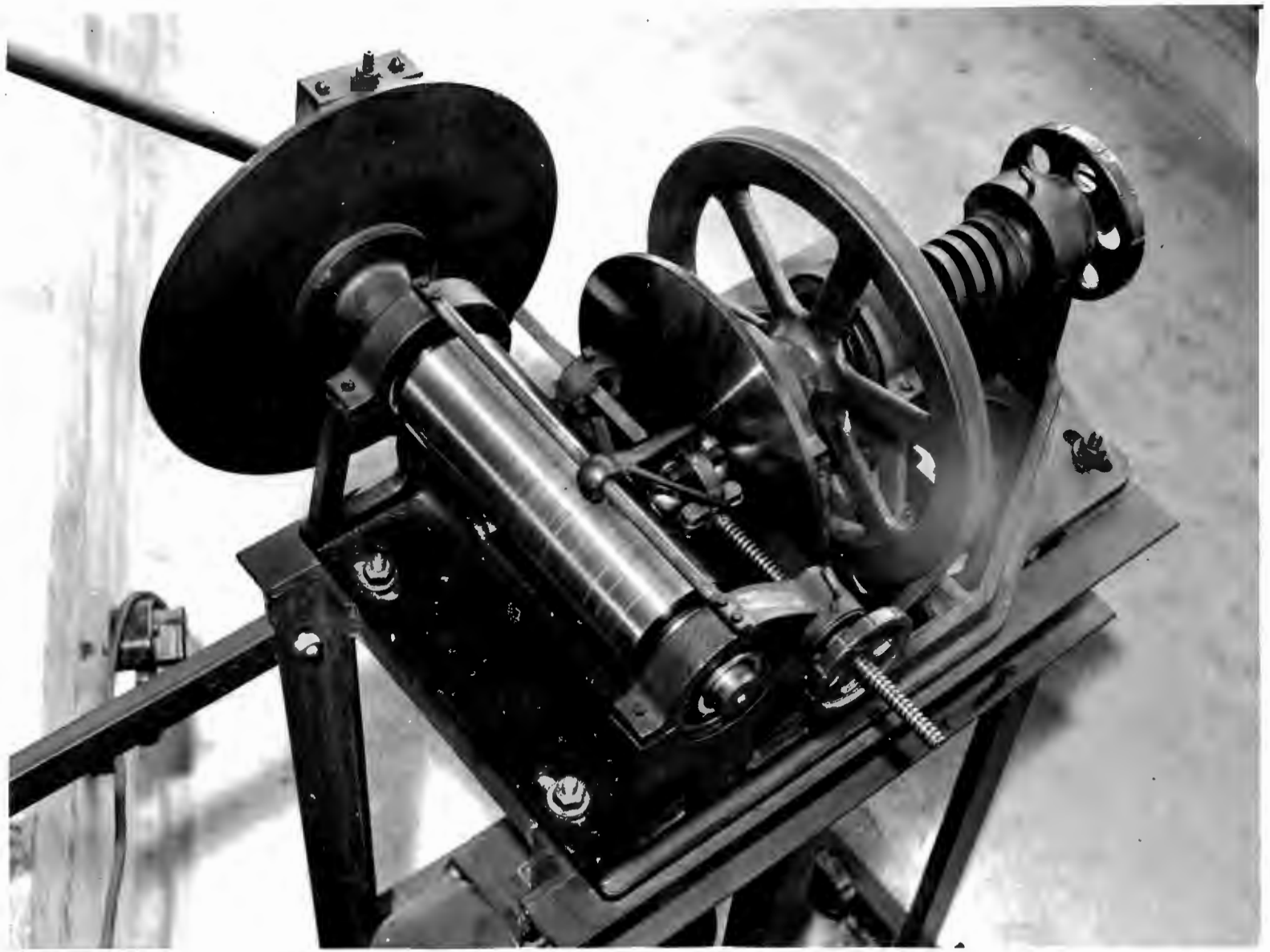


FIG. 137

FIG. 137. PHOTOGRAPH OF DISC, BALL AND ROLLER SPEED-CONTROL.

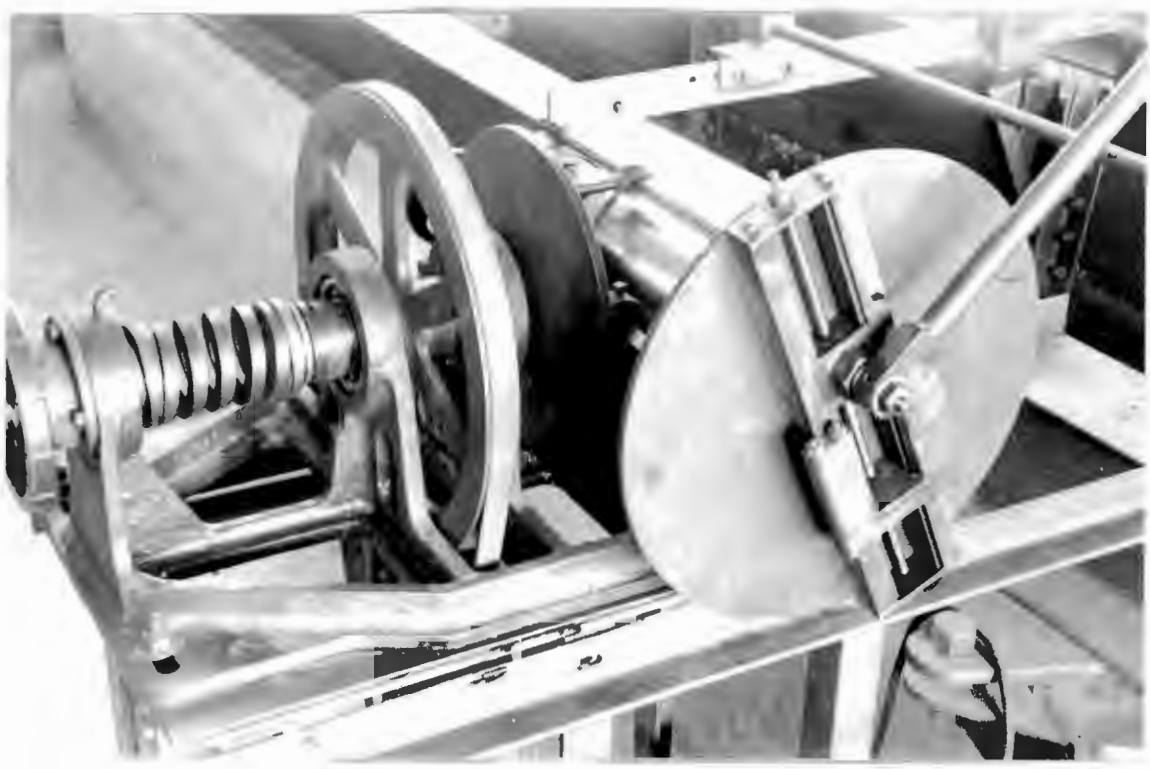
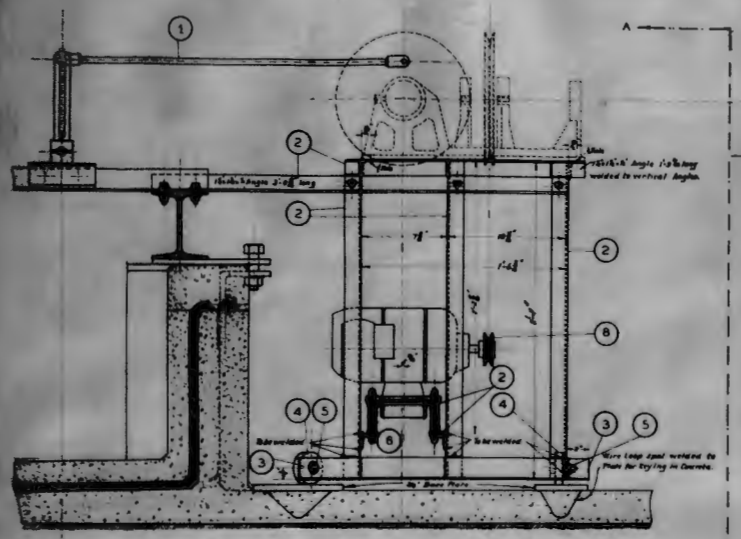
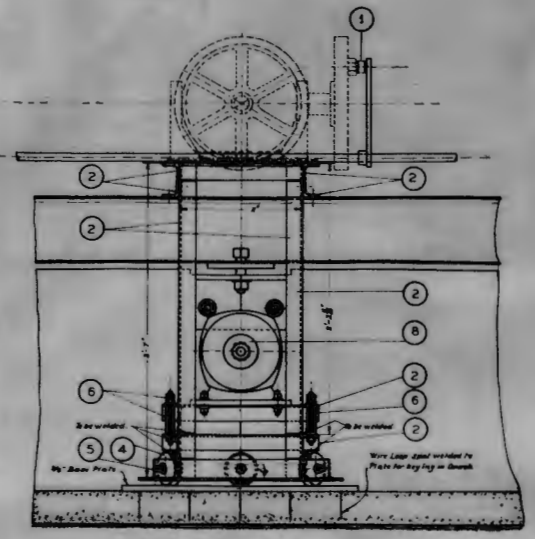
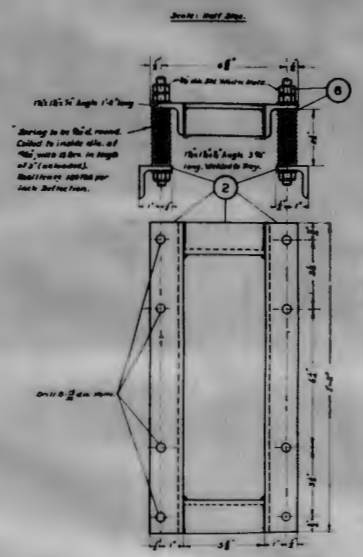
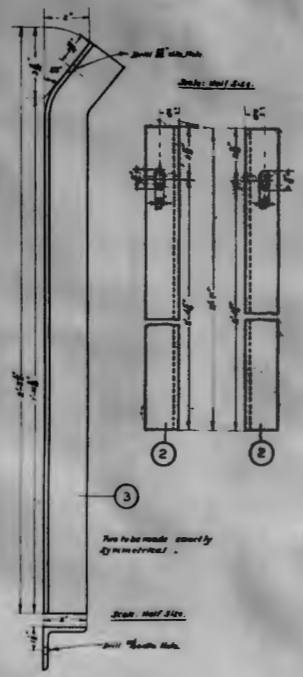


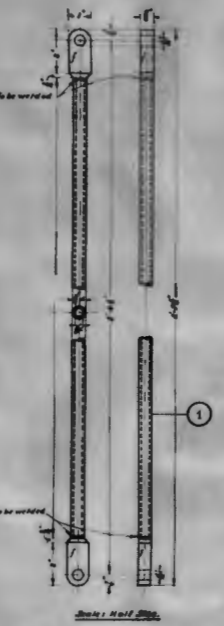
FIG. 138. VIEW OF SPEED CONTROL FROM THE ECCENTRIC SIDE.

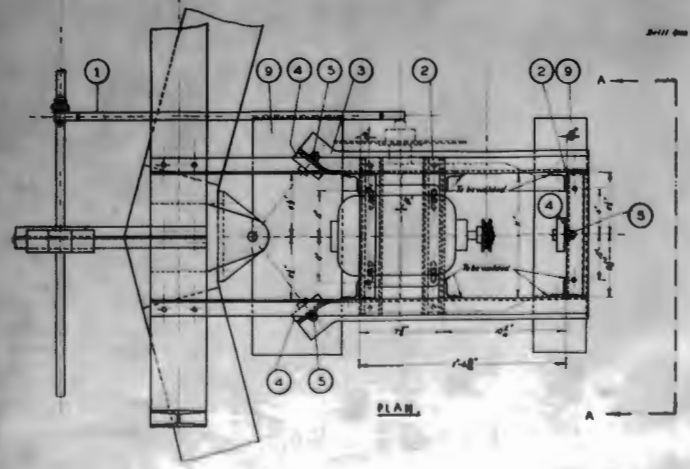


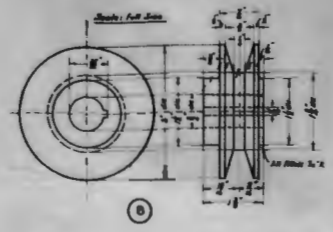


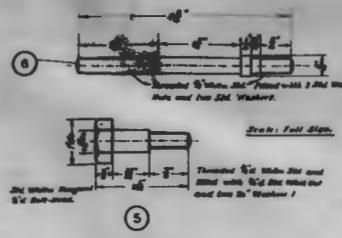


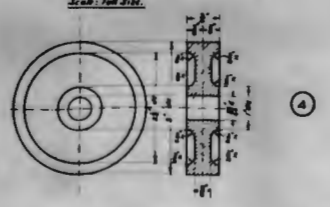












PARTS FOR ONE STAND ONLY.

Item	Description.	No. required.	Material.
1	Connecting Rod	1	Mild Steel.
2	4"x4"x½" Angle @ 2'-0½"	6	" "
	" " " 1'-0½"	6	" "
	" " " 0'-11"	6	" "
	" " " 2'-1"	6	" "
	" " " 1'-1"	6	" "
	" " " 2'-2½"	6	" "
3	3"x3"x½" Angle @ 2'-3½"	2	" "
	" " " 0'-11"	1	" "
4	Washer.	3	" "
5	Spring Pin, Nut and Washer.	2	" "
6	Spring Bolt, Nuts and Washers.	4	" "
7	½" White Jnc. Bolts with Nut and 4 Washers	14	" "
8	Motor Pulley	1	" "
9	½" Base Plates	14	" "
	1'-0"x0'-6"	1	" "
	1'-2"x0'-6"	1	" "

S.A.R.& H.

C.C.D. RESEARCH SECTION.

Investigation into Range of Tide in Table Bay Harbour

Scale: 5 inch = 1 foot, unless otherwise stated.

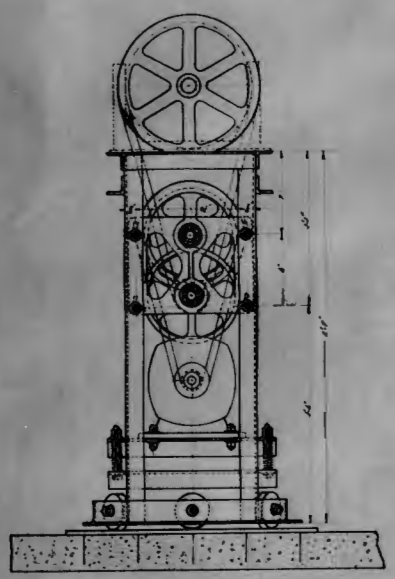
Date 5.10.43
Drawn by Tide B
Traced by Tide B
Checked [illegible]

Chief Civil Engineer

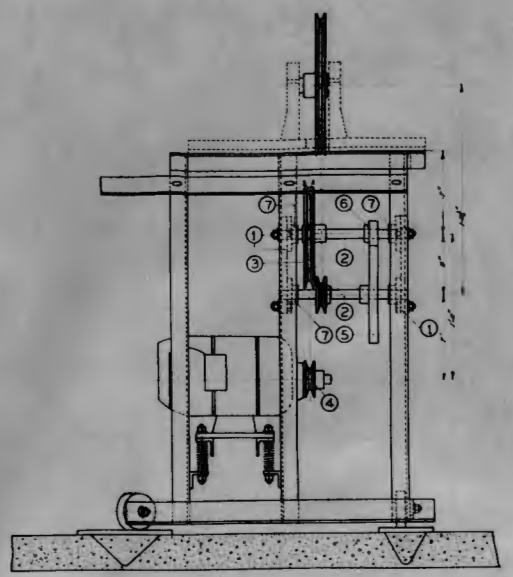
D.W.G. No. 94.

STAND FOR PADDLE DRIVING MECHANISM.

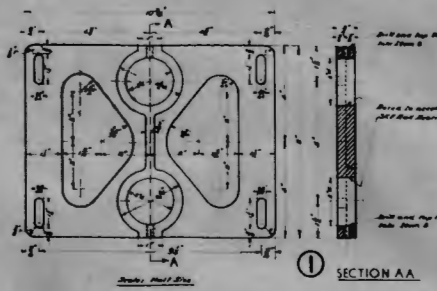
FIG. 139



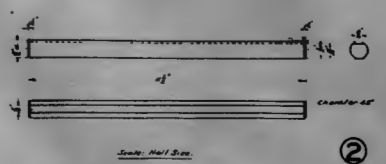
END ELEVATION



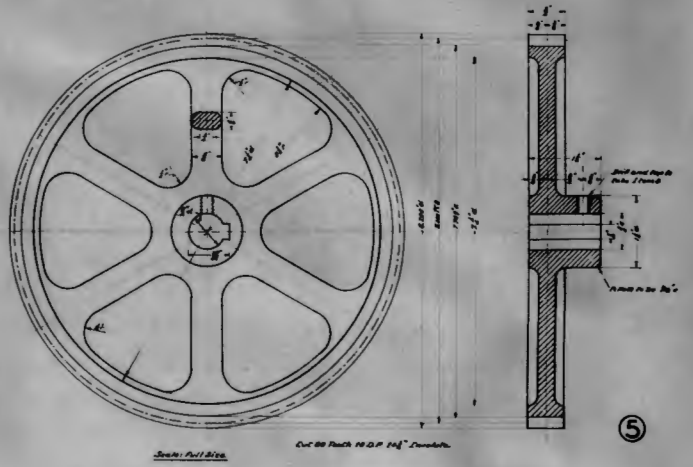
ELEVATION



① SECTION AA



②



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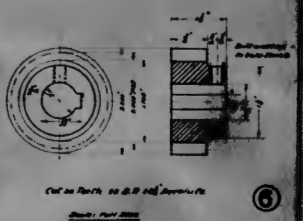
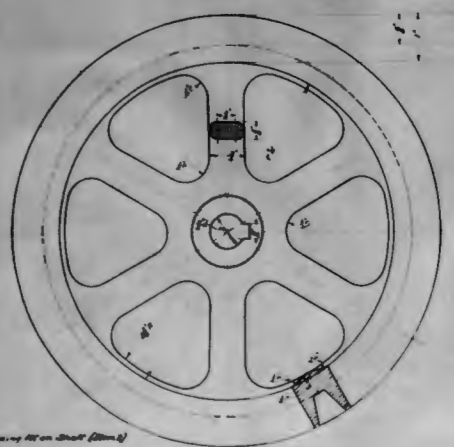
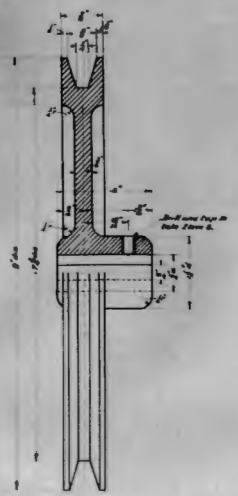
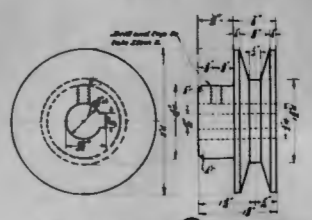


⑥

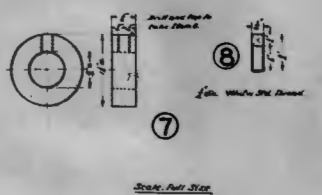




③



④



⑦

⑨

PARTS FOR ONE STAND.

No.	Description	Material	Qty	No.	Description	Material	Qty
1	Bearing Bracket	Cast Steel	2	9	Keys: 7/8" x 5/8" x 6"	M.S.	1
2	Shaft	M.S.	2		7/8" x 5/8" x 6"	-	1
3	Pulley Wheel	Cast Steel	1		1 3/4" x 1" x 6"	-	1
4	Pulley	- -	1		1 3/4" x 1" x 8"	-	1
5	Spur Wheel	- -	1				
6	Pinion	- -	1				
7	Collar	M.S.	2				
8	Set Screw	-	7				

FIG. 140

SPEED REDUCTION GEARING FOR WAVE MECHANISM.

Date	17.11.1944
Drawn by	E. de B.
Traced by	R. de B.
Checked by	H.S.T.

SCALE 3 INCH, 1 FOOT
unless otherwise stated

S.A.R. & H.
C.C.E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour
Chief Civil Engineer
DWG. P.D. 115

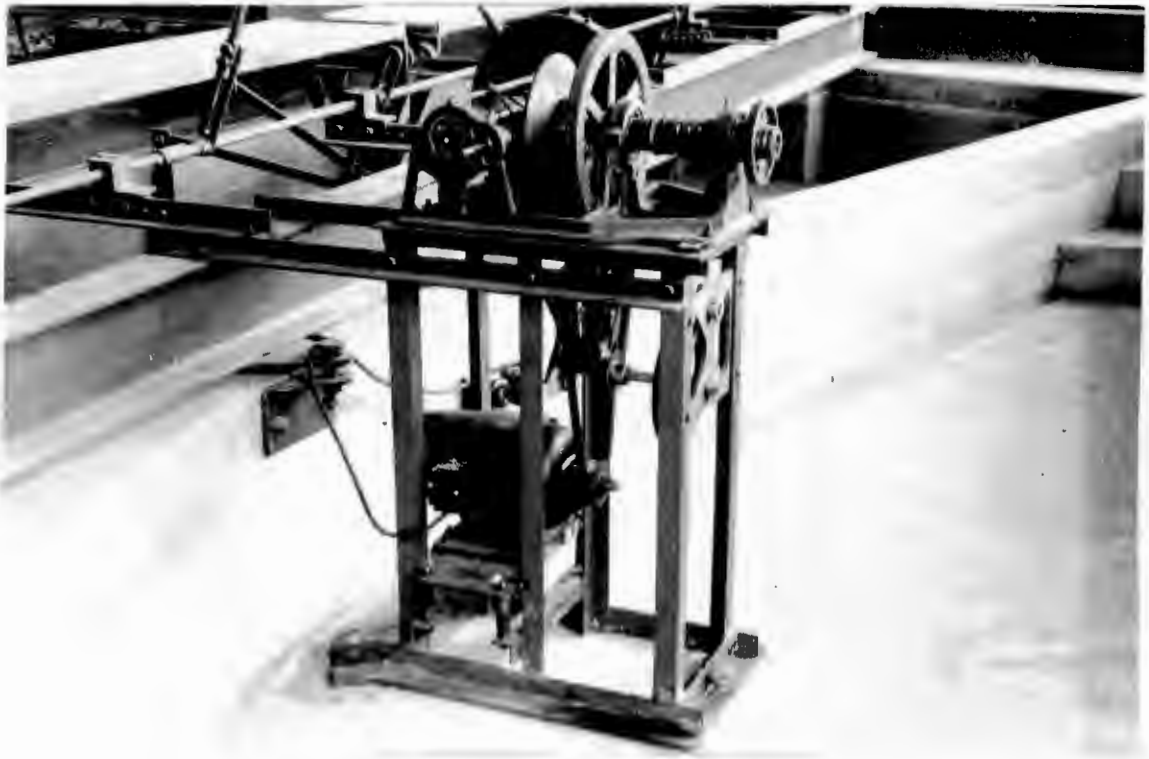


FIG. 141. PHOTOGRAPH OF PADDLE DRIVING MACHINERY.

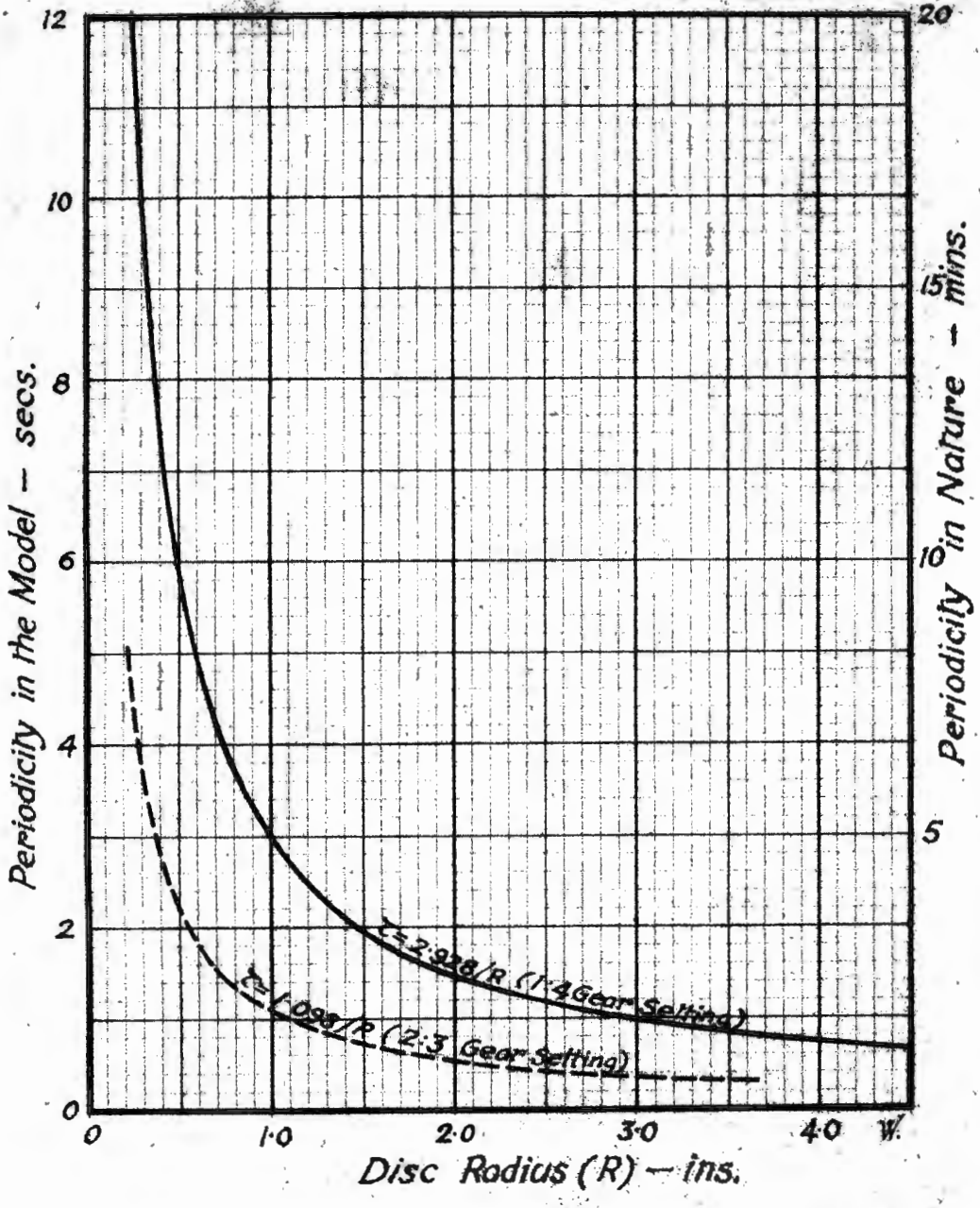
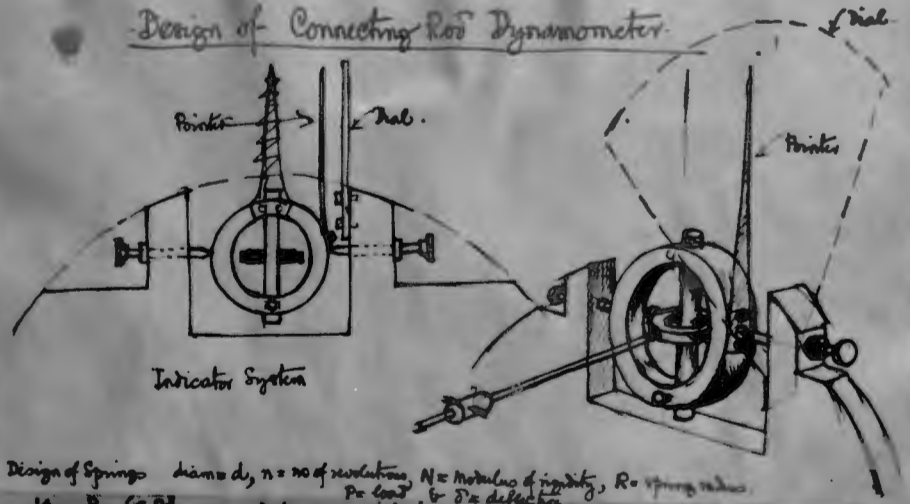


FIG. 142: RELATION BETWEEN PERIODICITY & DISC RADIUS ON SPEED-CONTROL MACHINE

24/9/45

Design of Connecting Rod Dynamometer

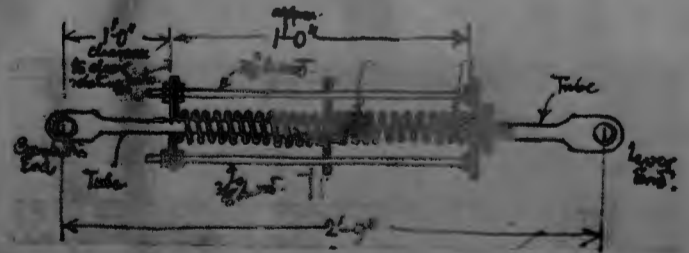


Design of Springs diam = d, n = no of revolutions, N = Modulus of rigidity, R = spring radius
P = load & δ = deflection

$d^4 = \frac{P}{\delta} \frac{64 R^3 n}{N}$ Make spring deflection $\frac{1}{8}$" at 20 lbs ∴ P/δ = 160 lb/in
" " about R = ¾" ∴ n = 15

$d^4 = \frac{160 \times 64 \times 15 \times 27}{12 \times 10^6 \times 64} = 0.0054$ ∴ d = 0.271"

Connecting Rod Dynamometer
for Wave Paddles

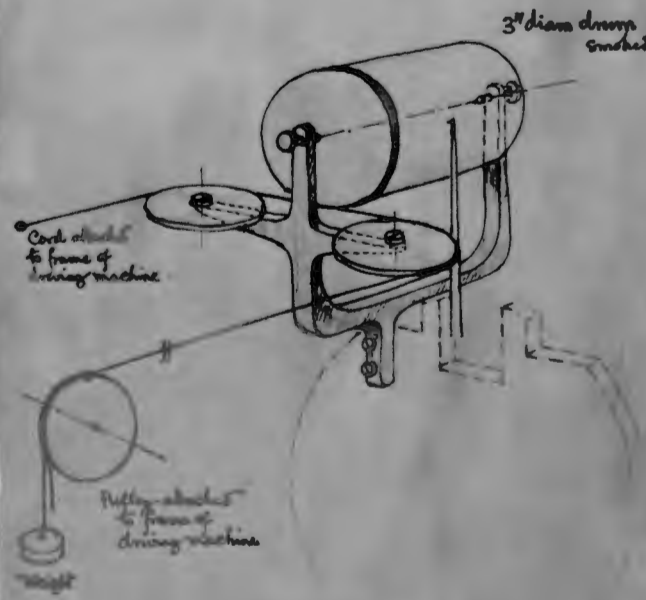


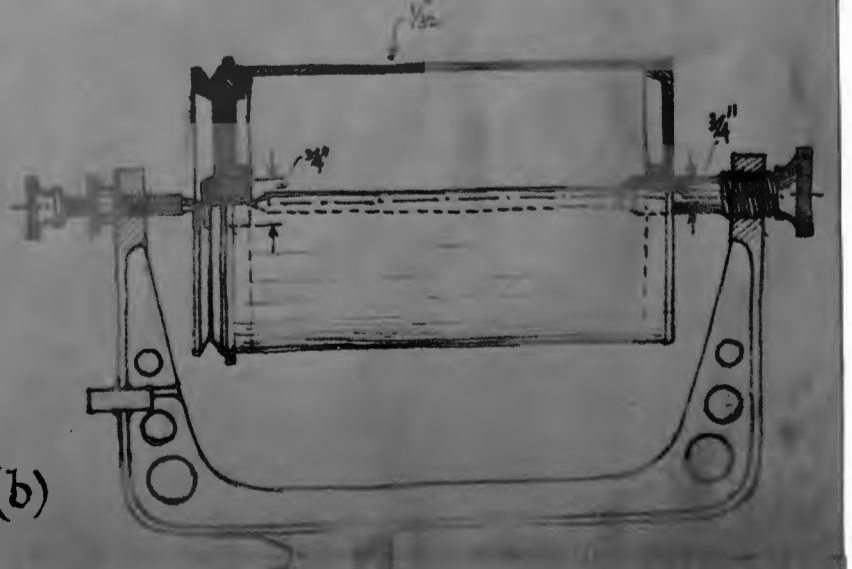
(a)

28/9/45

Automatic Recorder for Dynamometer Connecting Rod

(To be added later: perhaps make of Meccano parts)





(b)

FIGS. 143 (a) and (b). ROUGH DESIGNS FOR AUTOGRAPHIC DYNAMOMETER CONNECTING ROD.

FIG. 144. PHOTOGRAPH OF DYNAMOMETER.

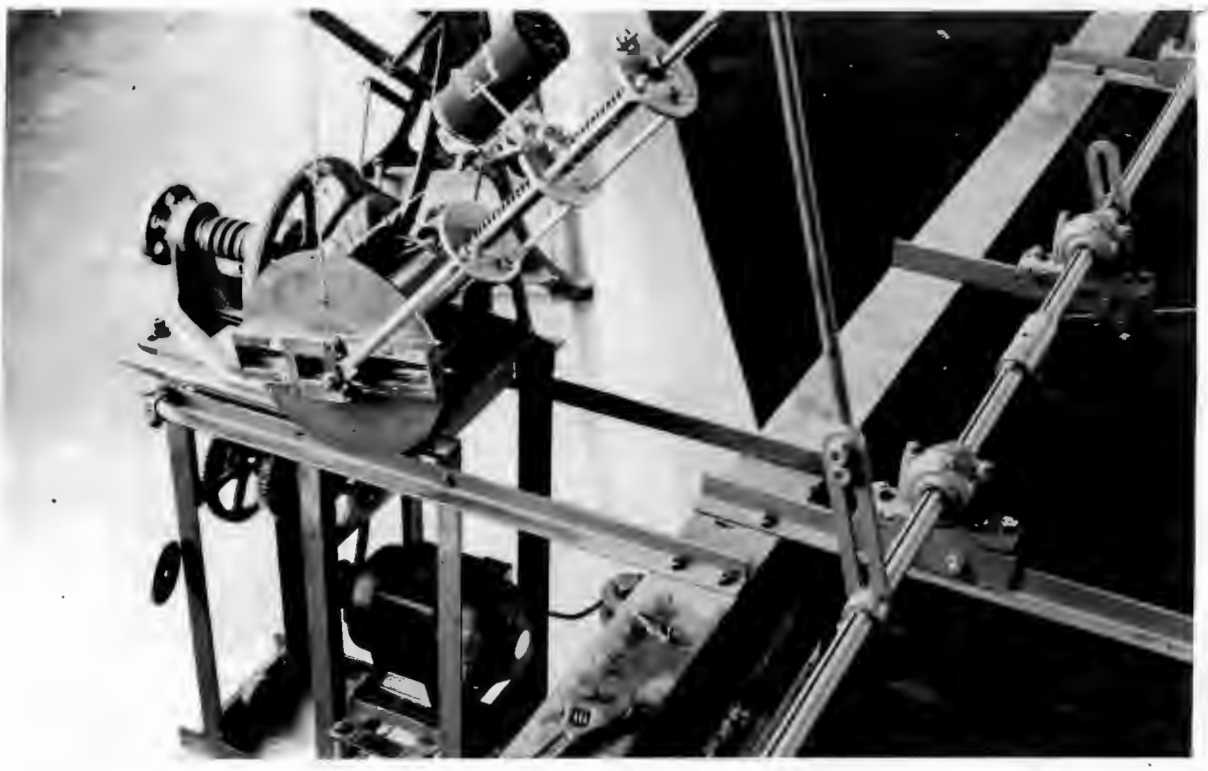
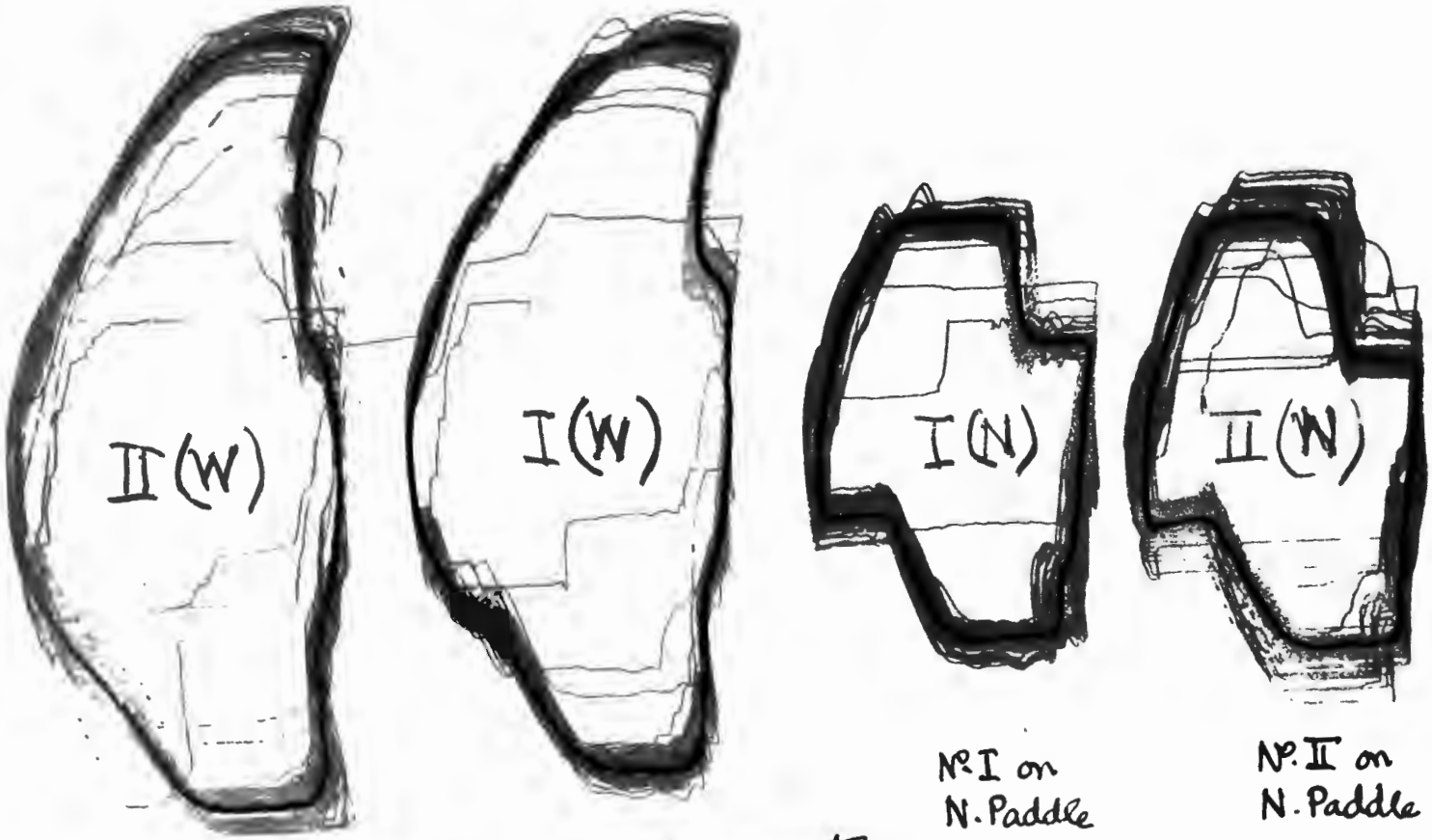


FIG. 145. PHOTOGRAPH OF DYNAMOMETER IN RELATION TO PADDLE DRIVING MACHINERY.

3rd CALIBRATION ADJUSTMENT OF CONNECTING-ROD DYNAMOMETERS



No II Dynamometer fitted to West Paddle

No I Dynamometer on W. Paddle

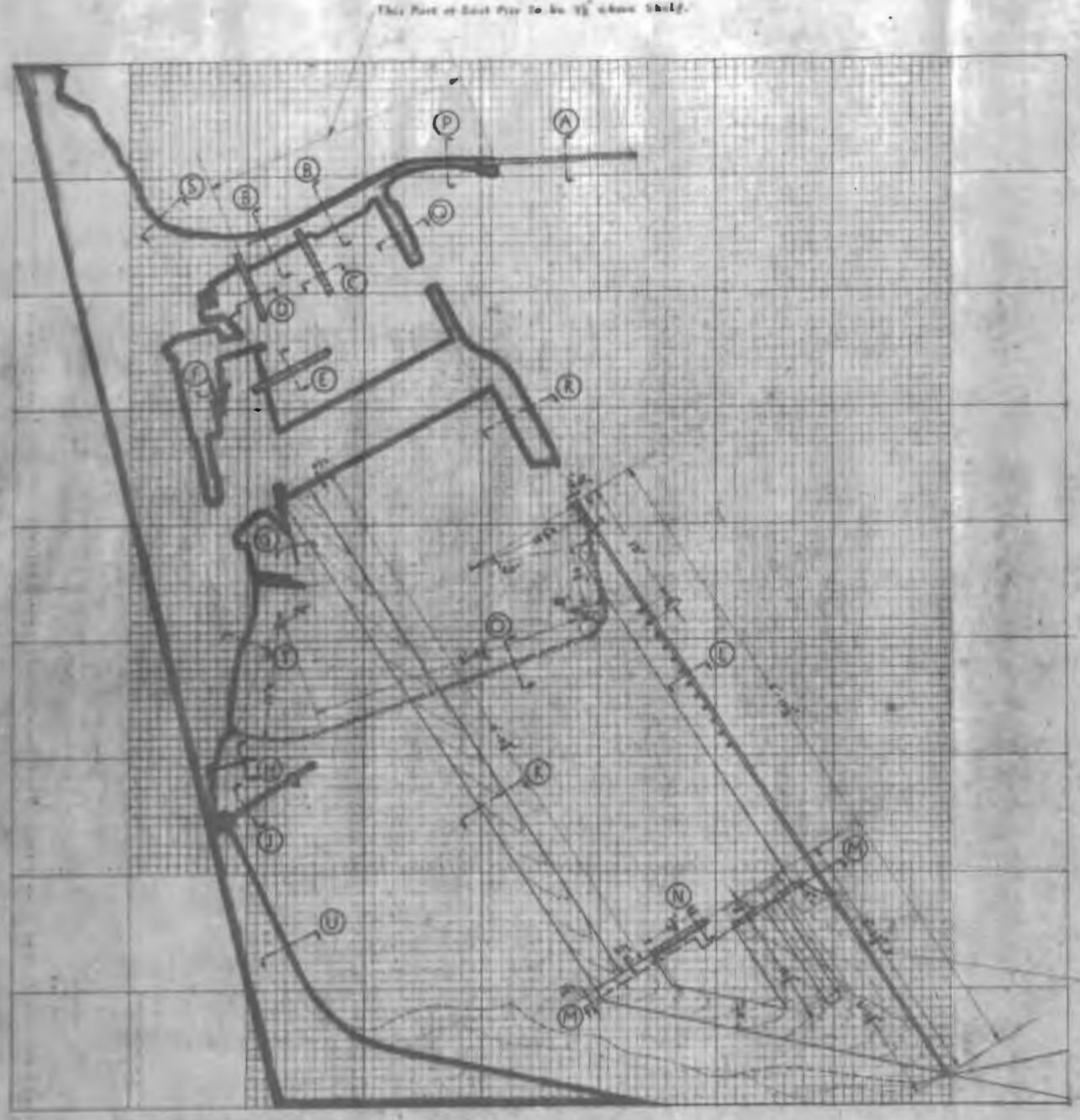
No I on N. Paddle

No II on N. Paddle

FIG. 146

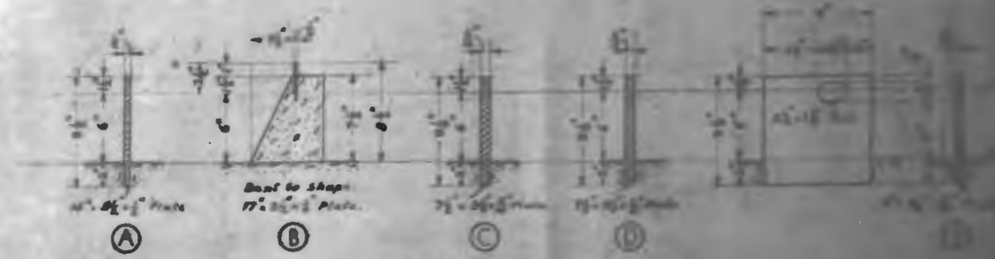
Date 25/1/4

Fig 147



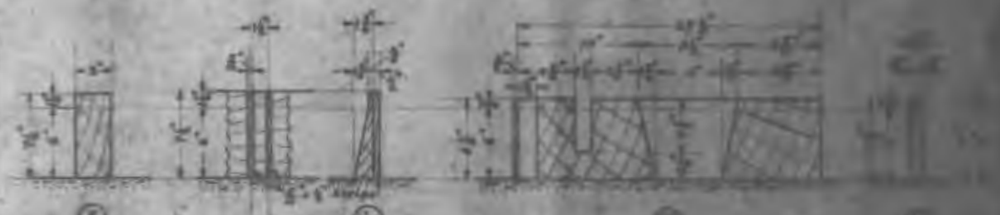
The Coordinate System in this Drawing is identical with the System used in the General Layout, DWG Nr. RD 66.

The Model Scales are : Horizontal 1/24, Vertical 1/24.



DETAILS OF STEEL

PLATE SECTION



DETAILS OF TIMBER SECTIONS

DETAILS OF CONCRETE SECTIONS

The Plane of this Part of the Backing Plate to be vertical.

Note: The shaded Portion is to be moulded in Concrete, 12" above Shelf, where the Height is to be 15' as shown on Sections.
All Walls not shown to be Vertical.
The Backing Plate is to be supported by the Steel Framework.
The Wooden Mats / Portion 'W' is to be made in one piece.
For all Timber Sections see "A" or "B" Sheet.
For General Layout, see Sheet Nr. RD 66.
The Steel and Timber Backing not to be painted until the same is in position and has been passed.
The Shuttering for the concrete Sections will be supplied and erected by the Contractor.

MODEL LAYOUT OF HARBOUR, QUAYS, BREAKWATERS ETC.

FIG. 147

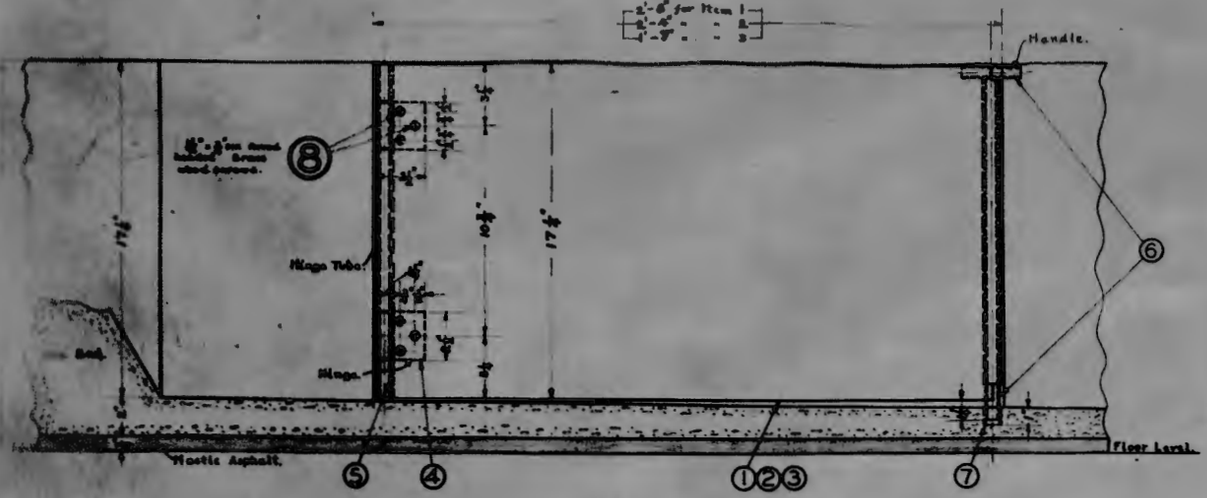
SCALE 1½ In = 1 ft	
Date	1945
Drawn by	W.R.T.
Traced by	W.R.T.
Checked by	R.E.

S. & R. C.E.'s Office
Investigation Dept.
Tank

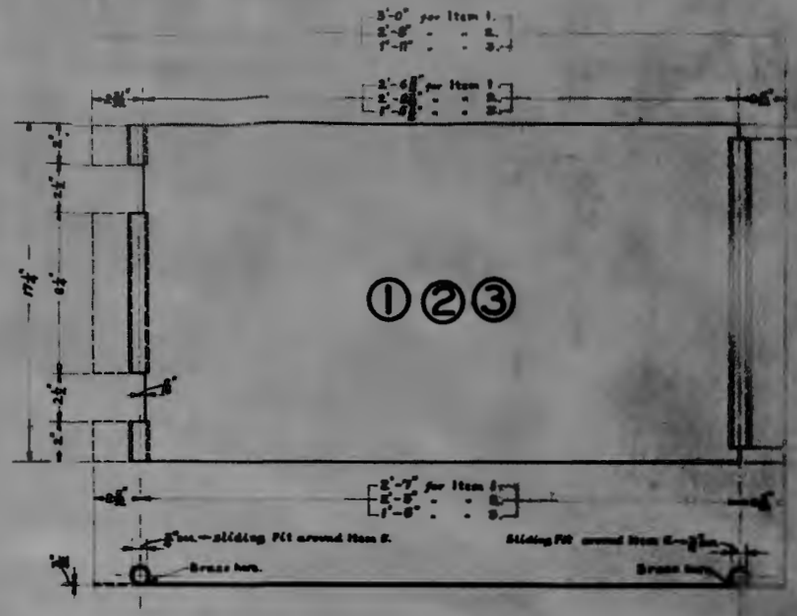
FIG. 148(a)

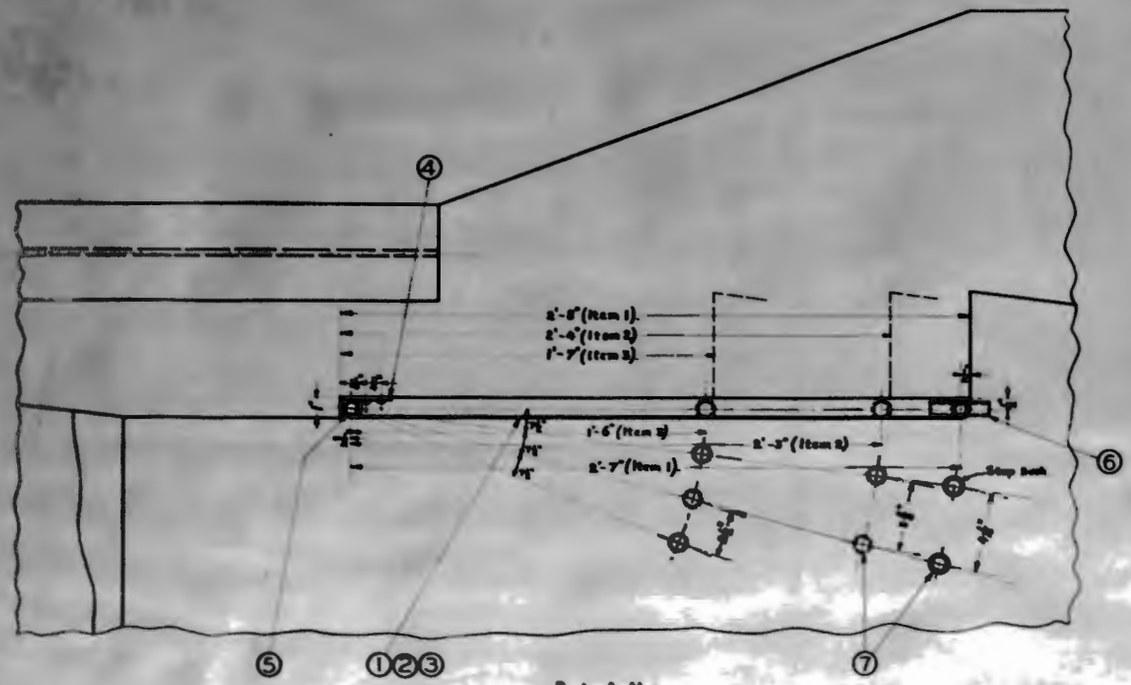
FIGS. 148 (a) and (b). PHOTOGRAPHS OF MODEL HARBOUR.

FIG. 148(b)

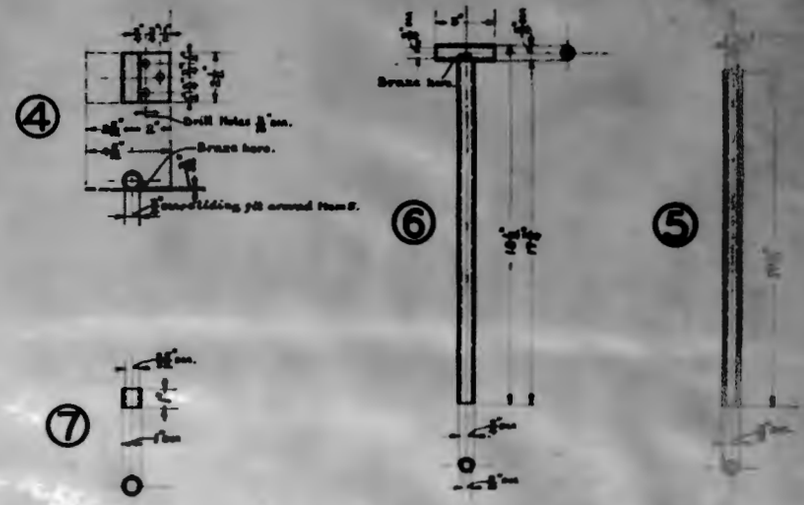


ELEVATION.





PLAN.



NOTE: For respective positions of Items 1,2 & 3 and general Layout see Dwgs. Nos. R.D.99.

Item	Description	Material	No.
1	Baffle Plate ¼" thick	Brass	2
2	" " " "	"	1
3	" " " "	"	1
4	Hinge	"	8
5	Hinge Tube ¼" internal dia.	"	4
6	Handle " " "	"	4
7	Stop Bush Tube ¾" internal dia.	"	13

Item	Description	Material	No.
8	Wood Screw, Round Head, Slotted	Brass	24

Date	30/9/43
Drawn by	WEQ J
Traced by	WEQ J
Checked by	[illegible]

SCALE : 3 in. = 1 ft.

S A R & H
C C E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour.
Chief Civil Engineer
DWG. No. RD 99

WAVE TRAPS FOR HARBOUR MODEL.

FIG. 149

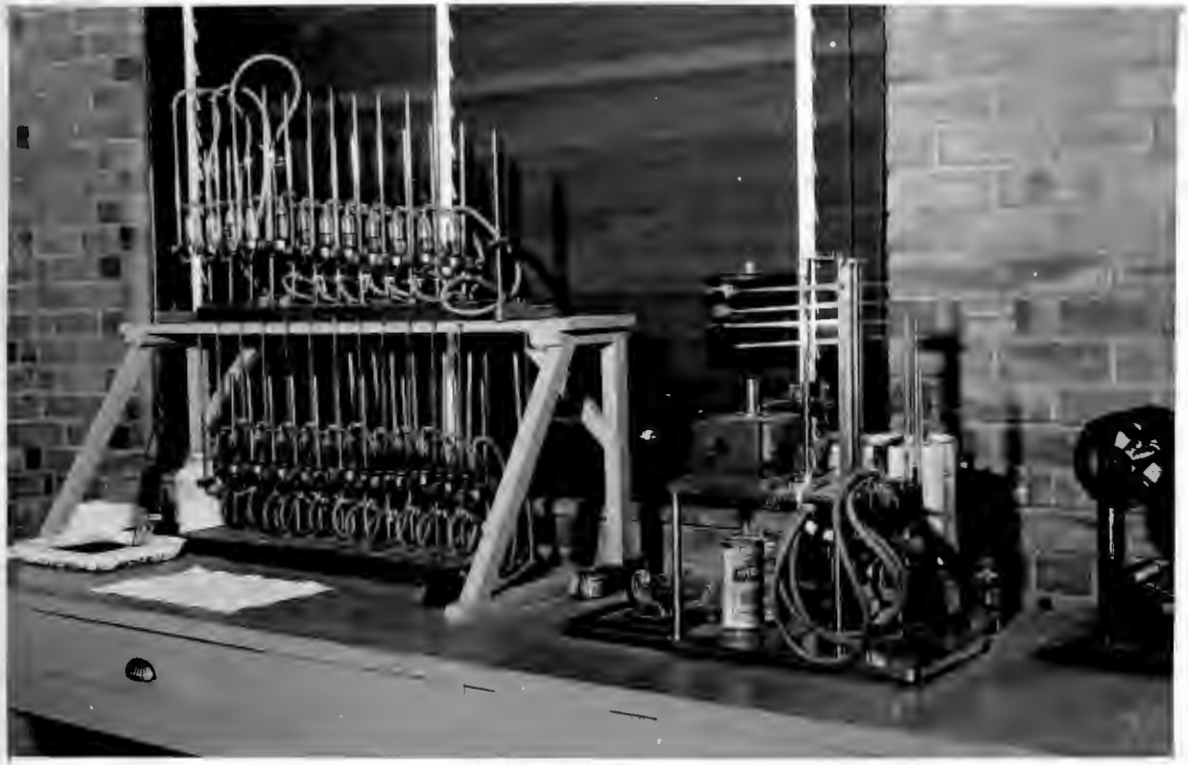
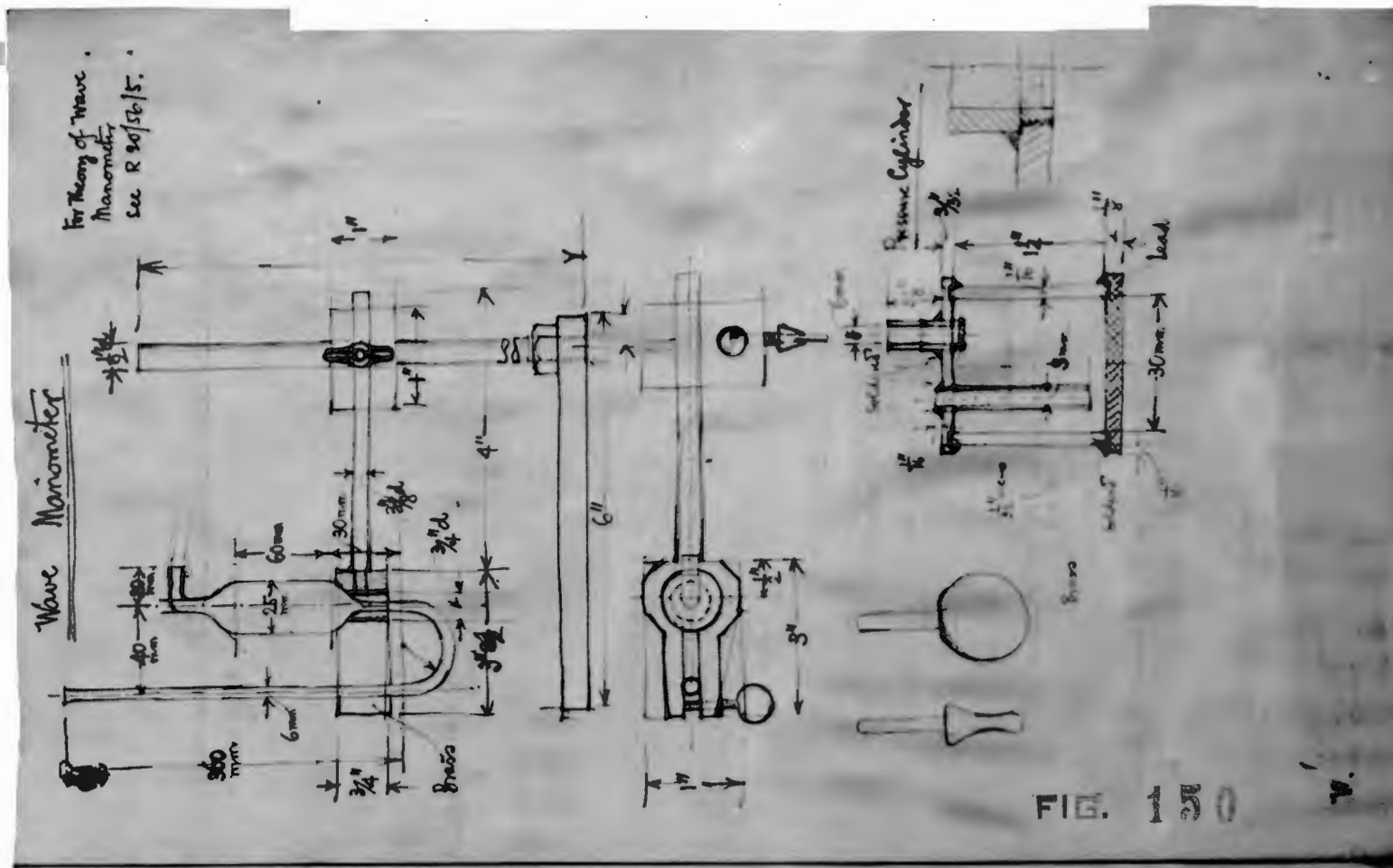


FIG. 151. BATTERY OF WAVE MANOMETERS INSTALLED AT THE RANGE LABORATORY.

FIG. 150. ROUGH DESIGN FOR WAVE MANOMETER.



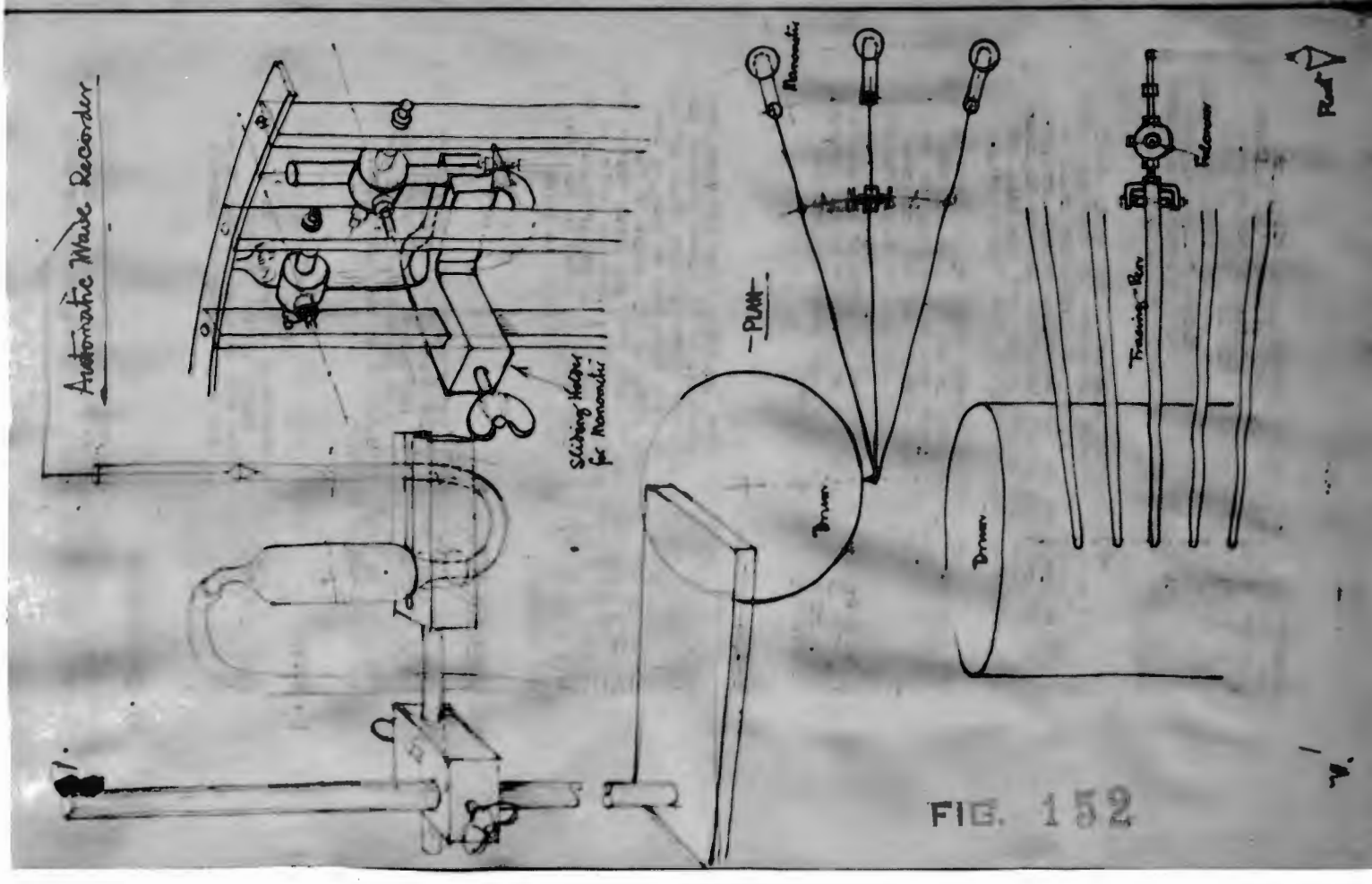


FIG. 152. ROUGH DESIGN FOR THE KYMATOGRAPH.

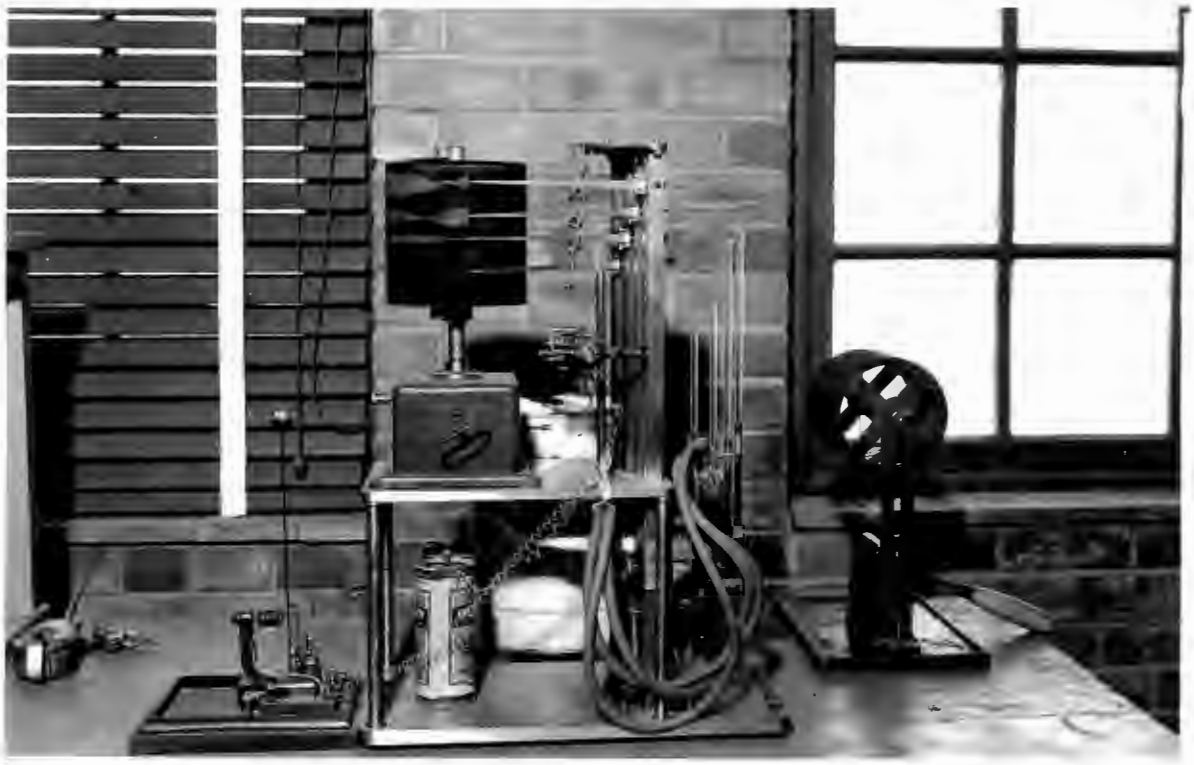


FIG. 153. VIEW OF THE KYMATOGRAPH AND DRUM-SMOKING APPARATUS.

FIG. 154. ANOTHER VIEW OF THE KYMATOGRAPH.

FIG. 155. TYPICAL KYMATOGRAM OF WATER SURFACE ELEVATIONS IN THE MODEL TRACED BY THE KYMATOGRAPH.

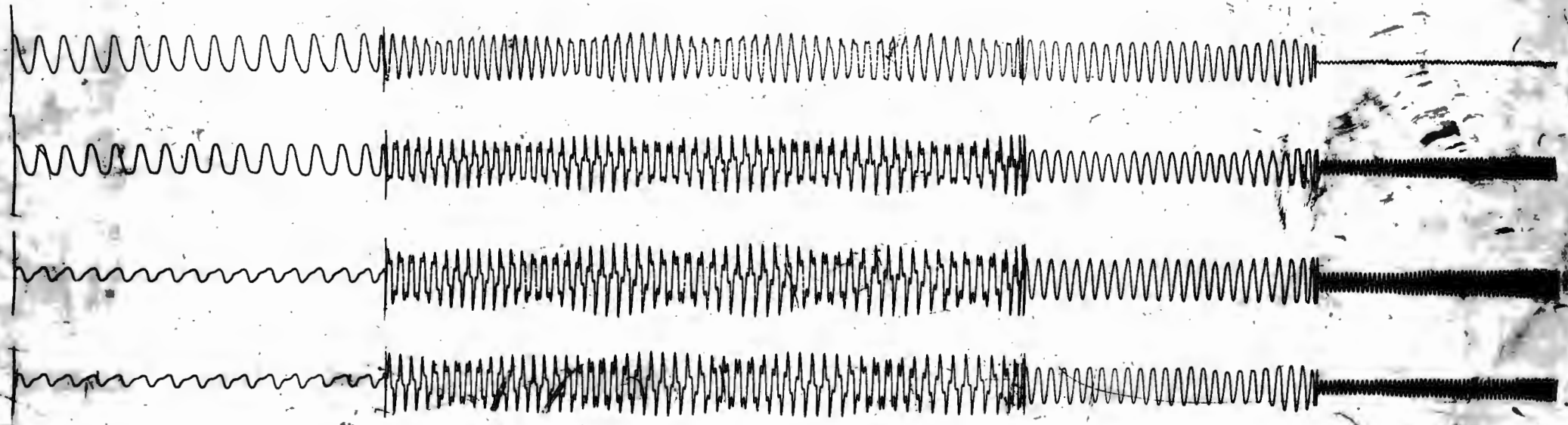


FIG. 155

FIG. 156. KYMATOGRAM OF CALIBRATION TEST FOR THE PEN RECORDERS OF THE KYMATOGRAPH.

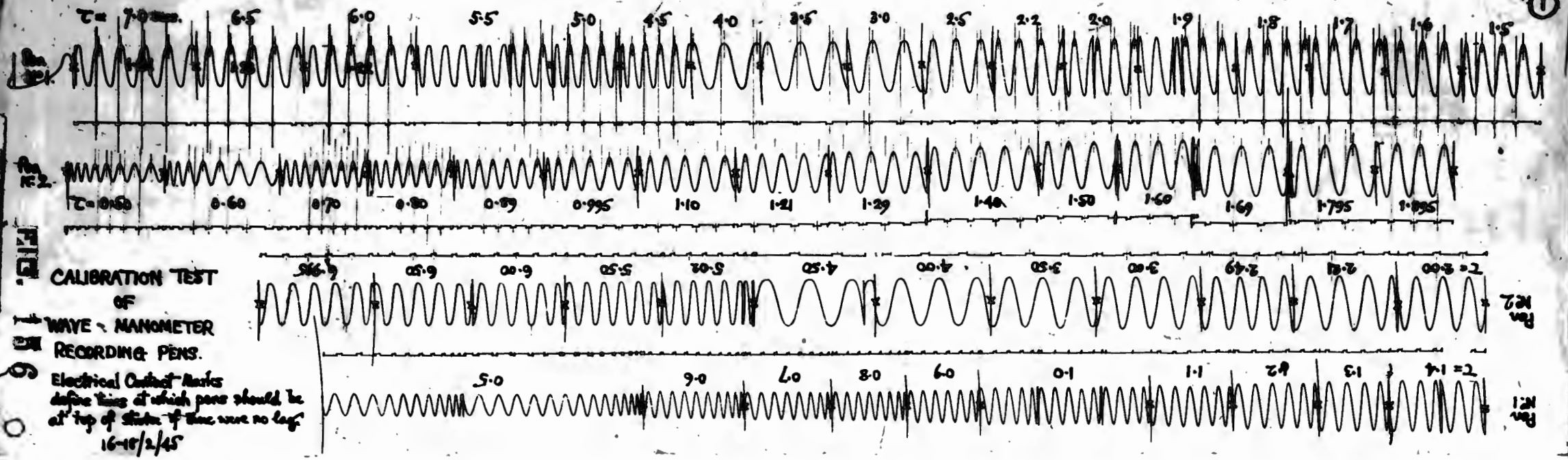


FIG. 156

FIG. 157. TYPICAL CALIBRATION CURVES FOR THE KYMATOGRAPH: NO. 3 PEN.

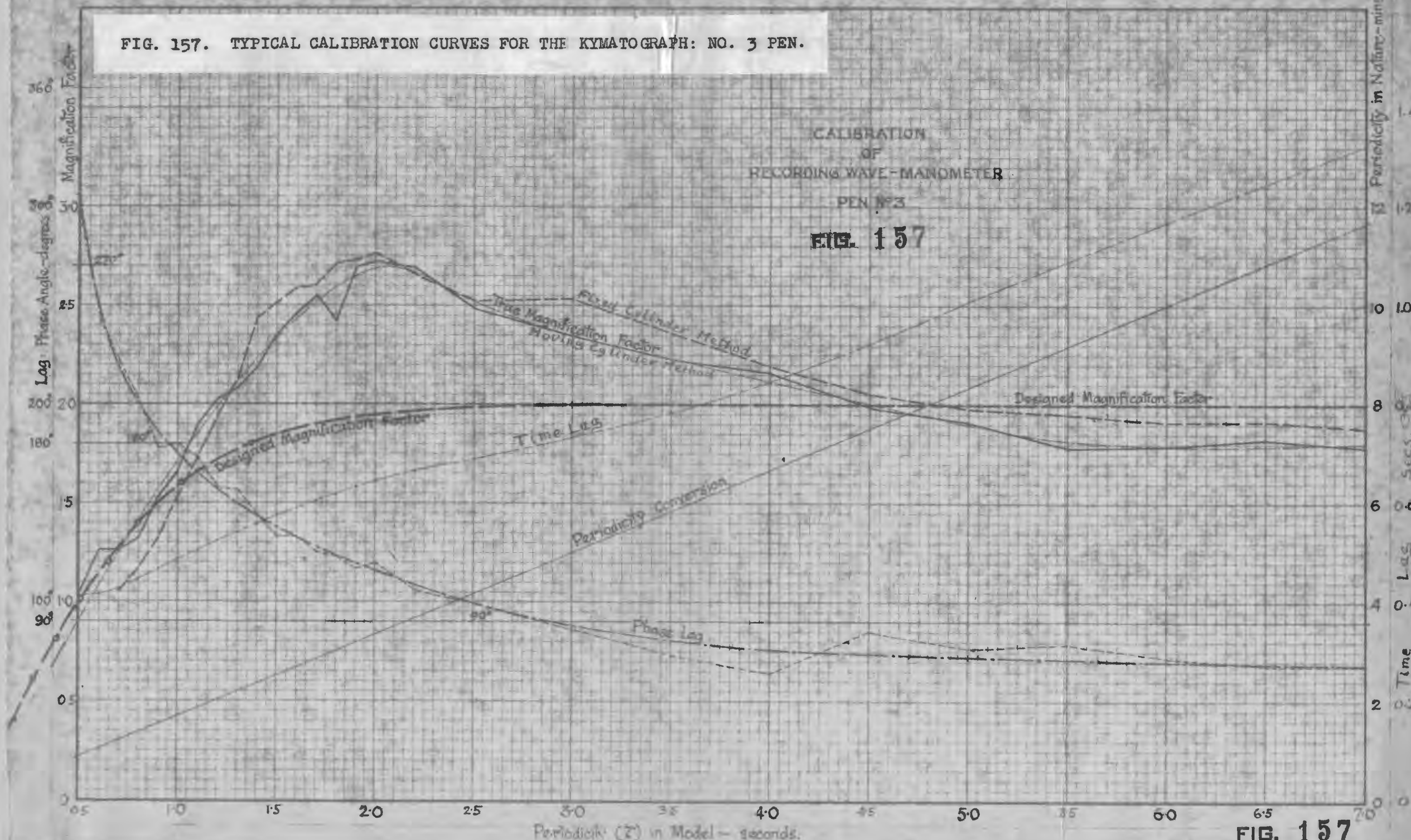


FIG. 157

COMPARATIVE CALIBRATION CURVES FOR THE KYMATOGRAPH RECORDING PENS.

(BY DISPLACER METHOD) USING ROUGH PAPER)

2/5/46

(2)

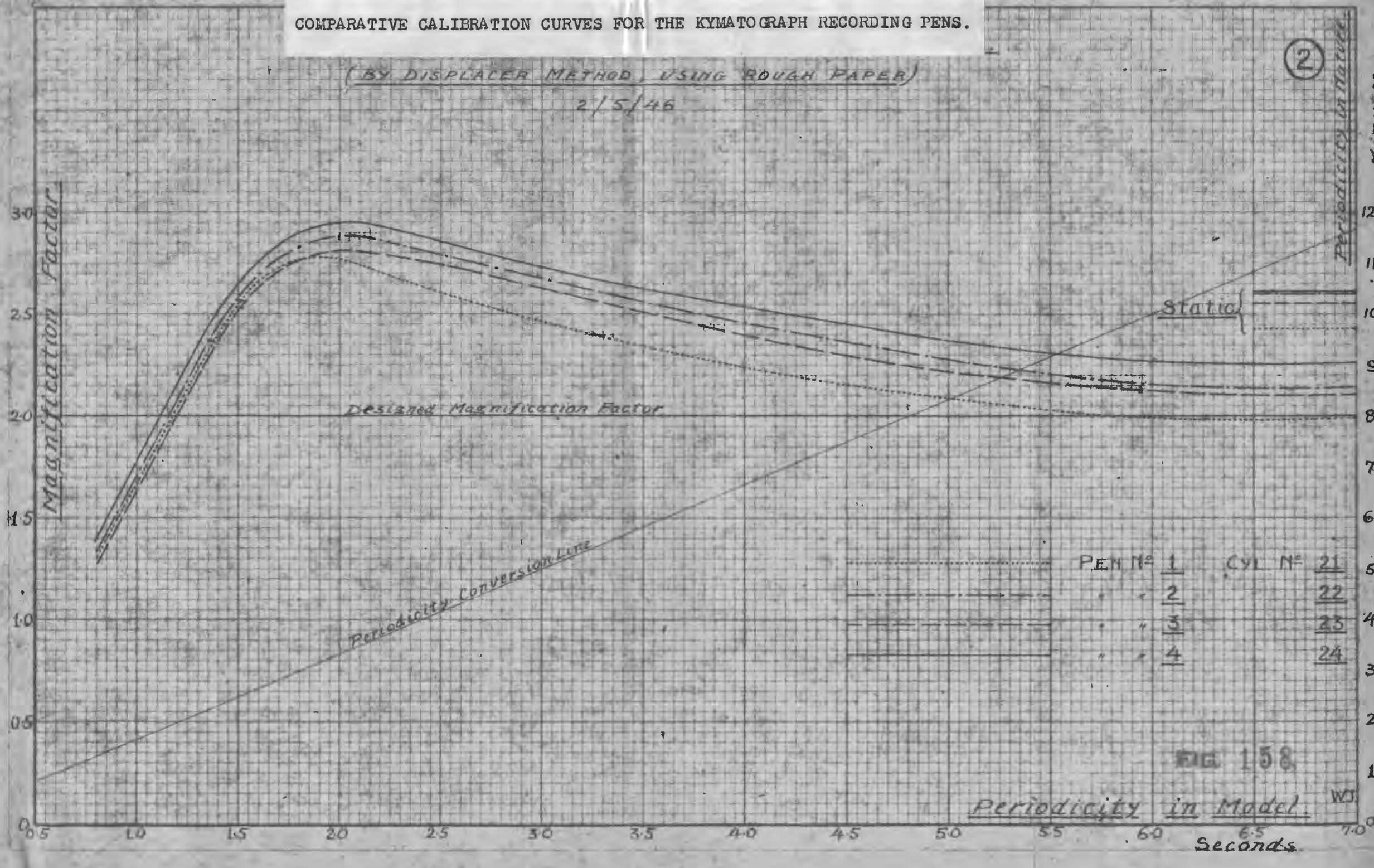


FIG 158.

WJ

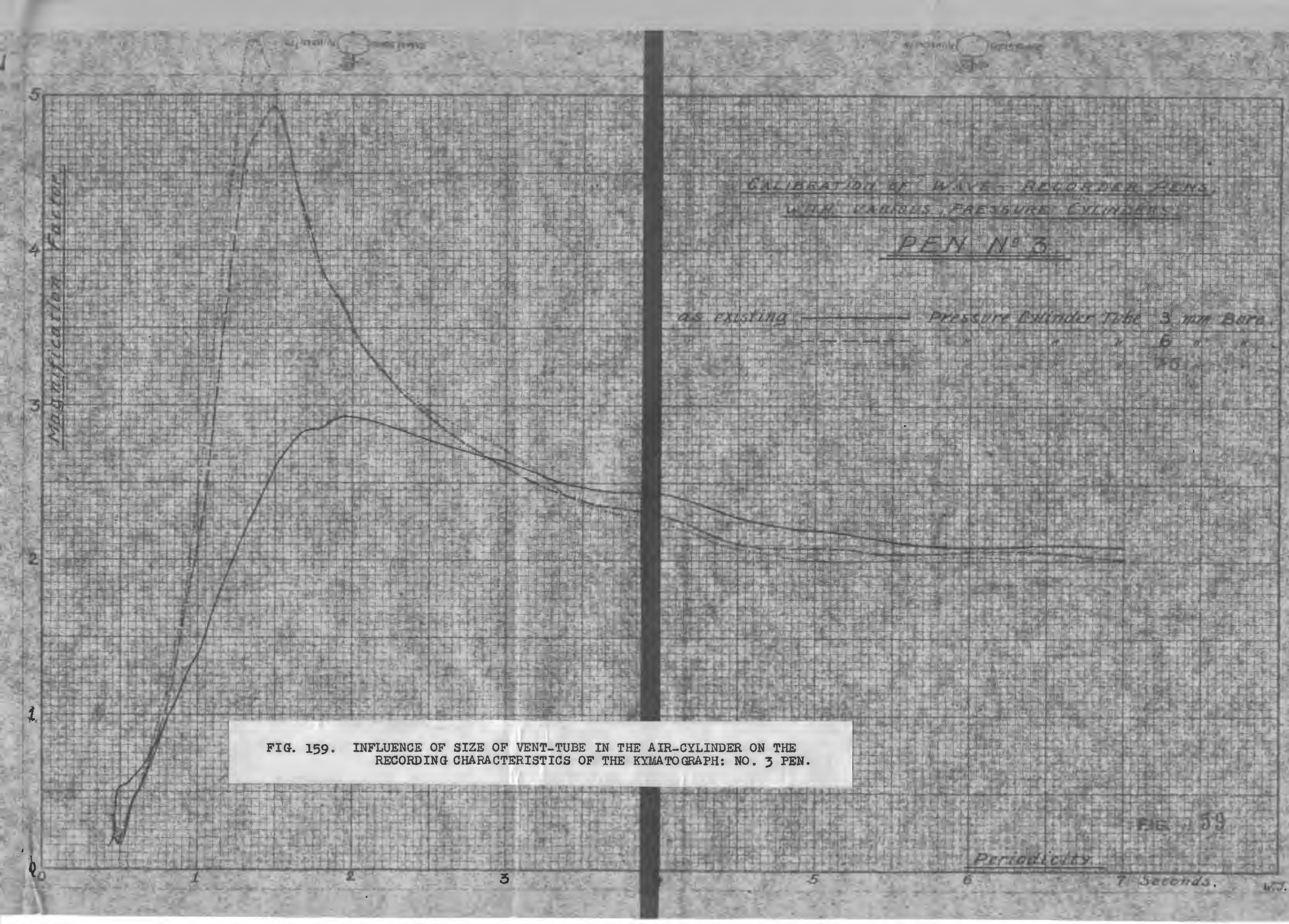


FIG. 159. INFLUENCE OF SIZE OF VENT-TUBE IN THE AIR-CYLINDER ON THE RECORDING CHARACTERISTICS OF THE KYMATOGRAPH: NO. 3 PEN.

CASE VII SILLS AND SIDE STOPS REMOVED.

—— Profile of water surface when maximum at L42

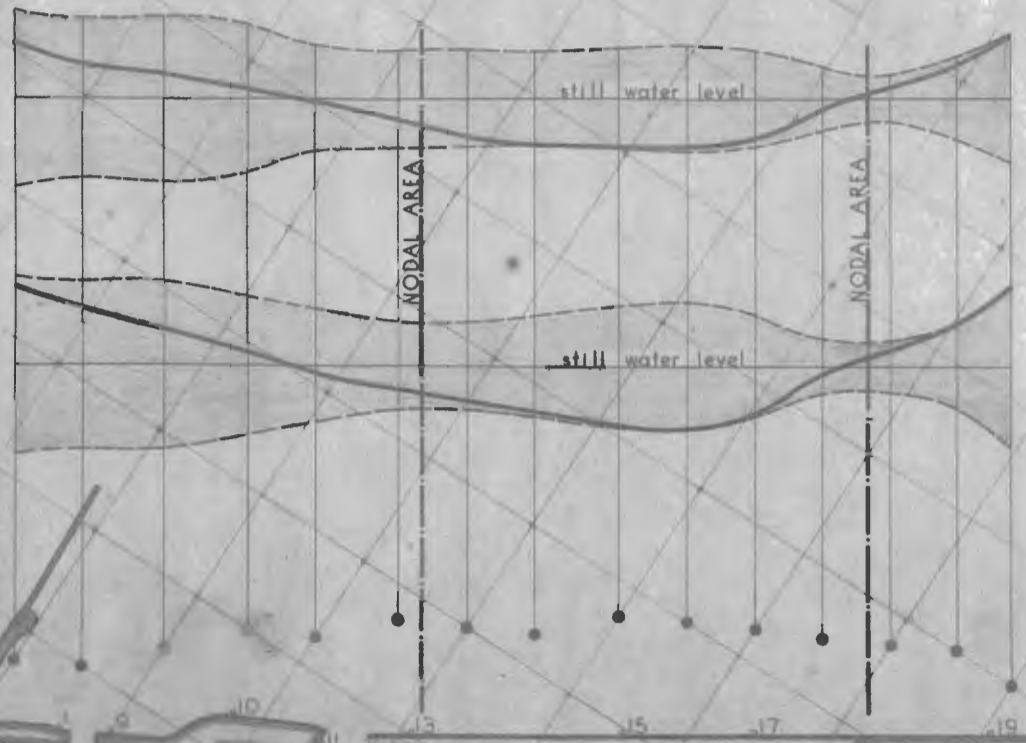
- - - - Maximum amplitude of water surface.

@ Position of manometer.

CASE VI SILLS AND SIDE STOPS IN POSITION.

FIG. 160

DETERMINATION OF EFFECTS OF PADDLE CLEARANCES.



SEICHE OF MIN. PERIOD.

NOTE: Numbers indicate positions of recorders.

FIG. 161. TYPICAL KYMATOGRAM OF WAVE-ENERGY EXPERIMENTS IN THE MODEL.

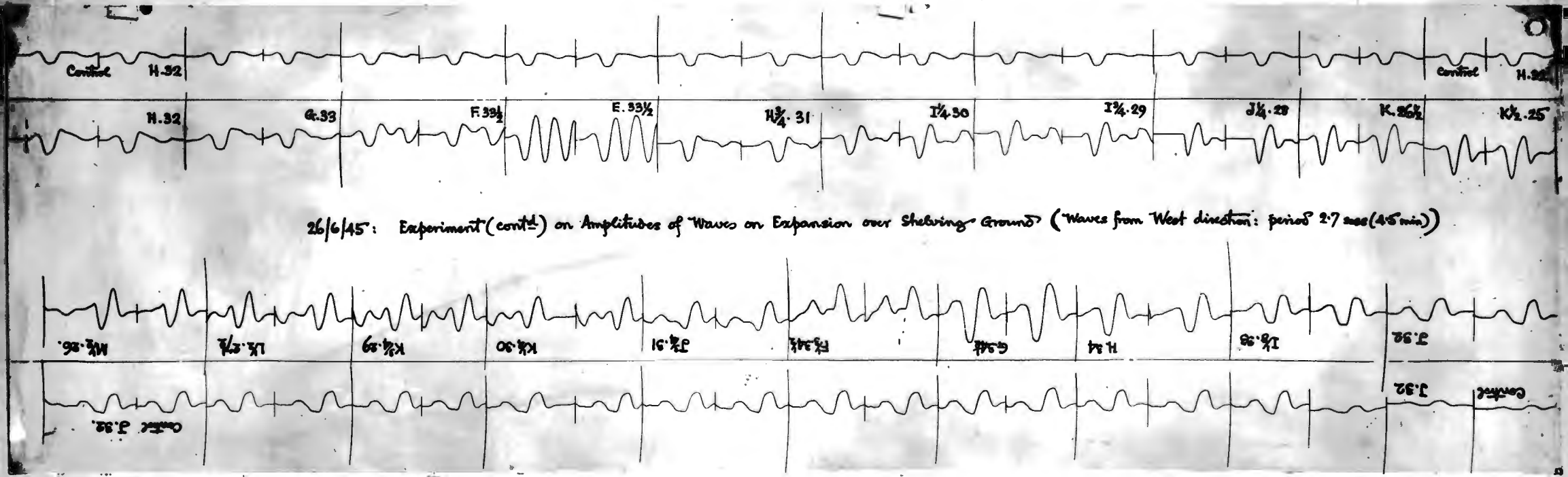


FIG. 161.

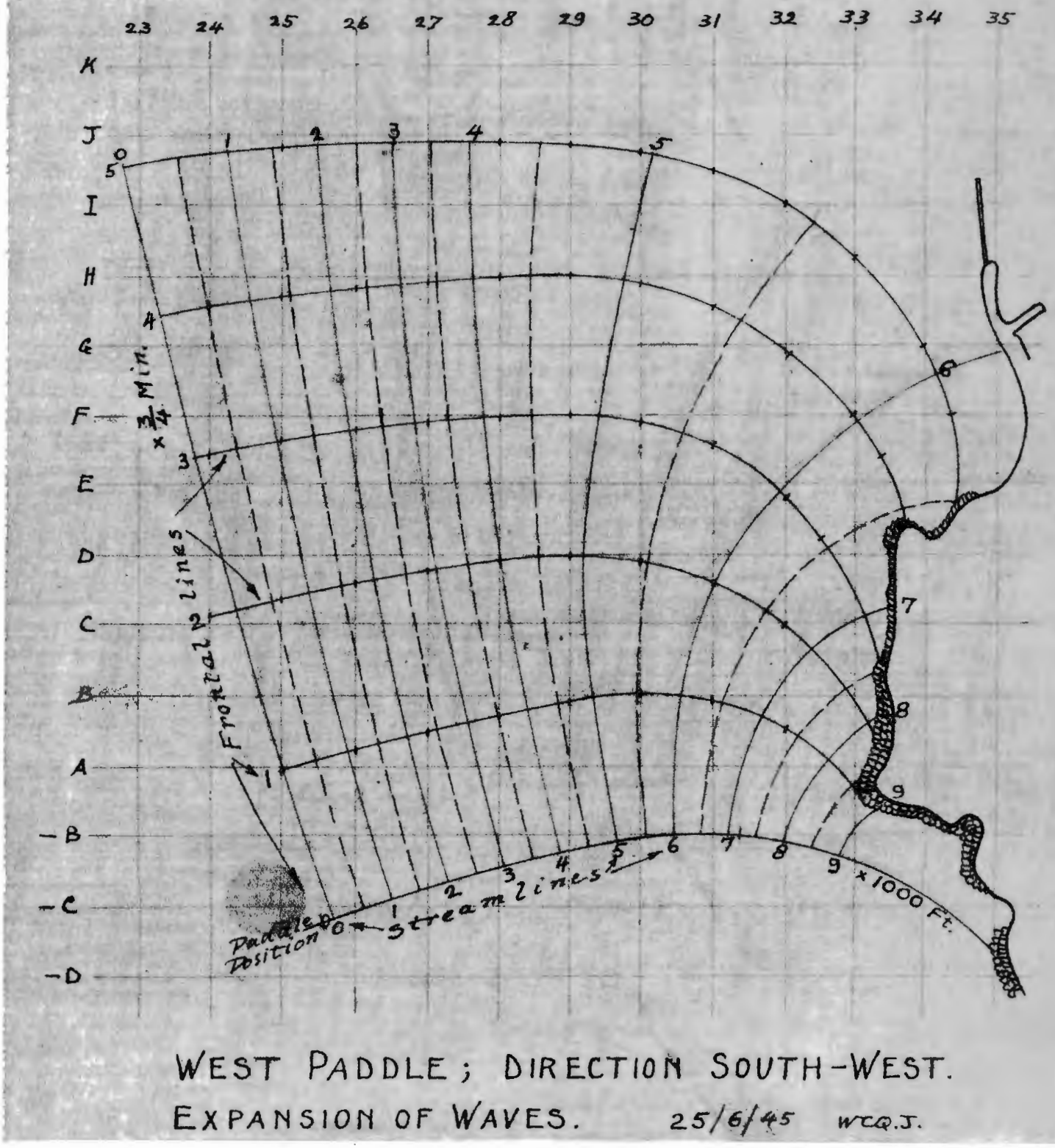


FIG. 162 (a). WAVE ENERGY EXPERIMENTS: EXPANSION OF WAVES FROM THE SOUTH-WEST.

FIG. 162 (b). WAVE ENERGY EXPERIMENTS: EXPANSION OF WAVES FROM THE WEST.

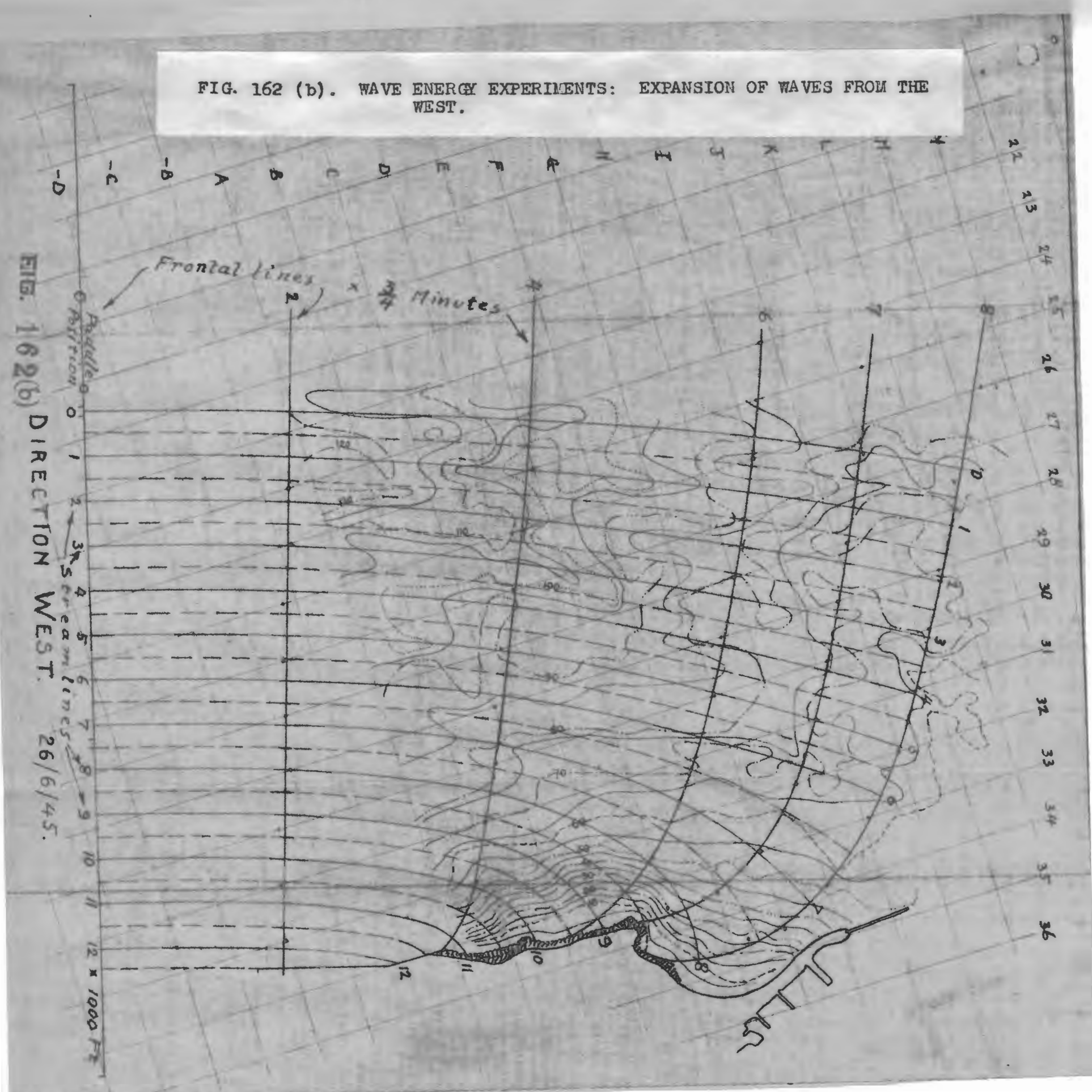


FIG. 162(b) DIRECTION WEST. 26/6/45.

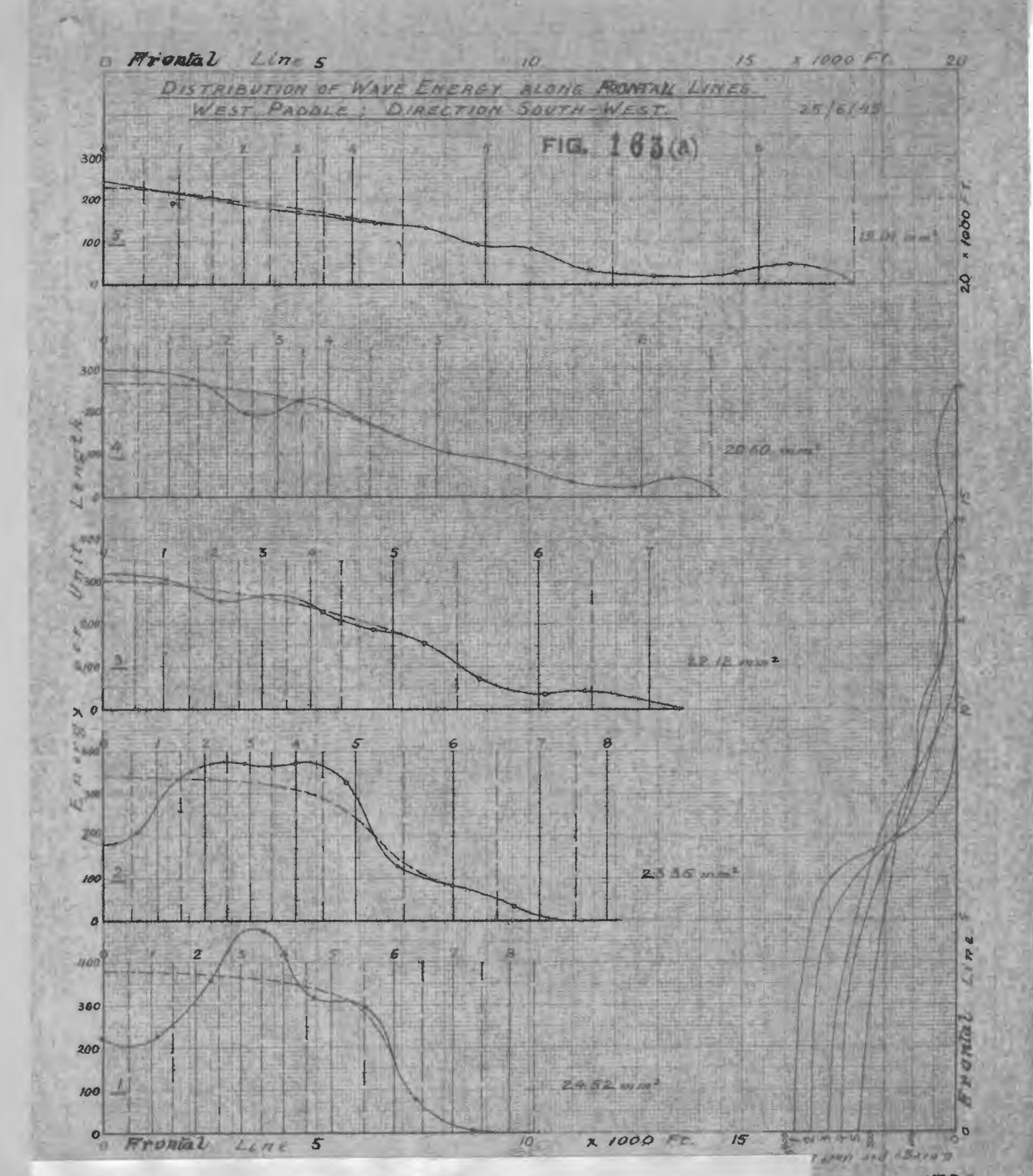


FIG. 163 (a). DISTRIBUTION OF ENERGY ALONG WAVE FRONTS (WAVES FROM SOUTH-WEST).

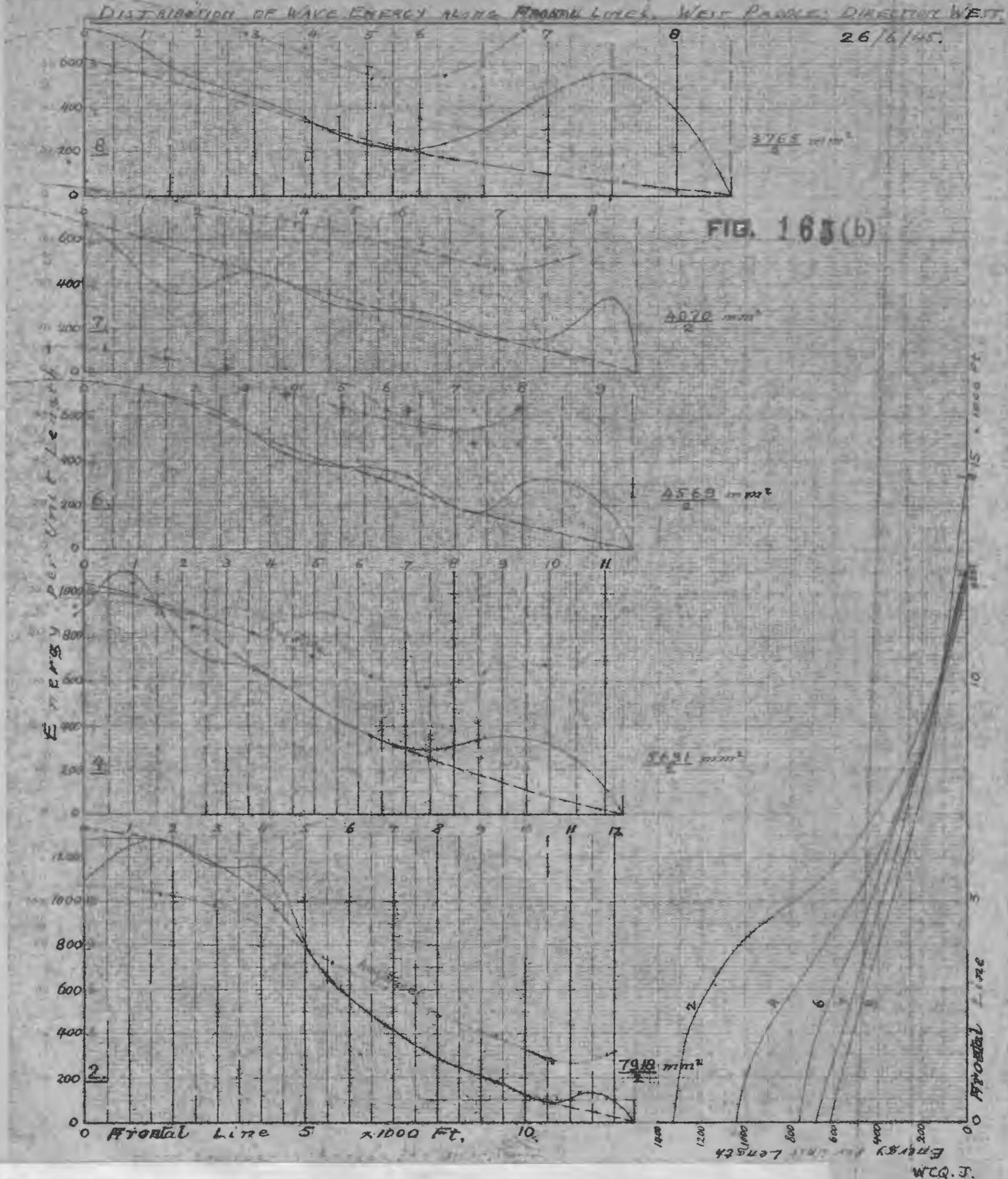
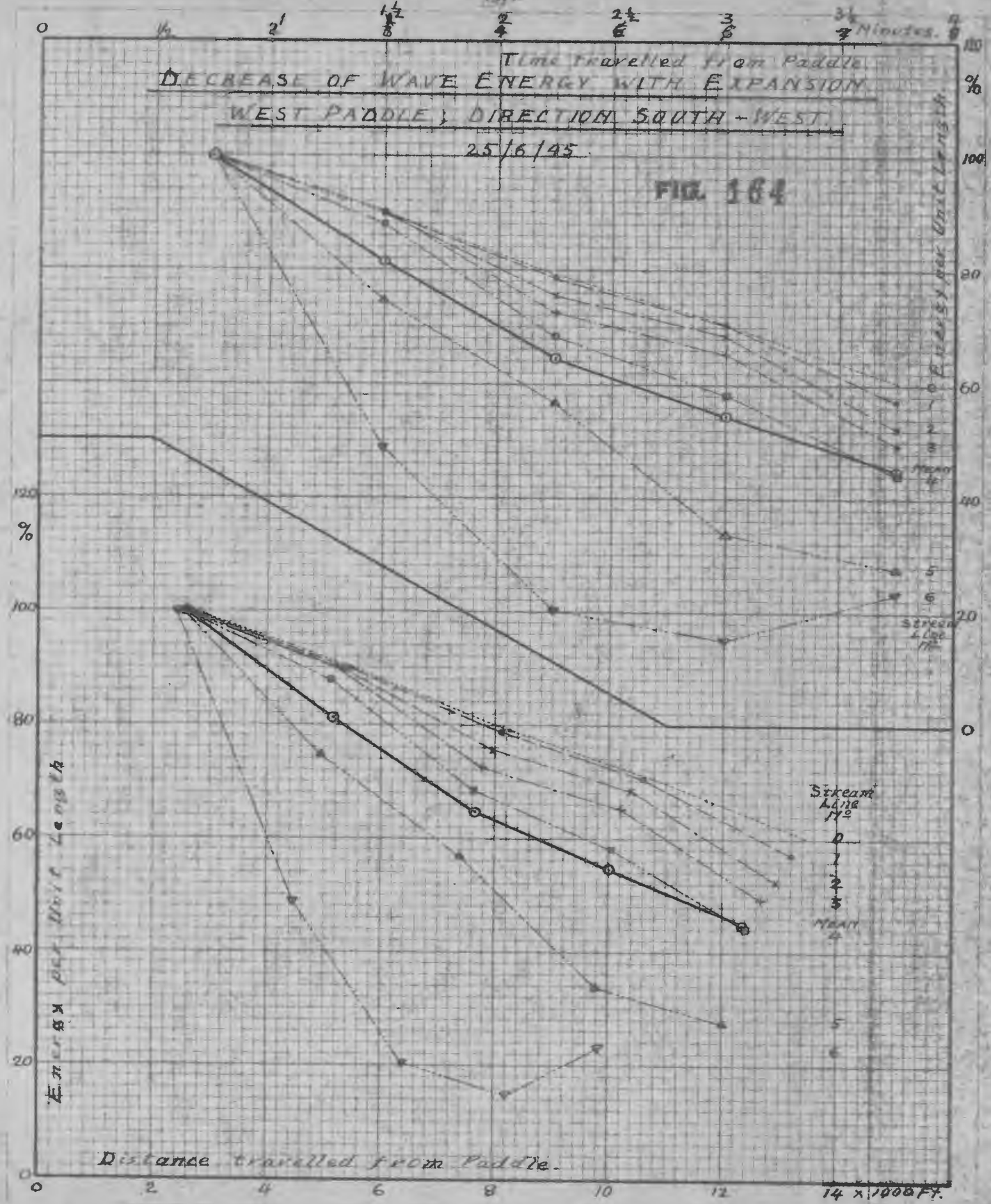


FIG. 163 (b). DISTRIBUTION OF ENERGY ALONG WAVE FRONTS (WAVES FROM WEST).


DECREASE OF WAVE ENERGY WITH EXPANSION
WEST PADDLE ; DIRECTION SOUTH - WEST.
25/6/95
FIG. 164
Time travelled from Paddle.
Minutes.
Energy per Unit Length.
%
Energy per Wave Length
Distance travelled from Paddle.
14 x 1000 Ft.
Stream Line No
Mean
WCGJ.

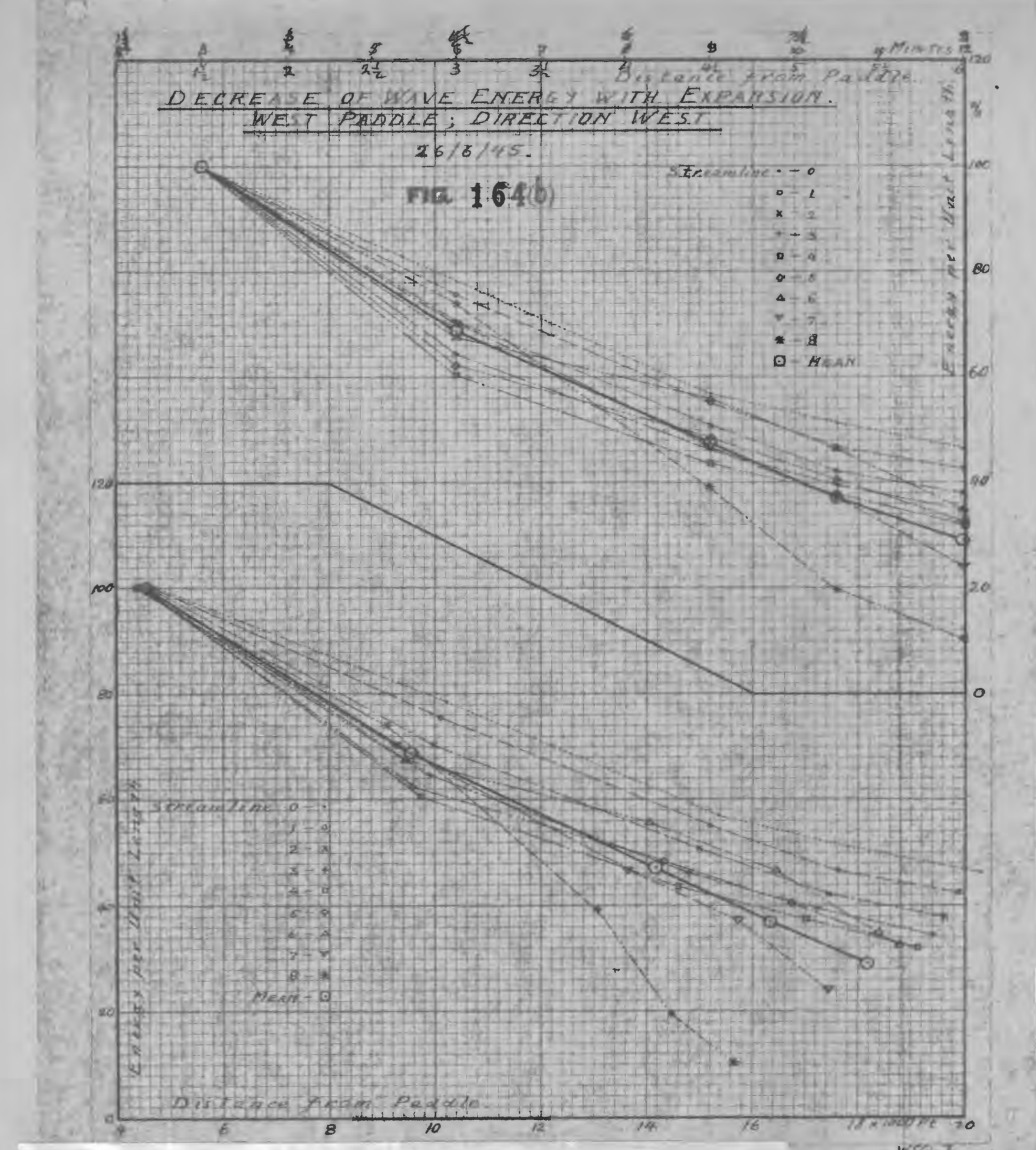


FIG. 164 (b). DISTRIBUTION OF WAVE ENERGY ALONG STREAMLINES (WAVES FROM WEST).

FIG. 165 (a). LOSS OF WAVE ENERGY WITH WAVE REFRACTION (WAVES FROM SOUTH-WEST).

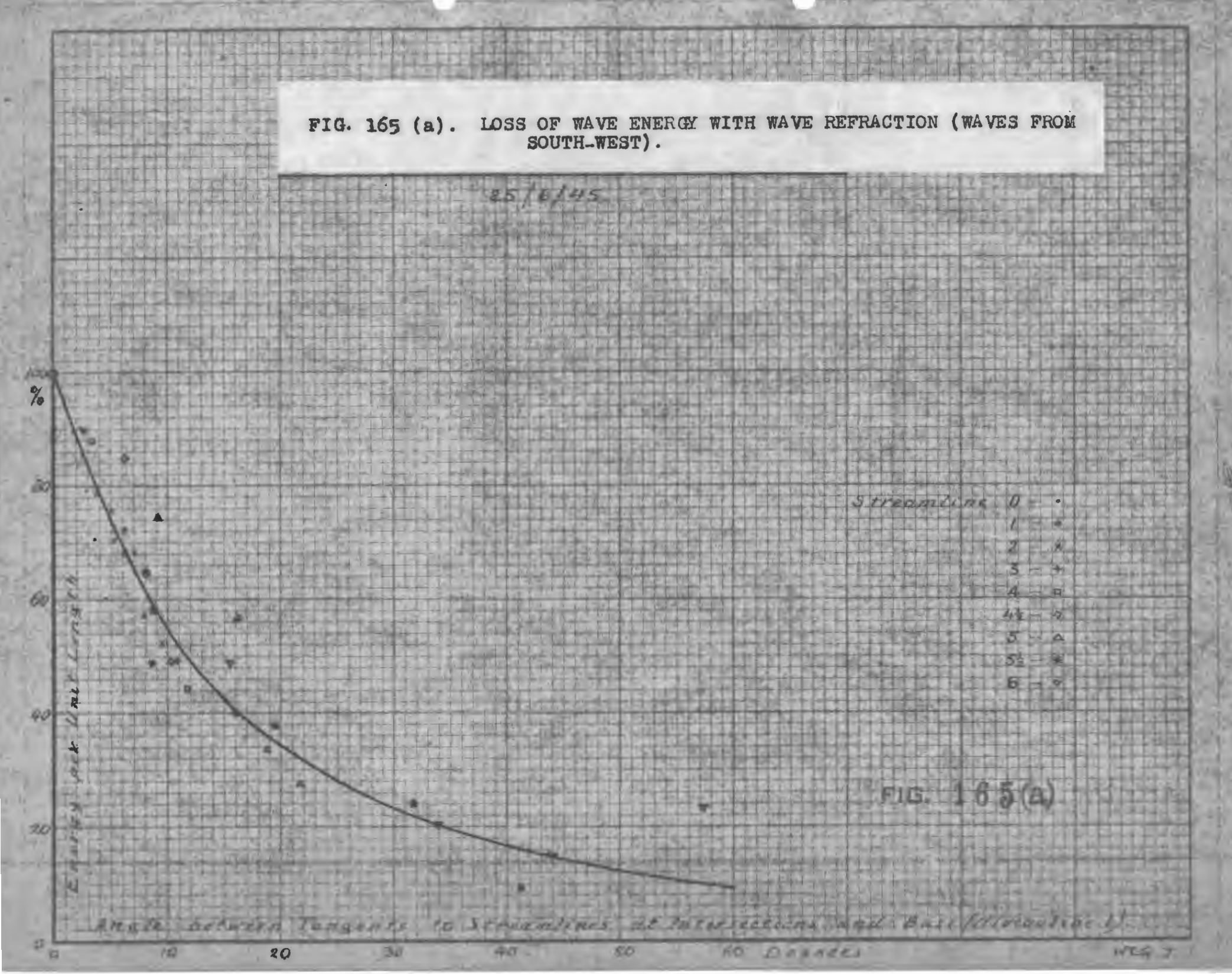


FIG. 165 (b). LOSS OF WAVE ENERGY WITH WAVE REFRACTION (WAVES FROM WEST).

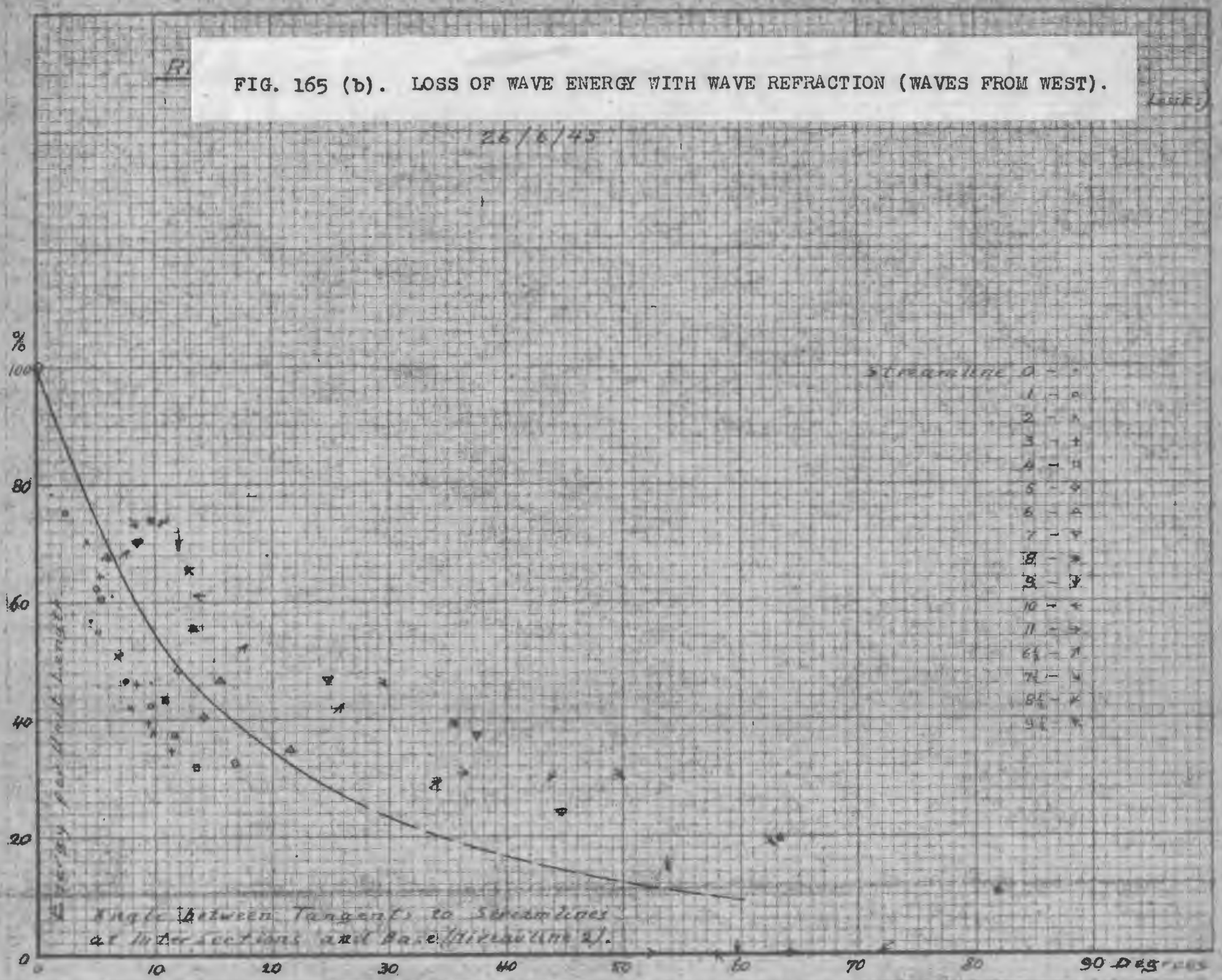
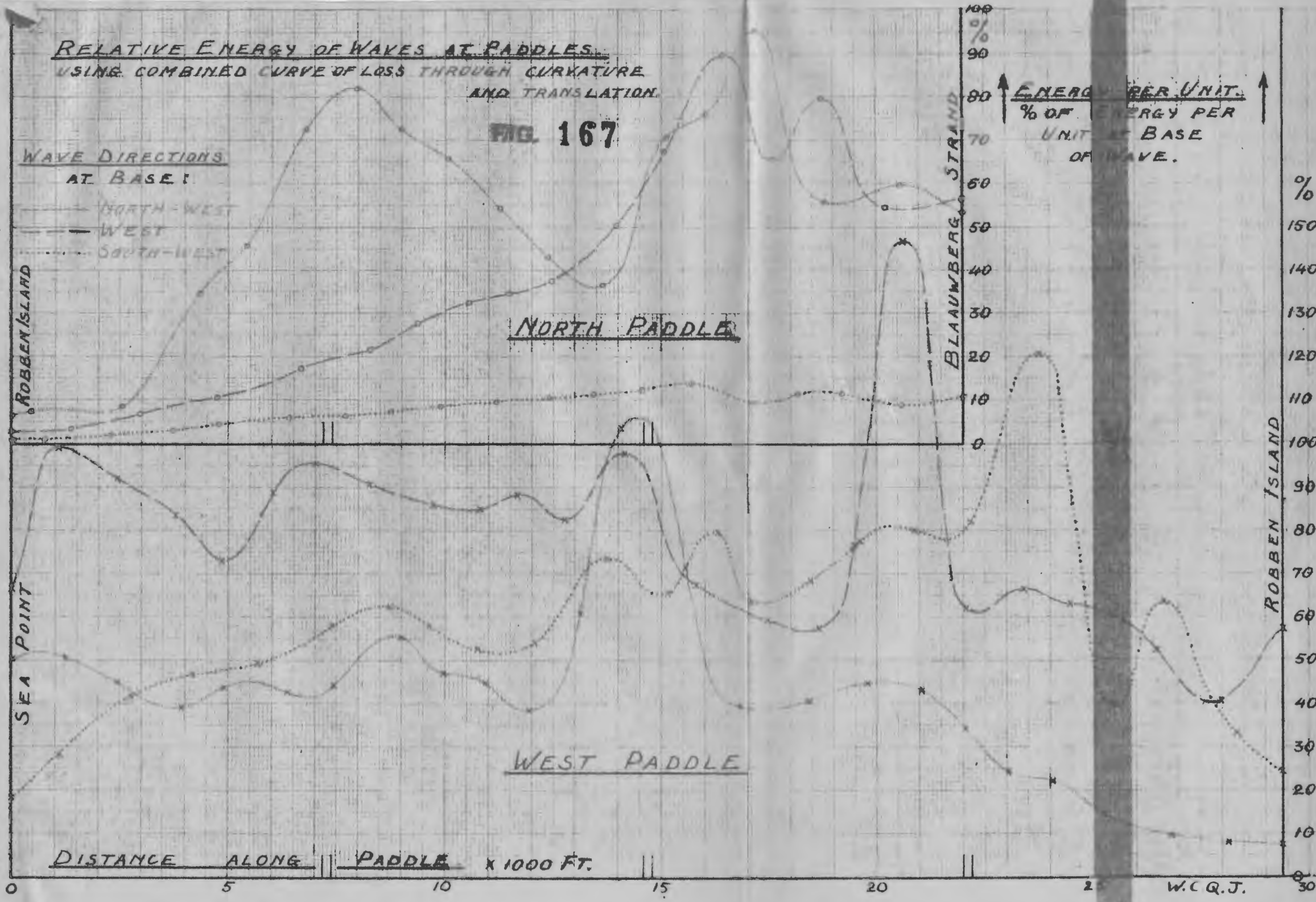


FIG. 166. EXTENT OF REFRACTION OF WAVES FROM SOUTH-WEST ON REACHING SITES OF THE WAVE PADDLES.

FIG. 166

FIG. 167. RELATIVE WAVE-ENERGIES CONCENTRATED AT THE WEST AND NORTH PADDLE SITES IN THE ENTRANCE CHANNELS OF TABLE BAY.



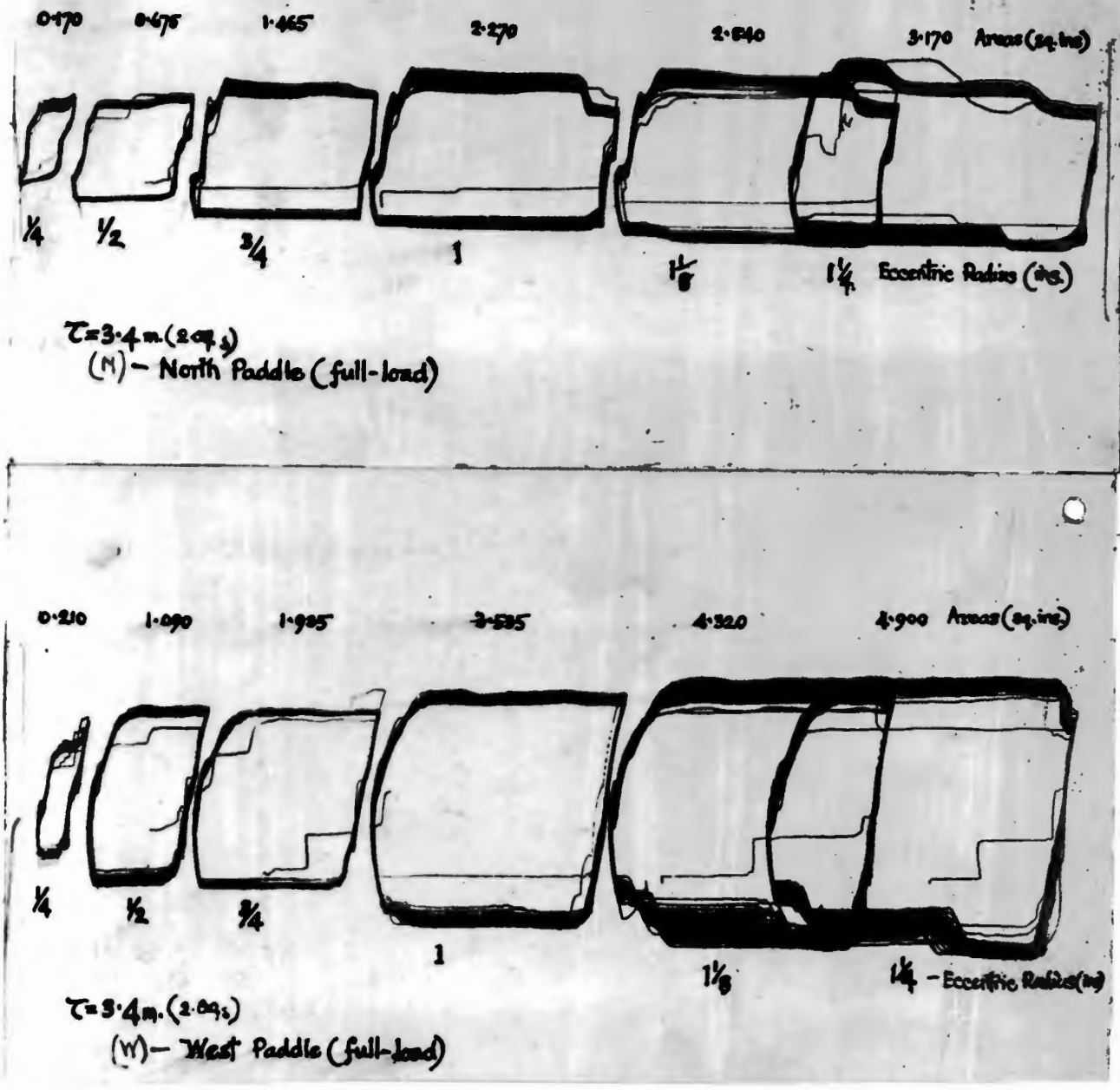


FIG. 169. TYPICAL INDICATOR DIAGRAMS OF POWER TRANSMITTED BY THE WAVE PADDLES: PERIODICITY 3.4 MINUTES.

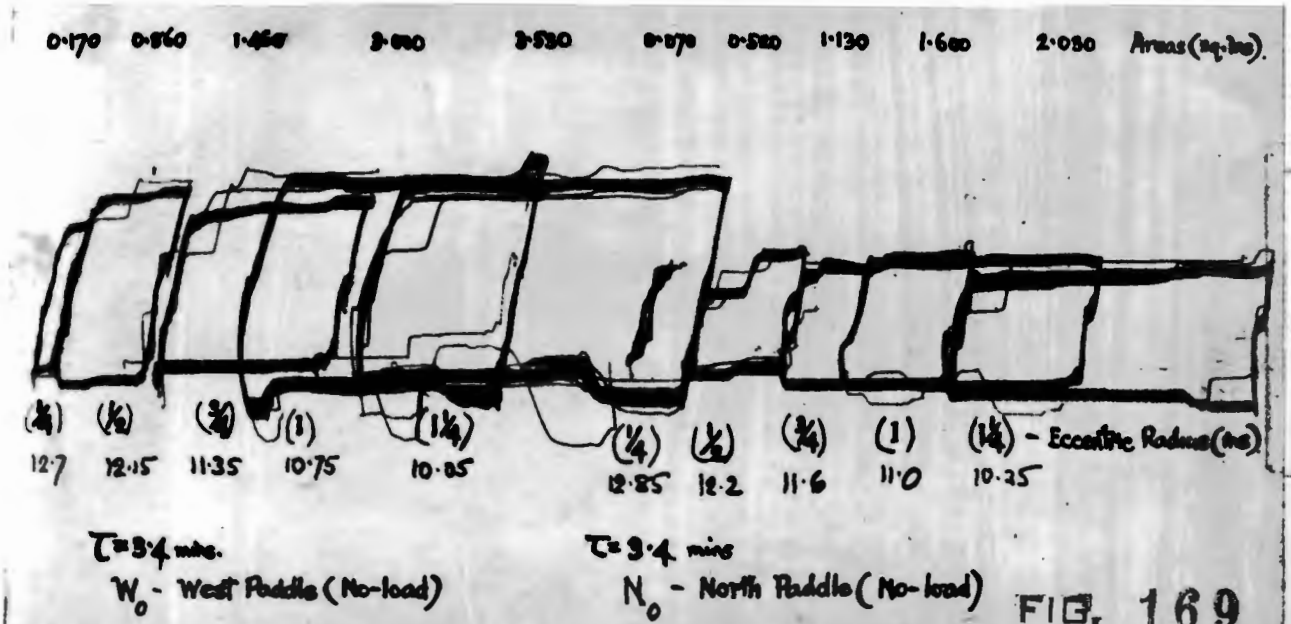
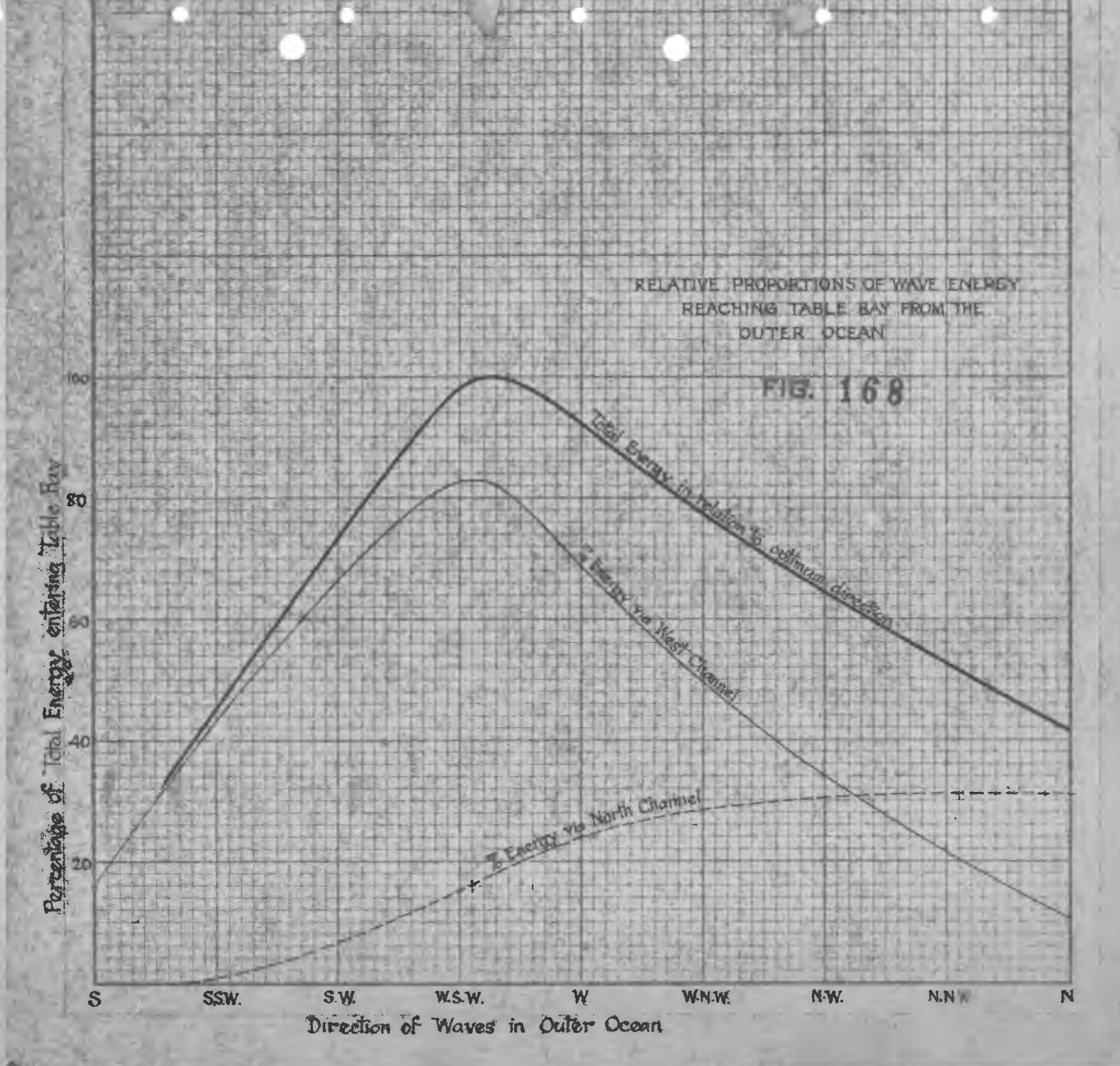


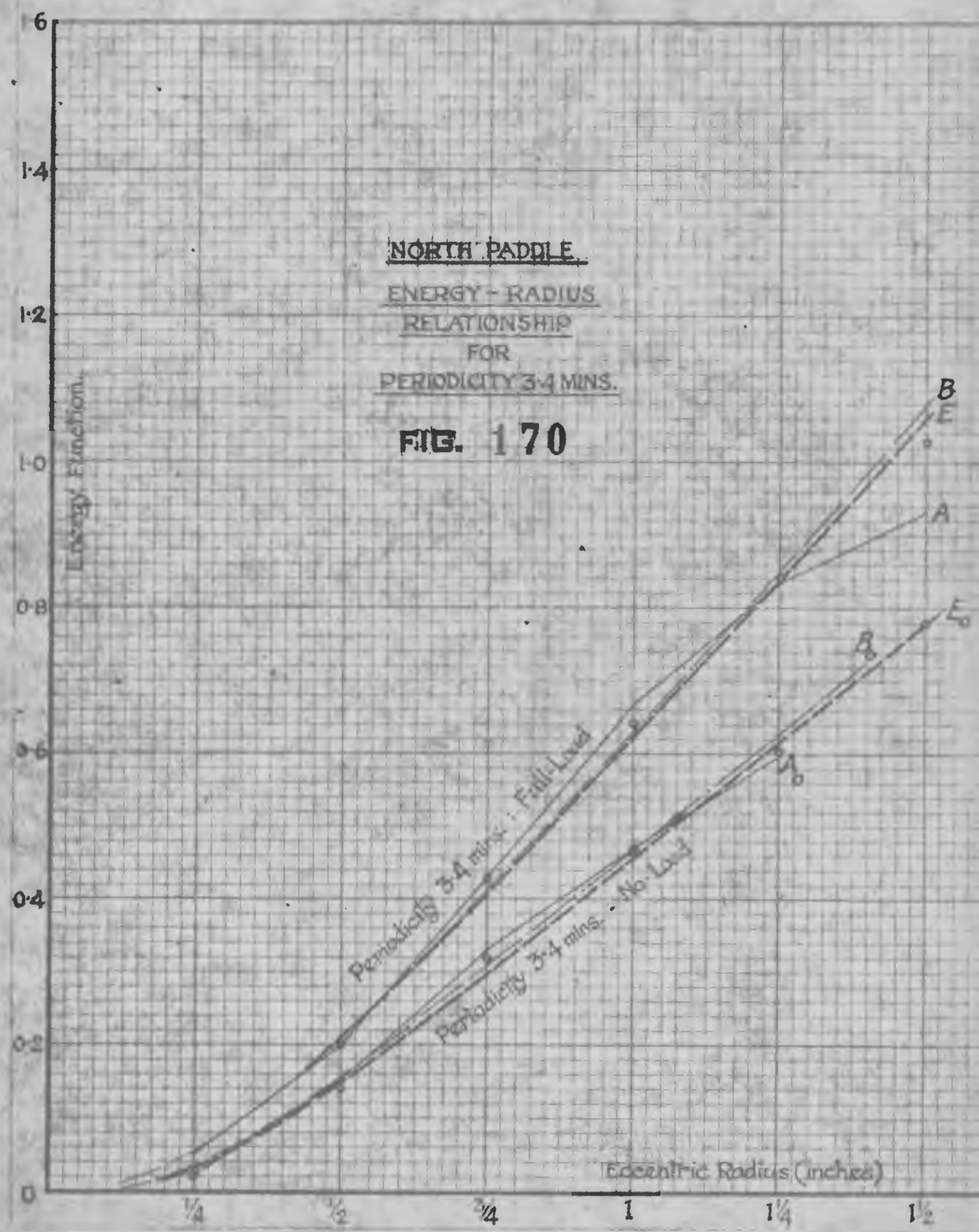
FIG. 169


RELATIVE PROPORTIONS OF WAVE ENERGY REACHING TABLE BAY FROM THE OUTER OCEAN
FIG. 168
Total Energy in relation to optimum direction
% Energy via West Channel
% Energy via North Channel
Percentage of Total Energy entering Table Bay
100
80
60
40
20
S
SSW.
S.W.
W.S.W.
W
W.N.W.
N.W.
N.N.W.
N
Direction of Waves in Outer Ocean

NORTH PADDLE.

ENERGY - RADIUS RELATIONSHIP FOR PERIODICITY 3·4 MINS.

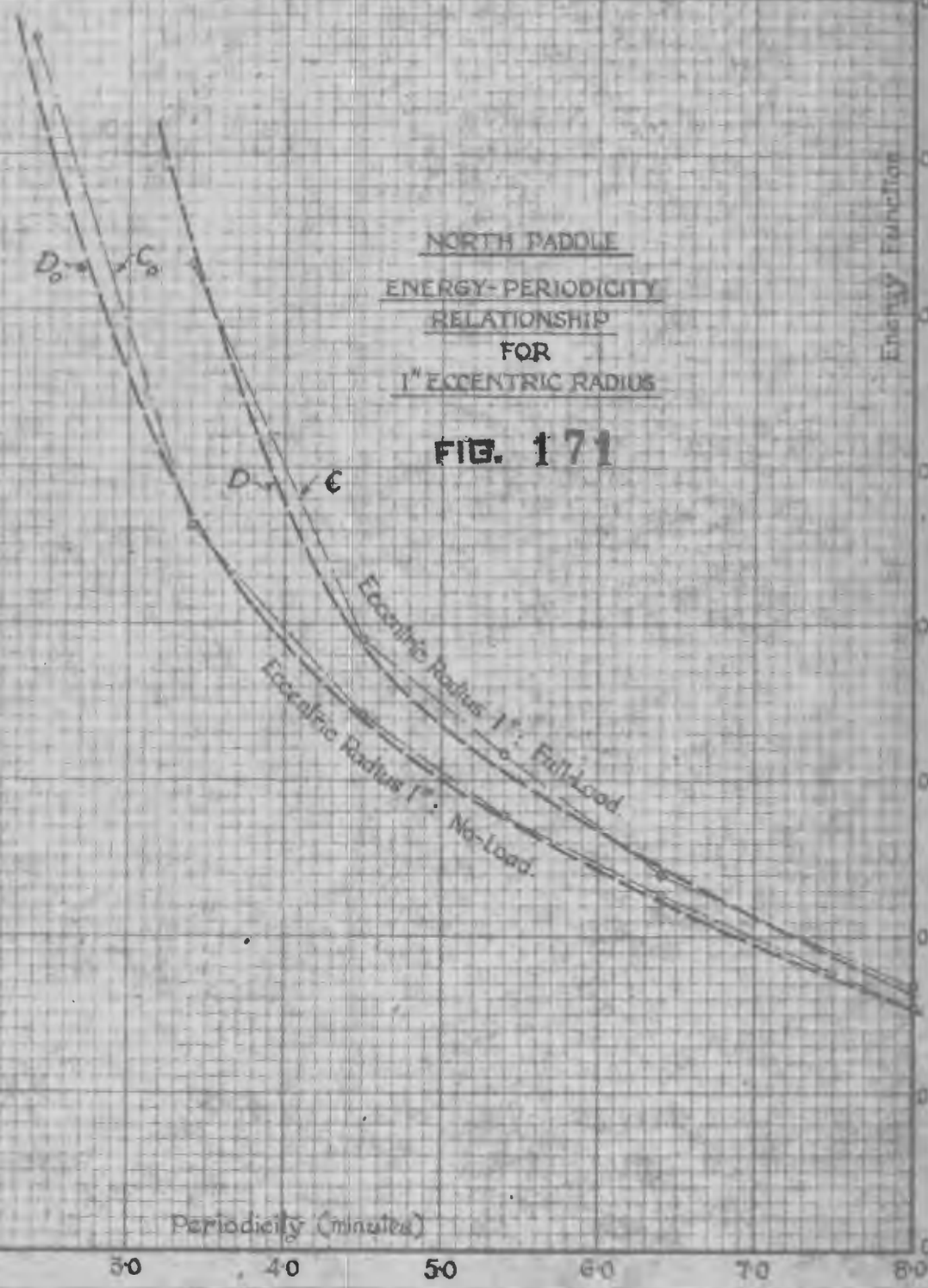
FIG. 170



NORTH PADDLE

ENERGY - PERIODICITY RELATIONSHIP FOR 1" ECCENTRIC RADIUS

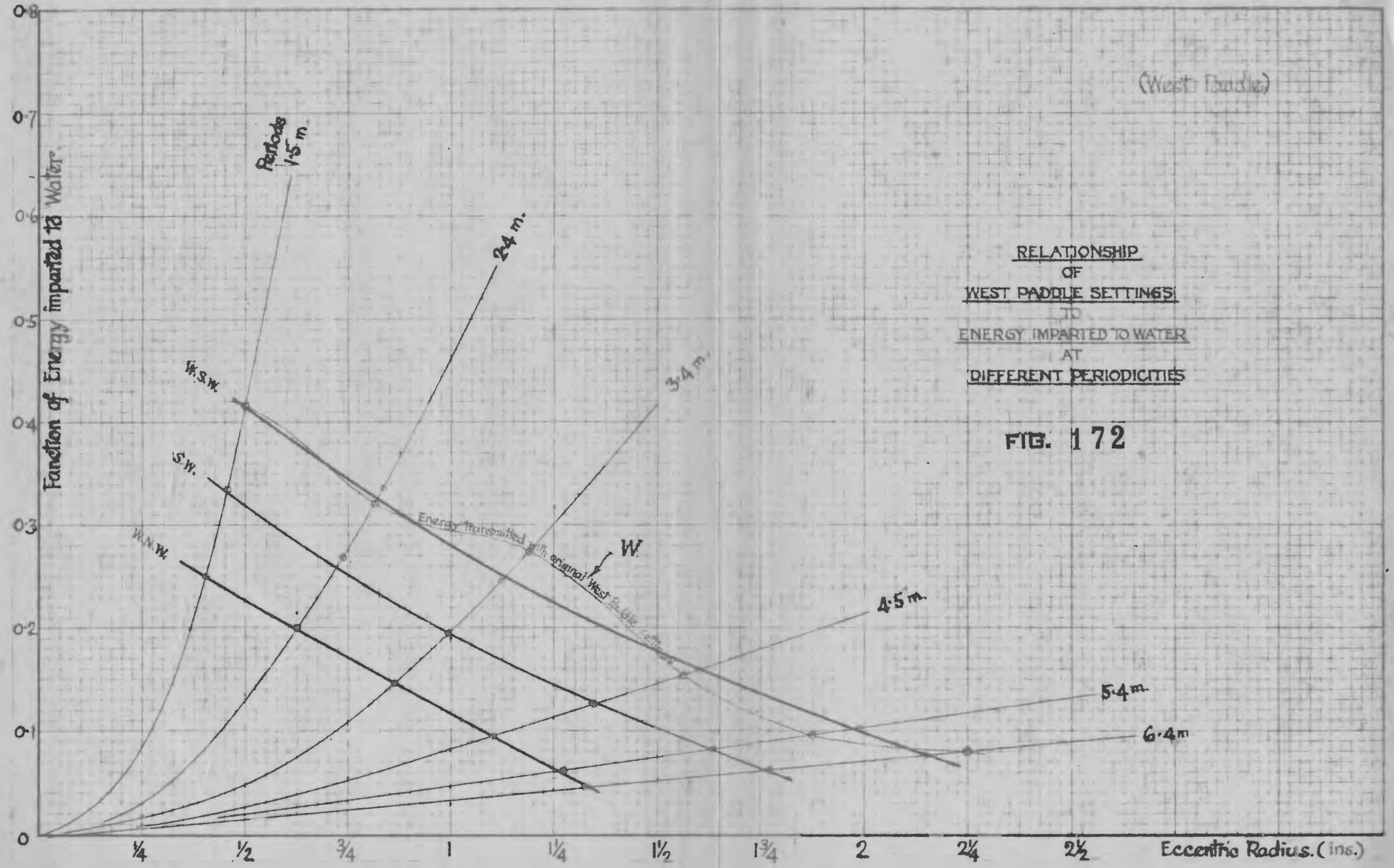
FIG. 171

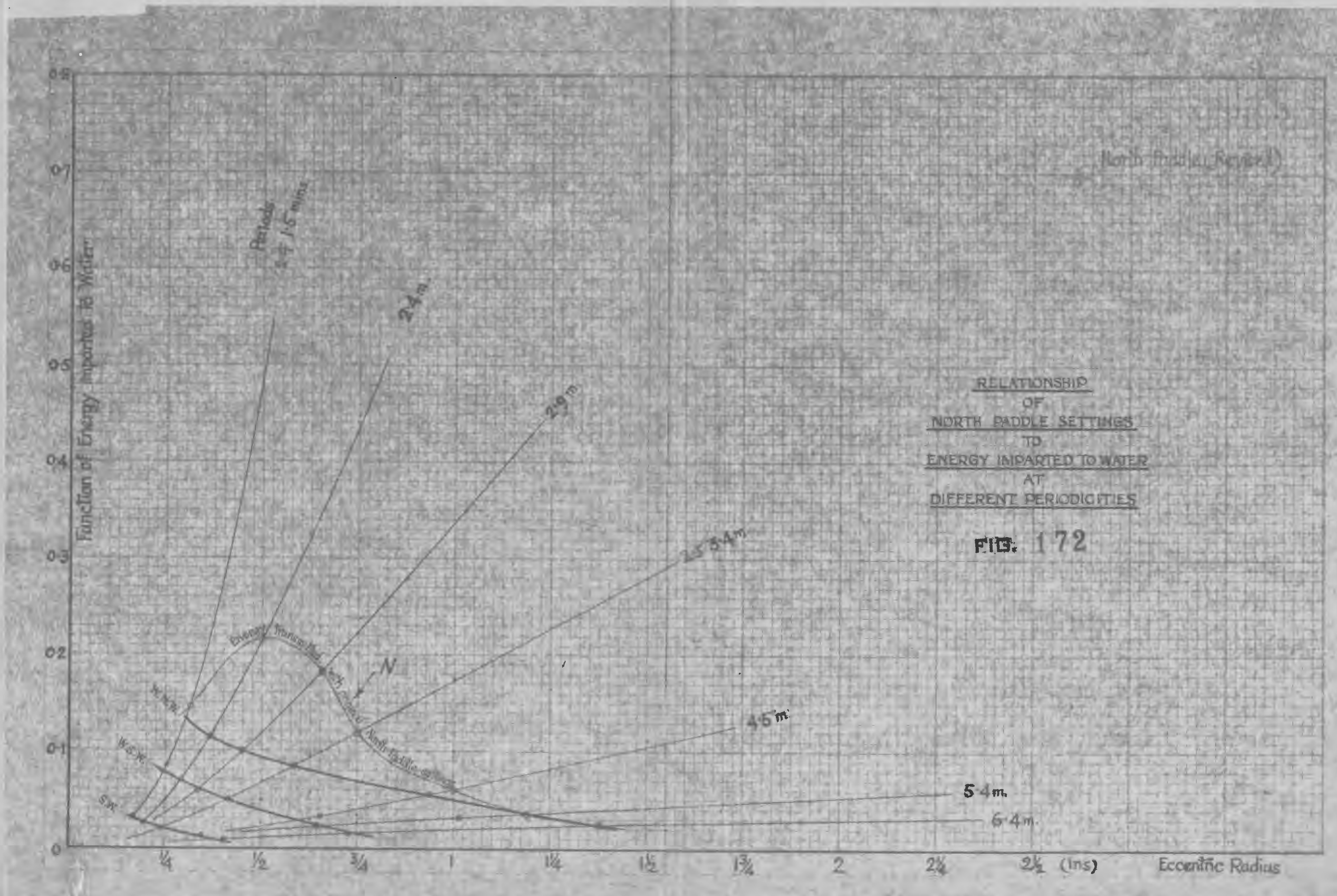


(West Paddle)

RELATIONSHIP
OF
WEST PADDLE SETTINGS
TO
ENERGY IMPARTED TO WATER
AT
DIFFERENT PERIODICITIES

FIG. 172

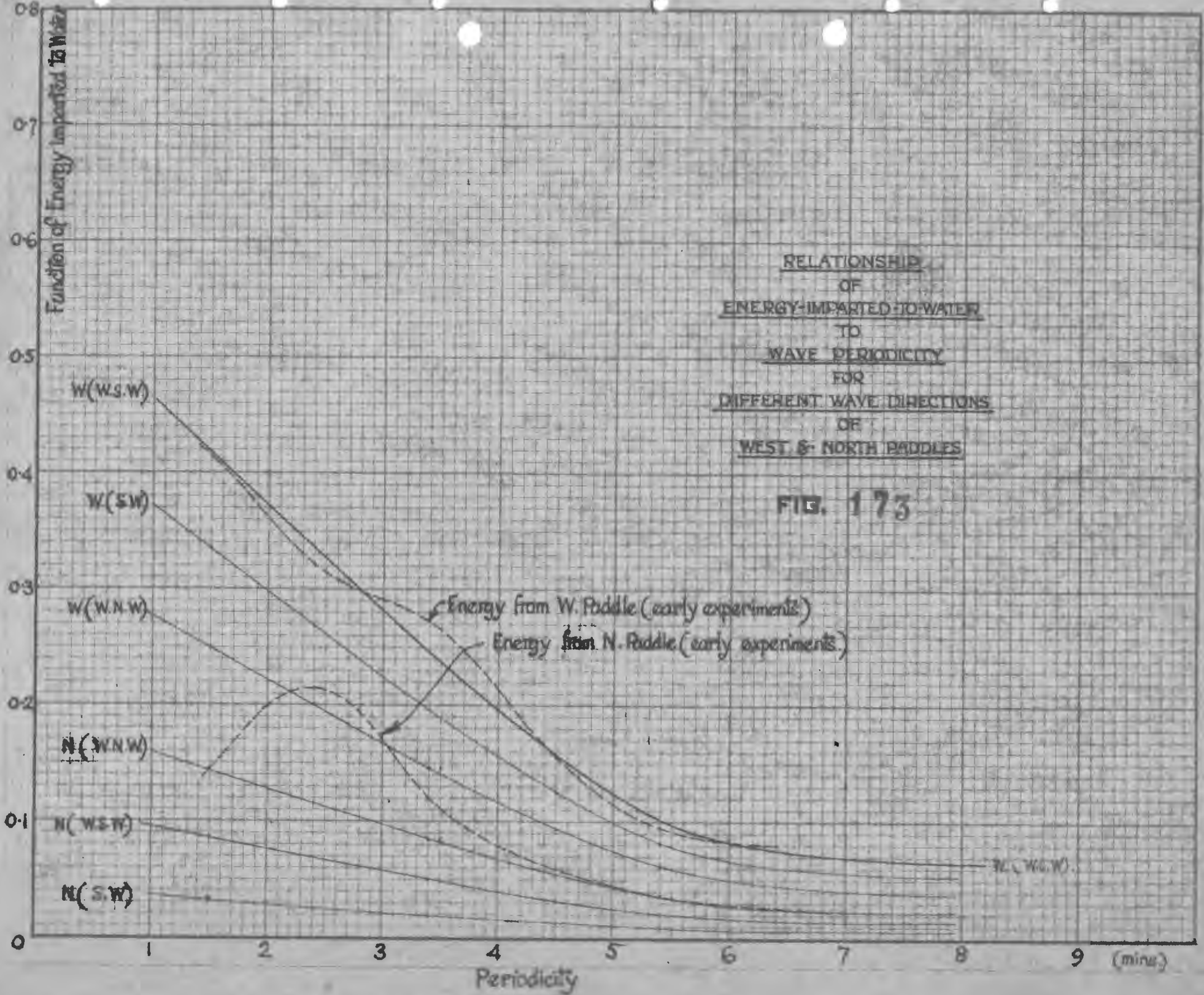




North Paddle Reversed

RELATIONSHIP
OF
NORTH PADDLE SETTINGS
TO
ENERGY IMPARTED TO WATER
AT
DIFFERENT PERIODICITIES

FIG. 172


Function of Energy imparted to Water
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
1
2
3
4
5
6
7
8
9
(mins.)
Periodicity
W(W.S.W)
W(S.W)
W(W.N.W)
N(W.N.W)
N(W.S.W)
N(S.W)
N(W.S.W)
Energy from W. Paddle (early experiments)
Energy from N. Paddle (early experiments)
RELATIONSHIP
OF
ENERGY IMPARTED TO WATER
TO
WAVE PERIODICITY
FOR
DIFFERENT WAVE DIRECTIONS
OF
WEST & NORTH PADDLES
FIG. 173

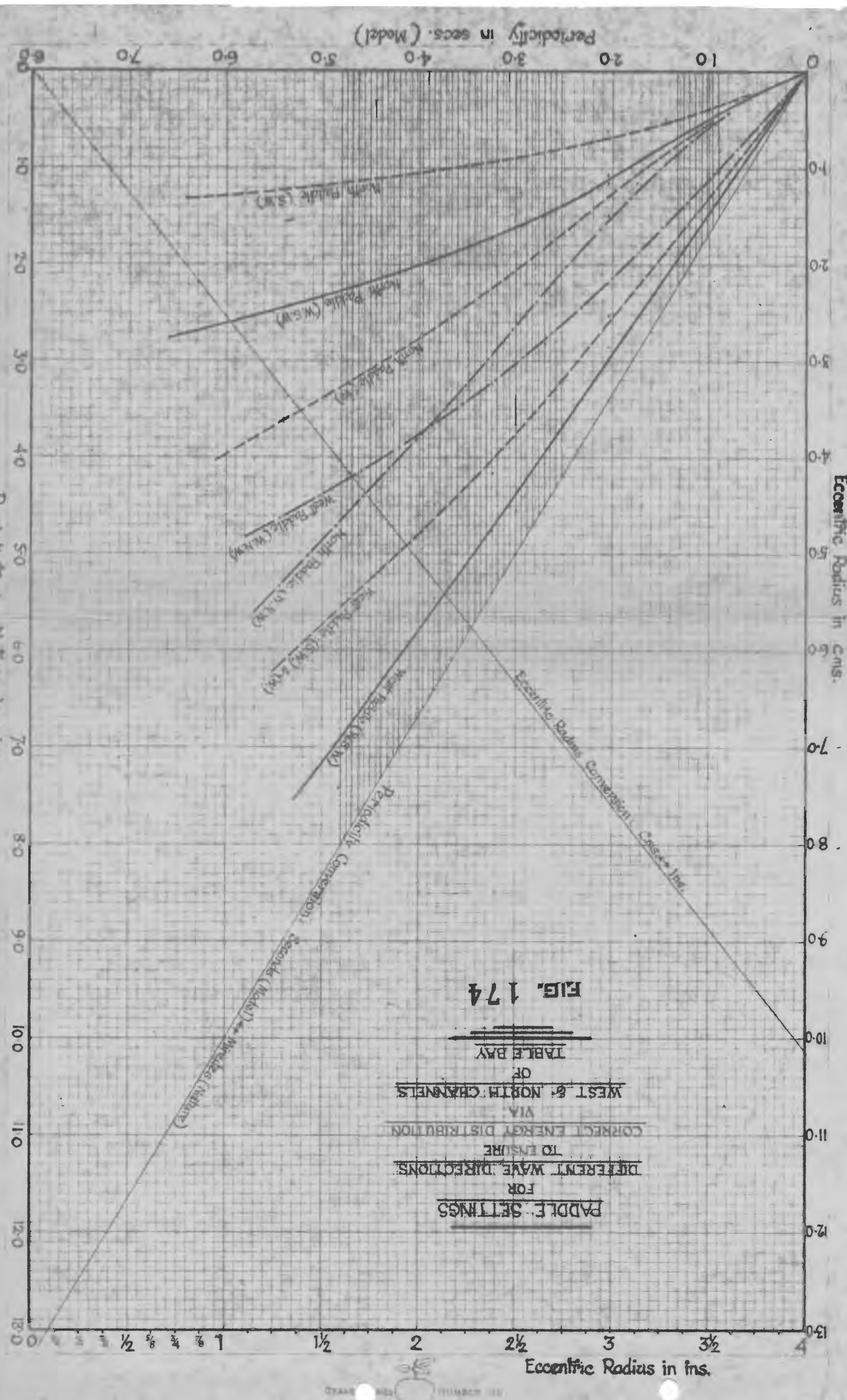


FIG. 174

PADDLE SETTINGS
FOR
DIFFERENT WAVE DIRECTIONS
TO ENSURE
CORRECT ENERGY DISTRIBUTION
VIA
WEST & NORTH CHANNELS
OF
TABLE BAY

FIG. 176. TYPICAL KYMATOGRAM IN THE DETERMINATION OF CRITICAL PERIODS OF OSCILLATION IN THE MODEL HARBOUR.

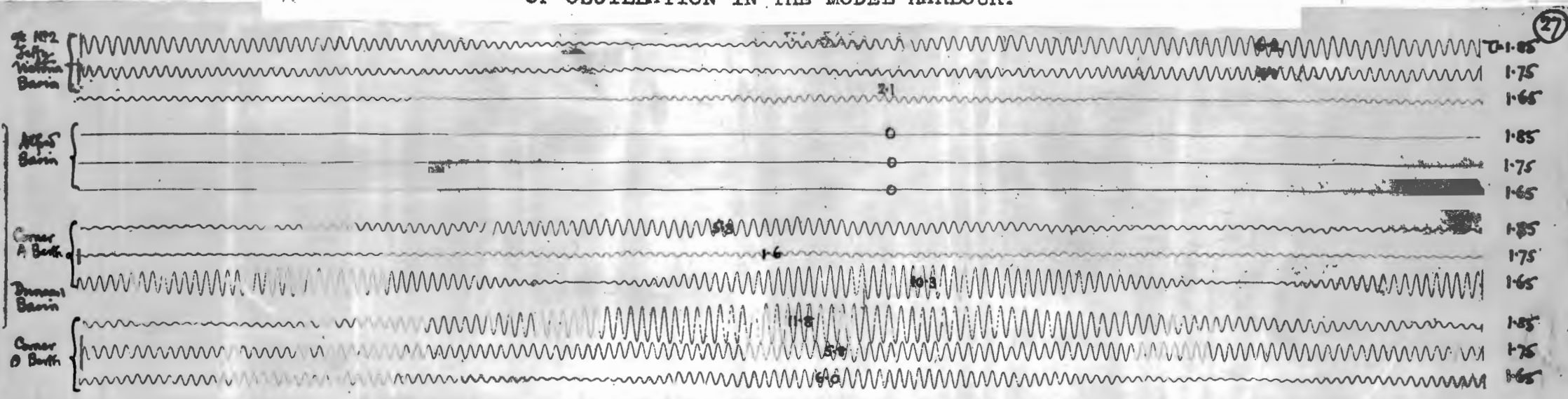


FIG. 176

FIG. 175. TYPICAL KYMATOGRAM IN TESTS OF THE TRAVELLING TIMES OF WAVES.

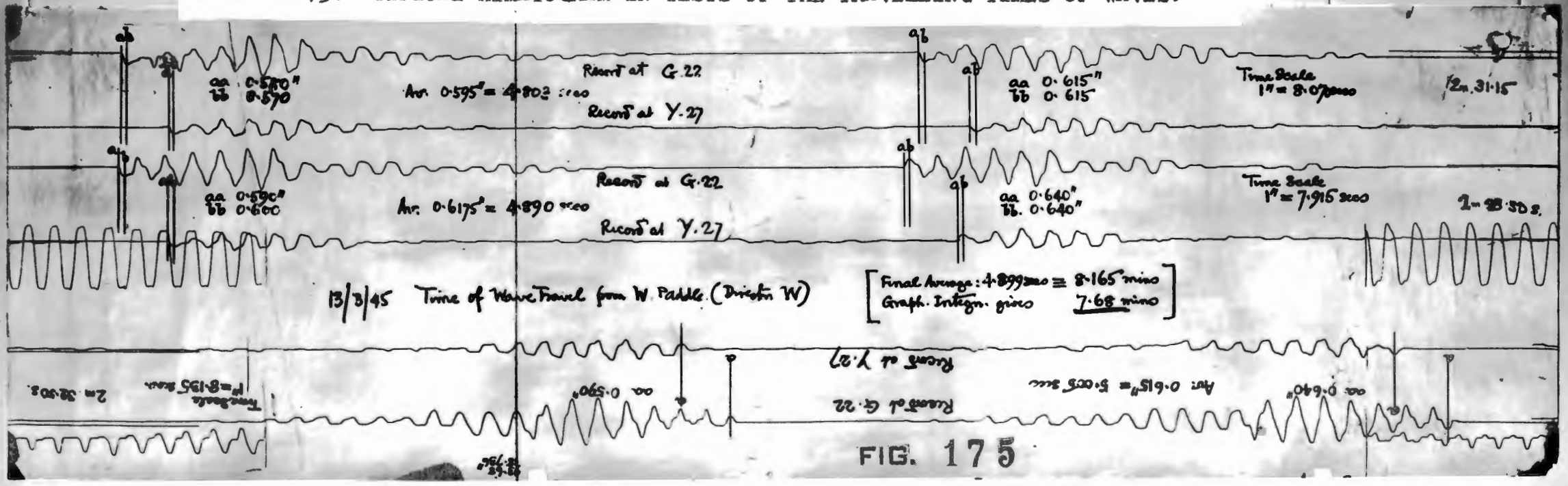
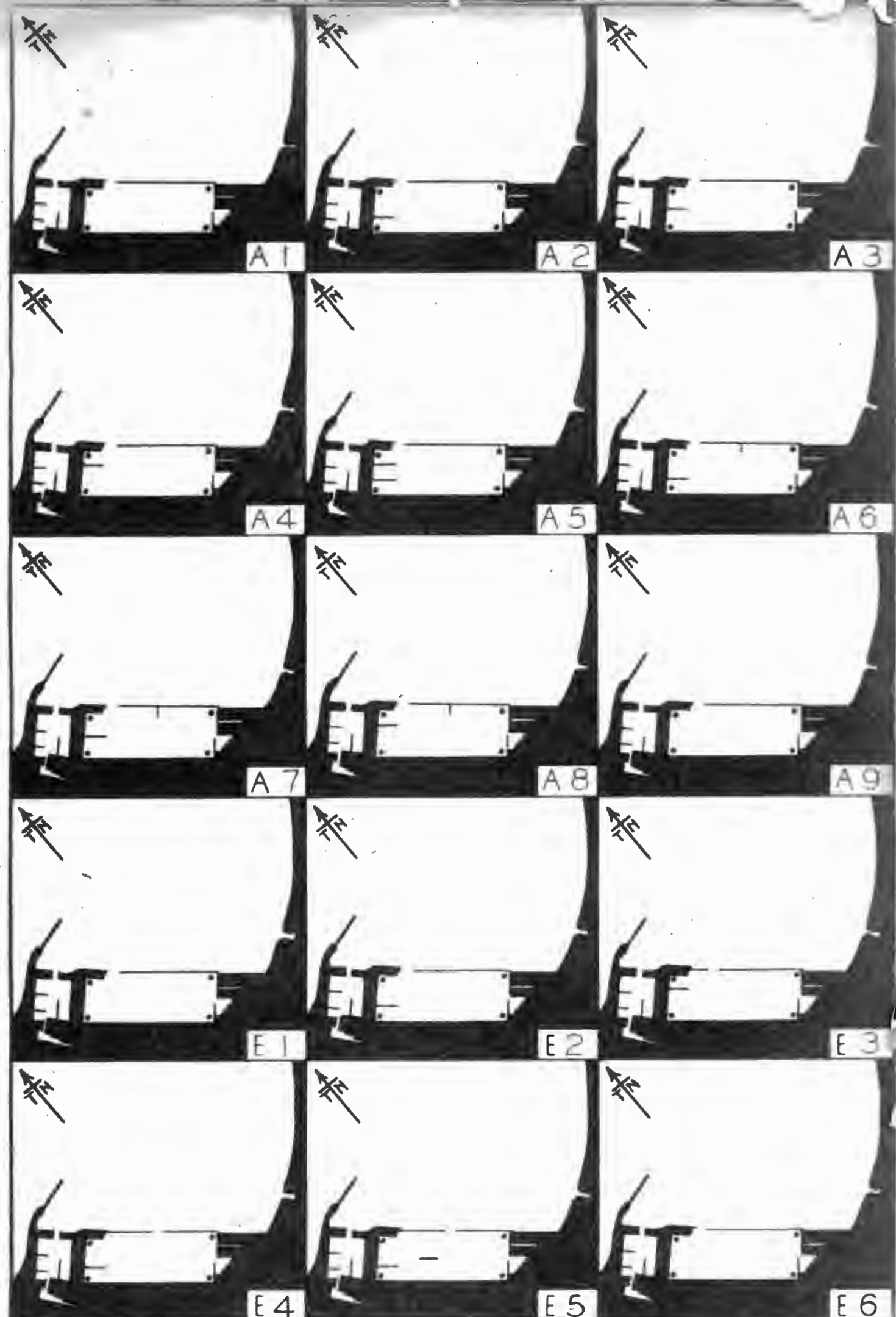


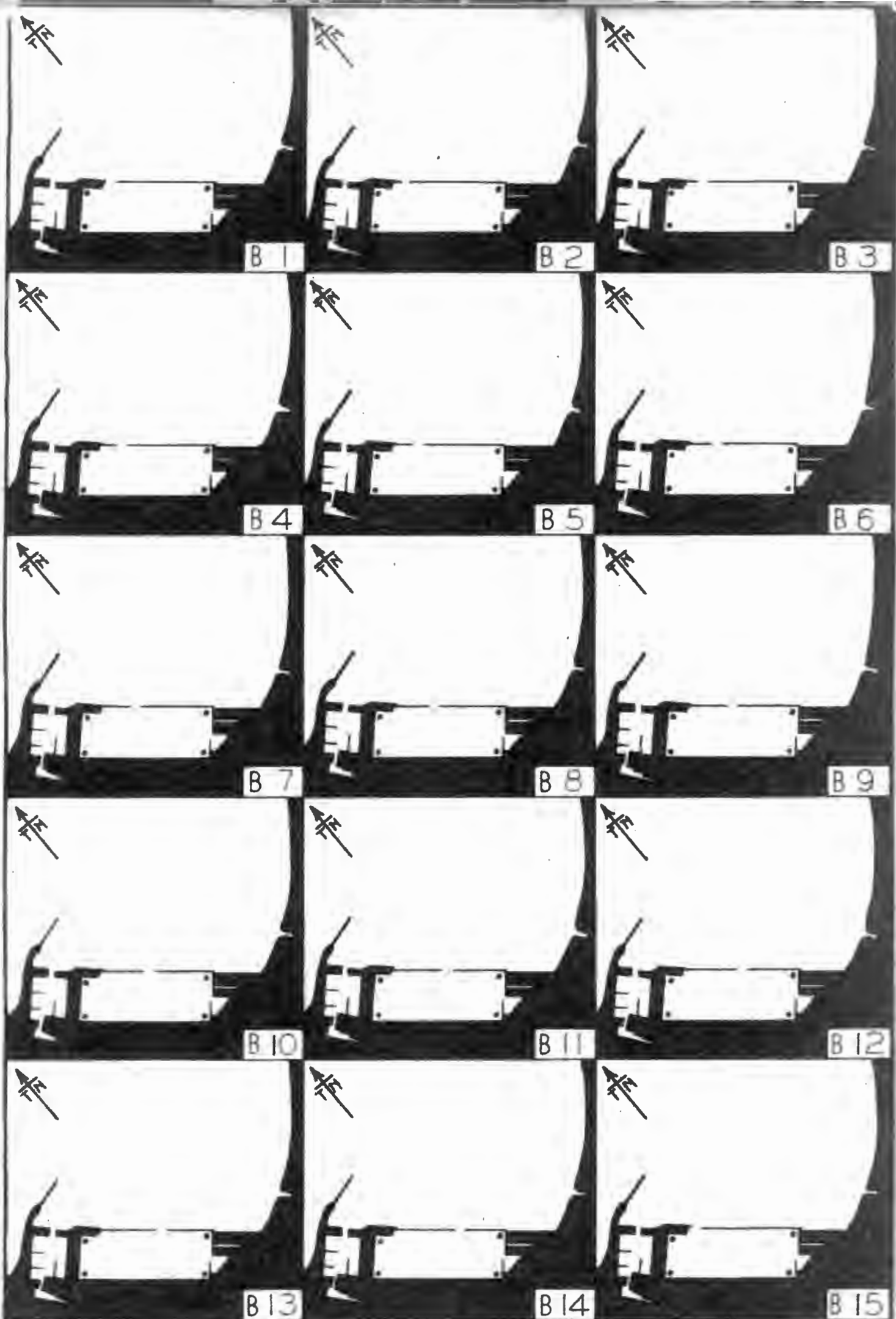
FIG. 175



DIAGRAMS OF TRIAL SOLUTIONS. 1946.

FIG. 177(a)

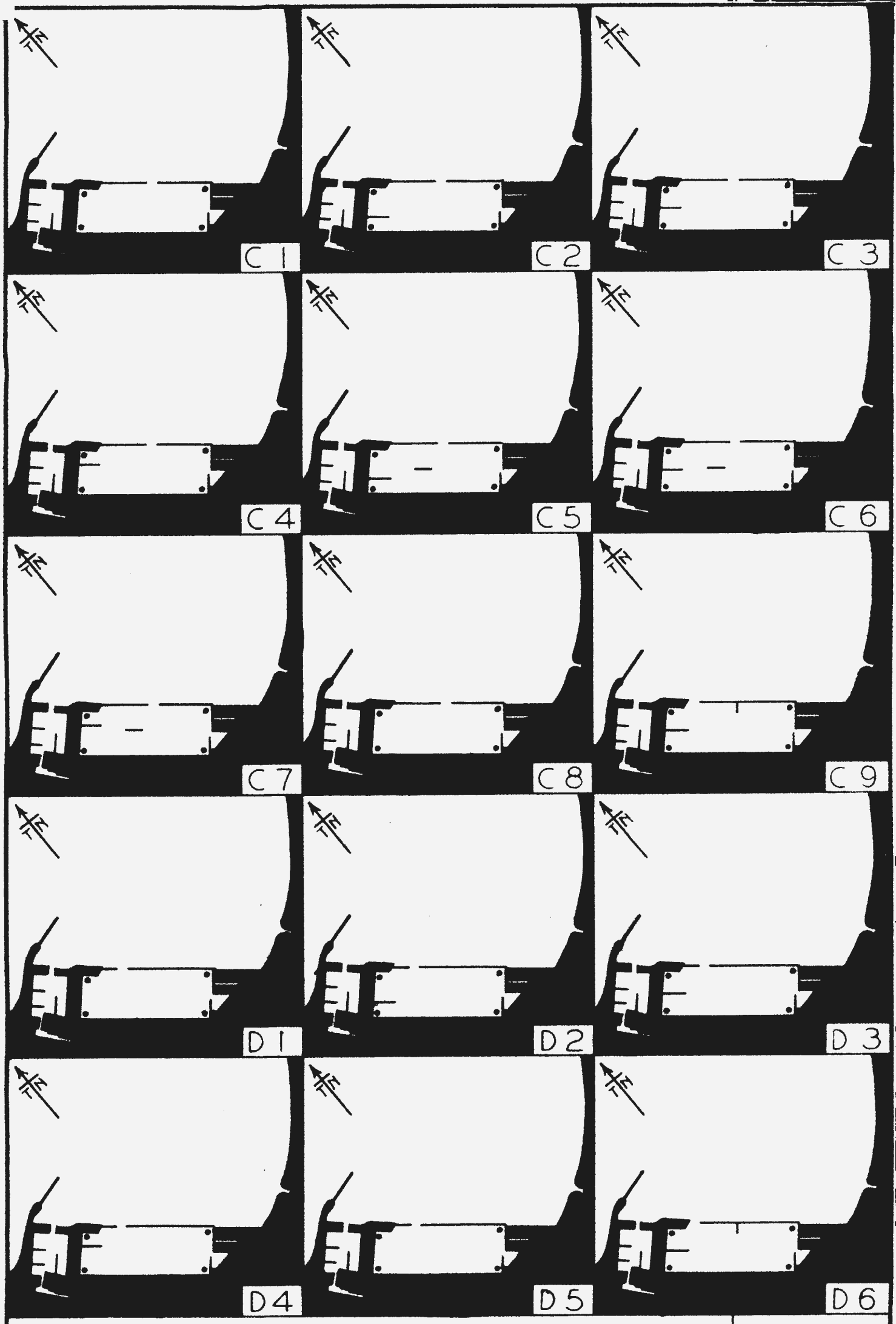
DWG Nº R.D. 140 C.



DIAGRAMS OF TRIAL SOLUTIONS. 1946

FIG. 177(b)

DWG Nº R.D. 140D.



DIAGRAMS OF TRIAL SOLUTIONS. 1946.

FIG. 177(C)

DWG Nº R.D. 140 E.

A1
A2
A3
A4
A5
A6
A7
A8
A9
100
50
0
CORNER 'A' BERTH
CORNER 'E' BERTH
CORNER 'O' BERTH
CORNER GRAVING DOCK
Vertical Range of Oscillation as percentage of Max.m Range for Existing Duncan Basin (A1 & A9).
Serial No. of Trial-Solution.
SYMBOLIC REPRESENTATION OF EFFICACY OF DIFFERENT TRIAL-SOLUTIONS IN QUELLING TRANSVERSE OSCILLATIONS IN THE DUNCAN DOCK.
Paddles operated together at Critical Periods already identified.
LEGEND.
Line
Wave Period (mins) & Direction
1·80 West
1·825 W.N.W.
1·625 West
1·65 W.N.W.

FIG. 178

EFFICACY OF SHIFTING THE ENTRANCE ALONG THE EASTERN MOLE IN QUELLING TRANSVERSE OSCILLATIONS IN DUNCAN DOCK.

(Paddle operated together at critical speeds already identified previously)

Vertical Range of Oscillation as percentage of Max.m Range for Existing Duncan Dock. (B1 & B15)

CORNER "A" BERTH

CORNER "E" BERTH

CORNER "C" BERTH

CORNER GRAVING DOCK

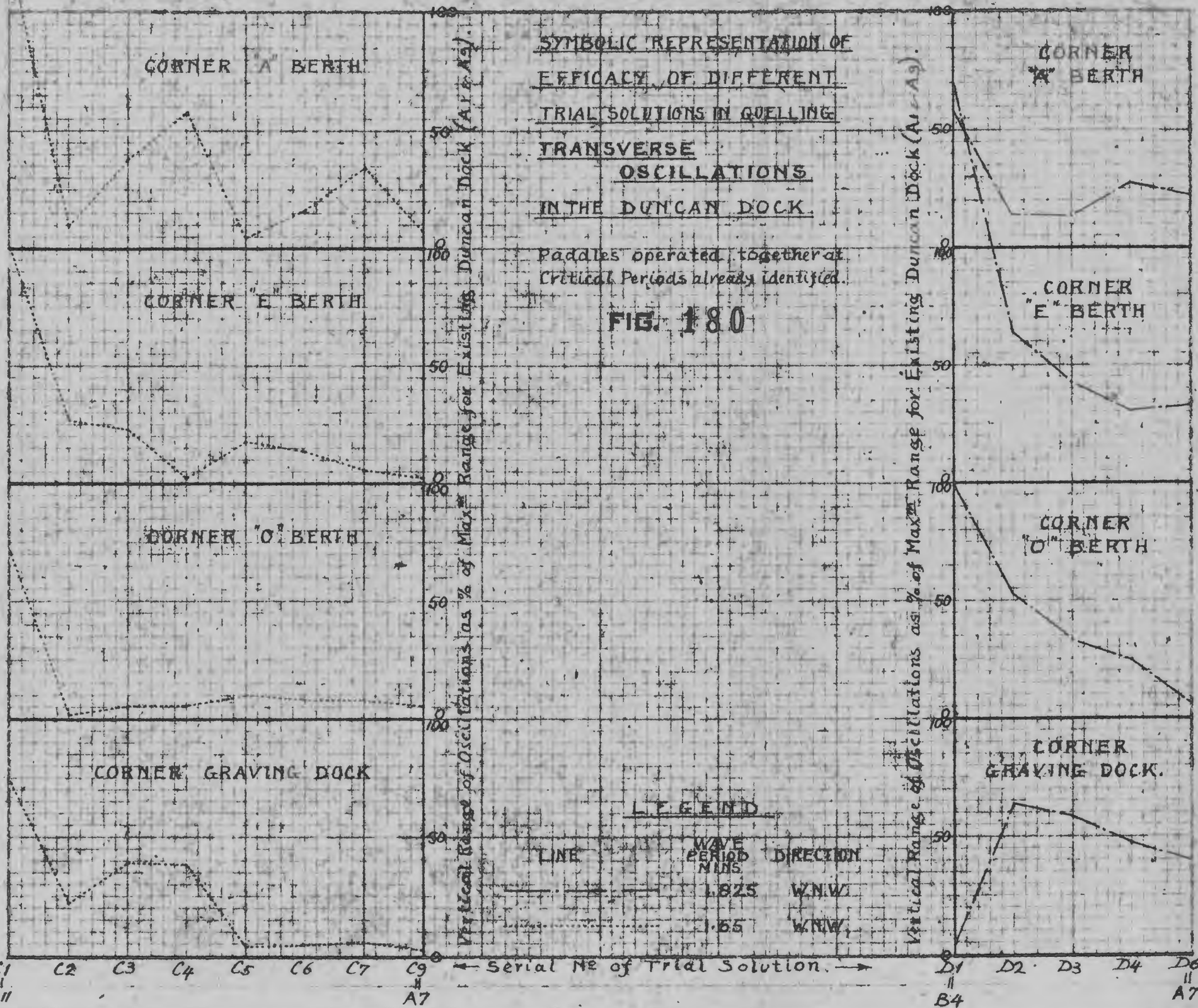
0 50 100 150 100 50 0 100 50 0 50 100

12 50 14 50 16 50 18 50 20 50 22 50 24 50 26 50 28 50 30 50 32 50 34 50 36 50 38 50 FEET.

DISTANCE OF CENTRE OF ENTRANCE FROM CORNER "A" BERTH

A1 B15	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	Serial No. of Trial-Solution.
														Line
LEGEND:														Wave Period (Mins.) & Direction
														1.825 W.N.W.
														1.65 W.N.W.

FIG. 179


SYMBOLIC REPRESENTATION OF EFFICACY OF DIFFERENT TRIAL SOLUTIONS IN QUELLING TRANSVERSE OSCILLATIONS IN THE DUNCAN DOCK.
Paddles operated together at Critical Periods already identified.
FIG. 180
CORNER "A" BERTH
CORNER "E" BERTH
CORNER "O" BERTH
CORNER GRAVING DOCK
CORNER "A" BERTH
CORNER "E" BERTH
CORNER "O" BERTH
CORNER GRAVING DOCK.
Vertical Range of Oscillations as % of Max.m Range for Existing Duncan Dock (A1 - A9).
Vertical Range of Oscillations as % of Max.m Range for Existing Duncan Dock (A1 - A9).
100
50
0
← Serial Nº of Trial Solution. →
C1 C2 C3 C4 C5 C6 C7 C9
B11 A7
D1 D2 D3 D4 D6
B4 A7
LEGEND
LINE
WAVE PERIOD SECS
DIRECTION
1.825 W.N.W.
1.65 W.N.W.

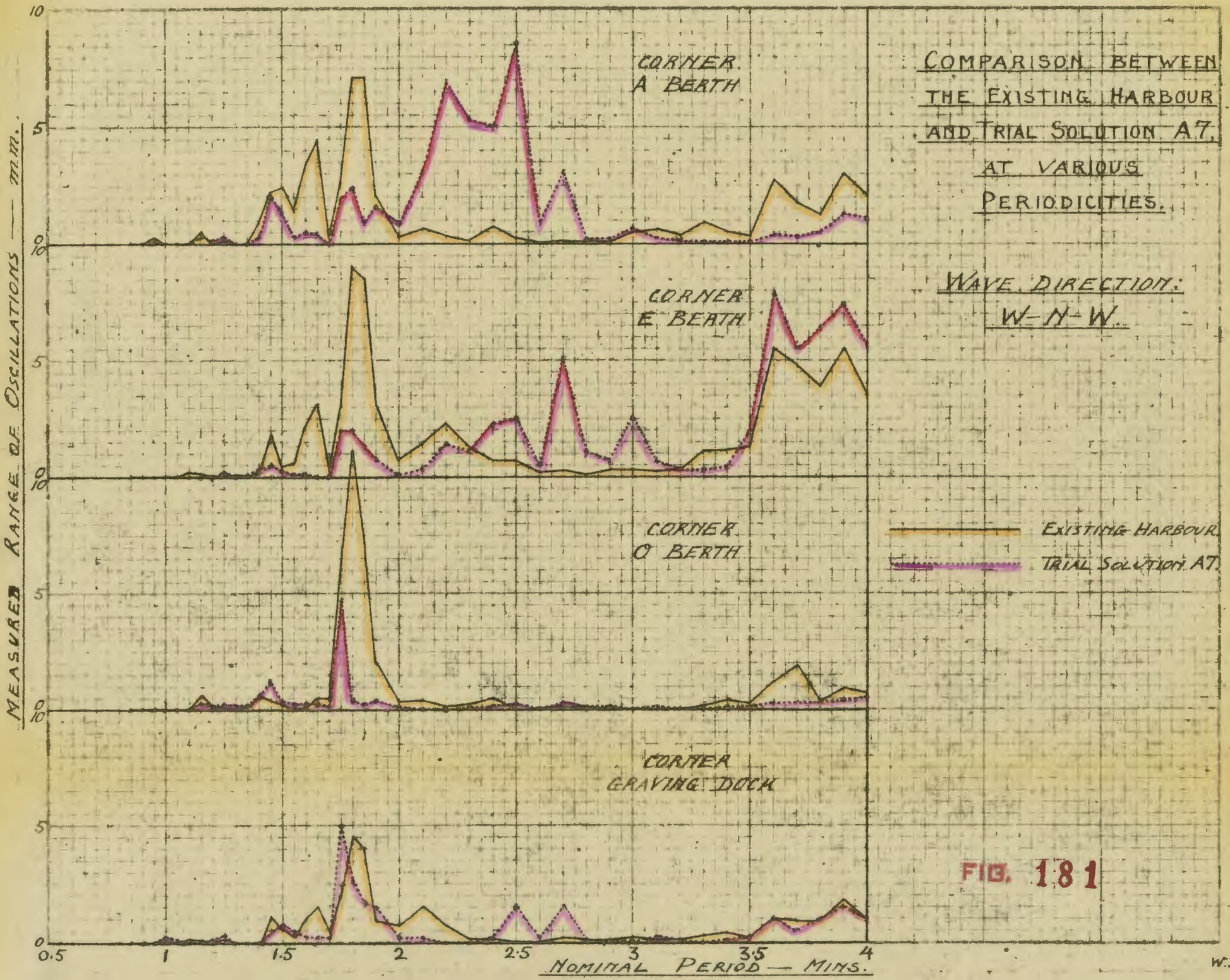
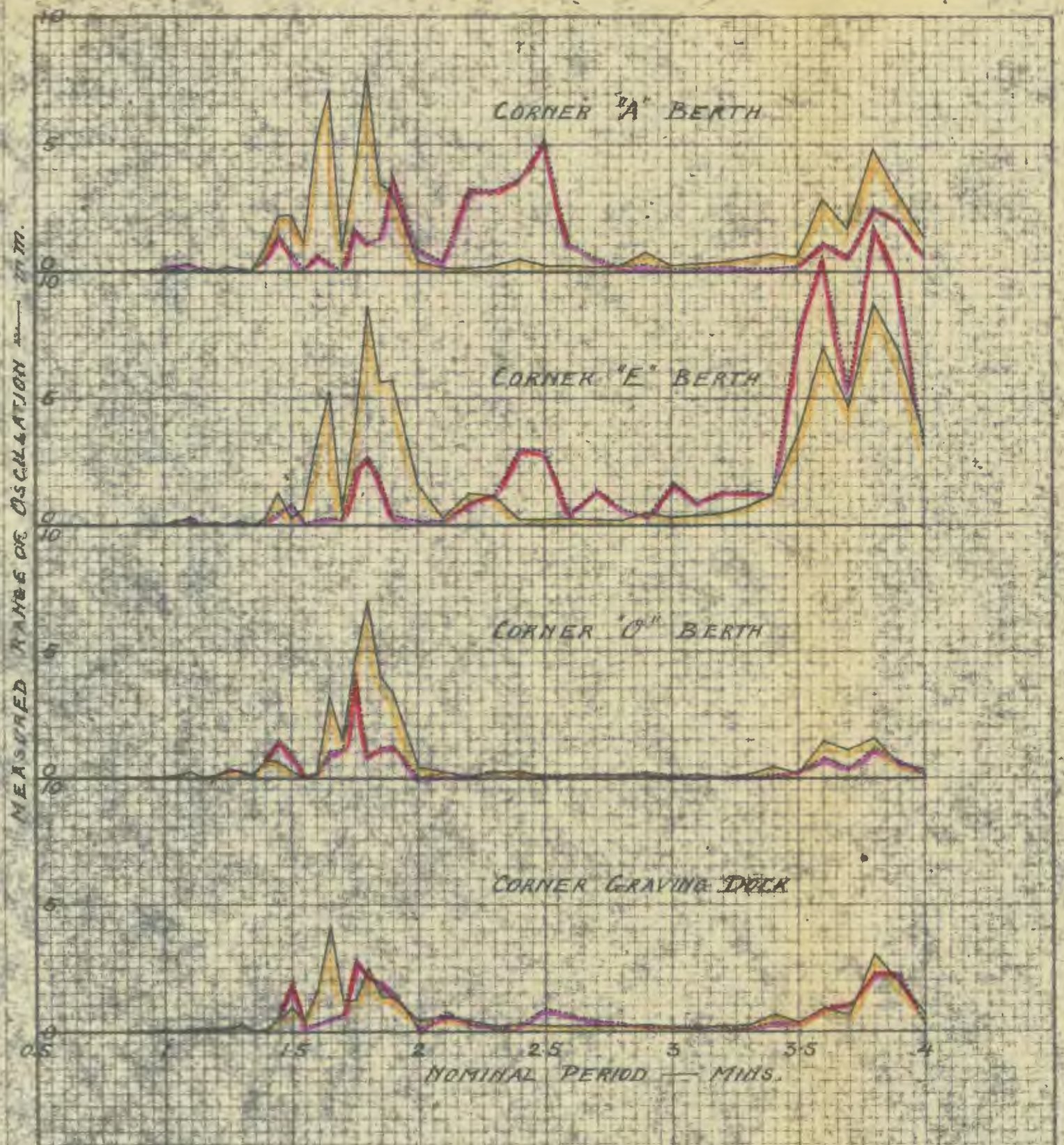

COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION A7, AT VARIOUS PERIODICITIES.
WAVE DIRECTION: W-N-W
CORNER A BERTH
CORNER E BERTH
CORNER O BERTH
CORNER GRAVING DOCK
EXISTING HARBOUR
TRIAL SOLUTION A7
MEASURED RANGE OF OSCILLATIONS — m.m.
NOMINAL PERIOD — MINS.
0.5
1
1.5
2
2.5
3
3.5
4
0
5
10
W.J.

FIG. 181



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION E2 AT VARIOUS PERIODICITIES.

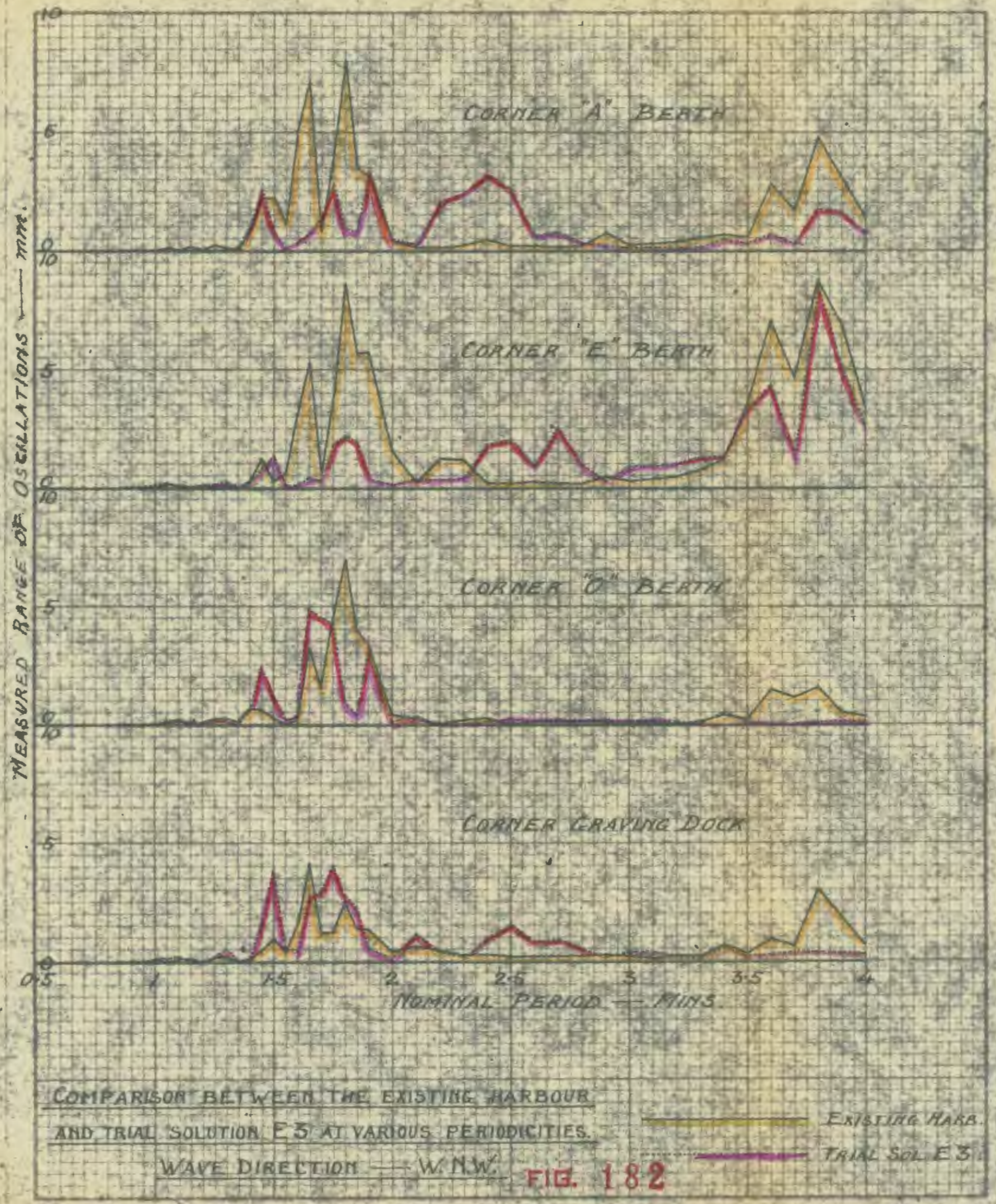
WAVE DIRECTION — W.N.W.

EXISTING HARB.

TRIAL SOL. E 2.

FIG. 182

W.J.

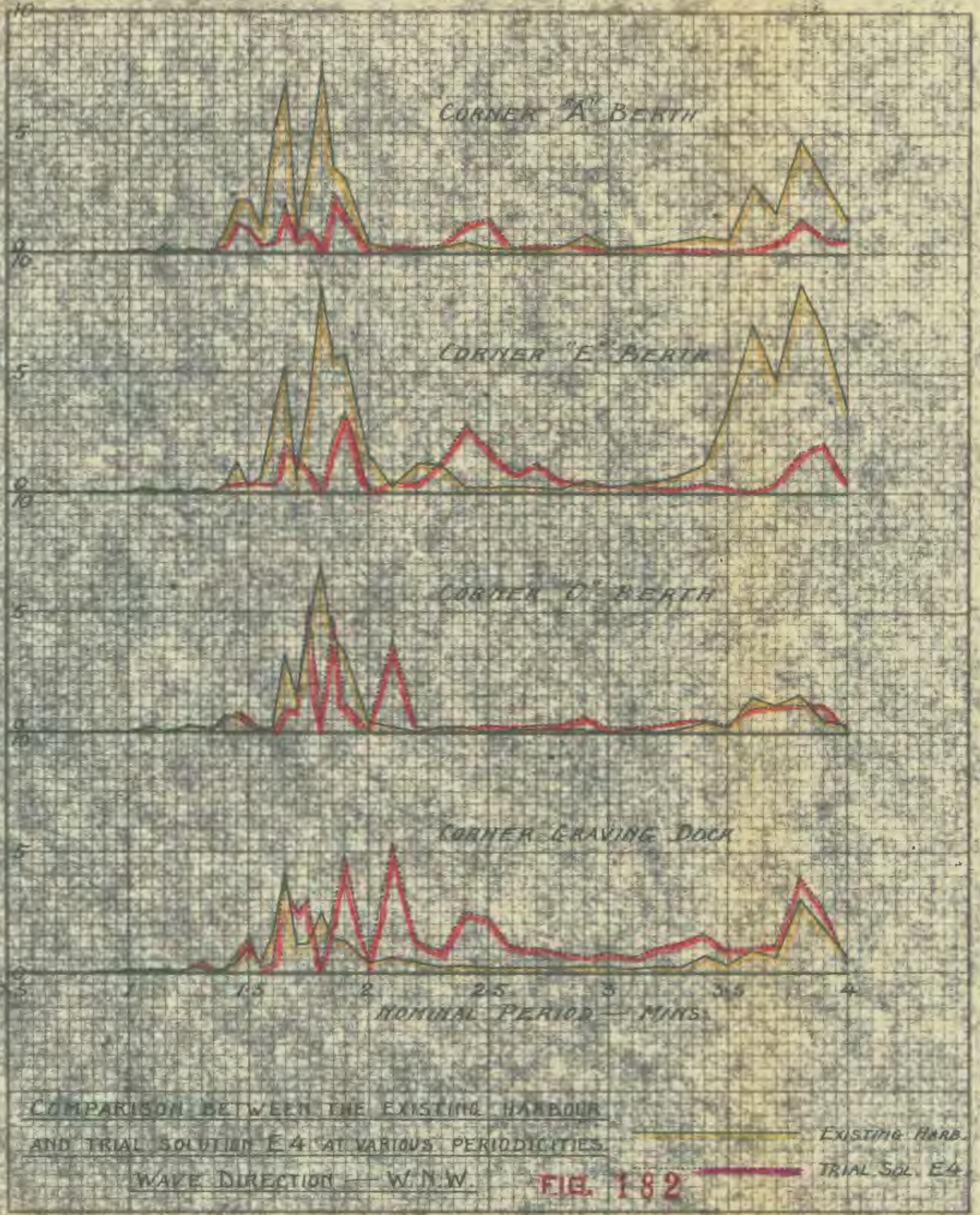


COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION E3 AT VARIOUS PERIODICITIES.

WAVE DIRECTION — W.N.W.

FIG. 182

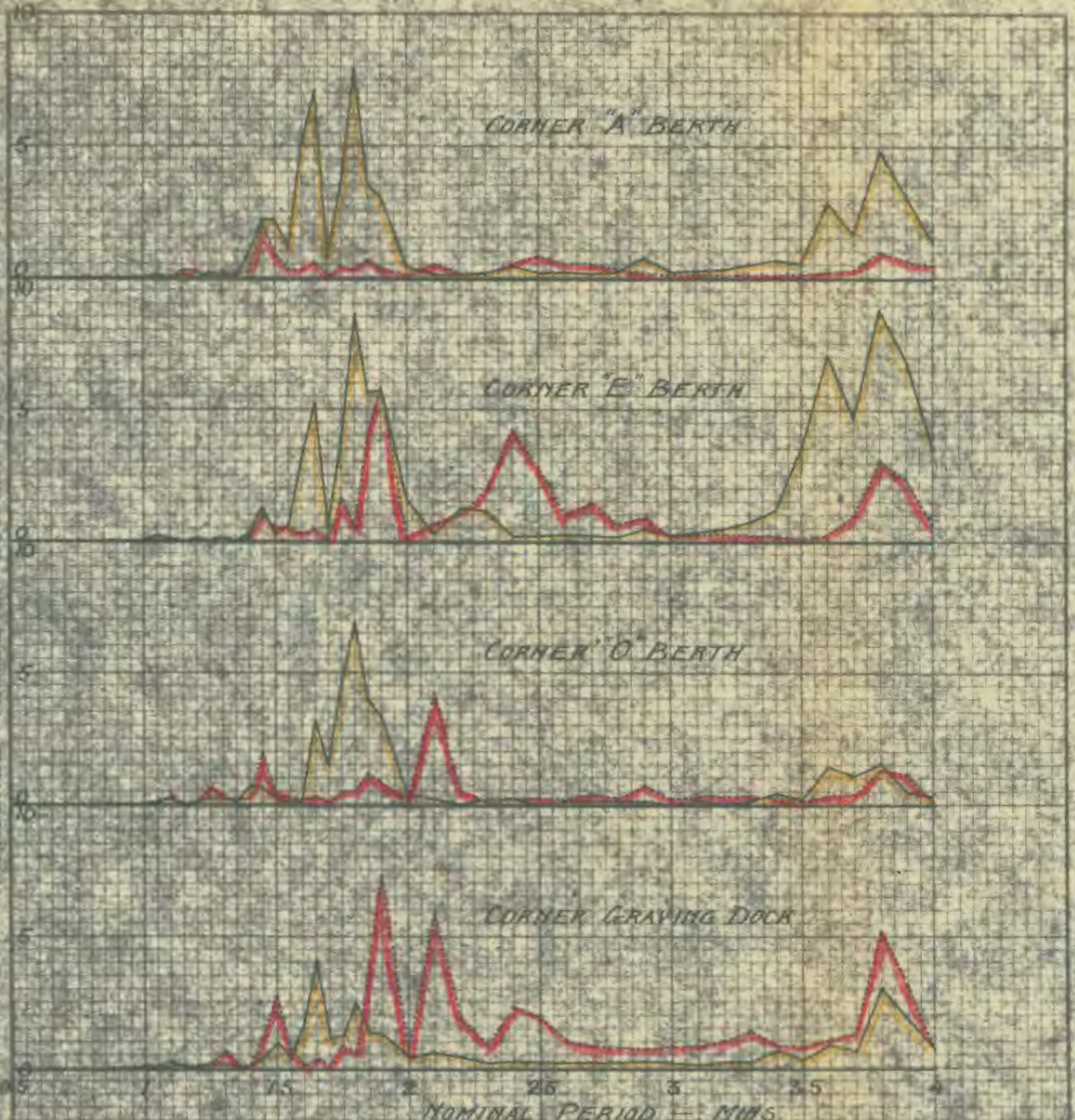
W.J



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION E 4 AT VARIOUS PERIODICITIES.

WAVE DIRECTION — W.N.W.

FIG. 182



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION E 5 AT VARIOUS PERIODICITIES.

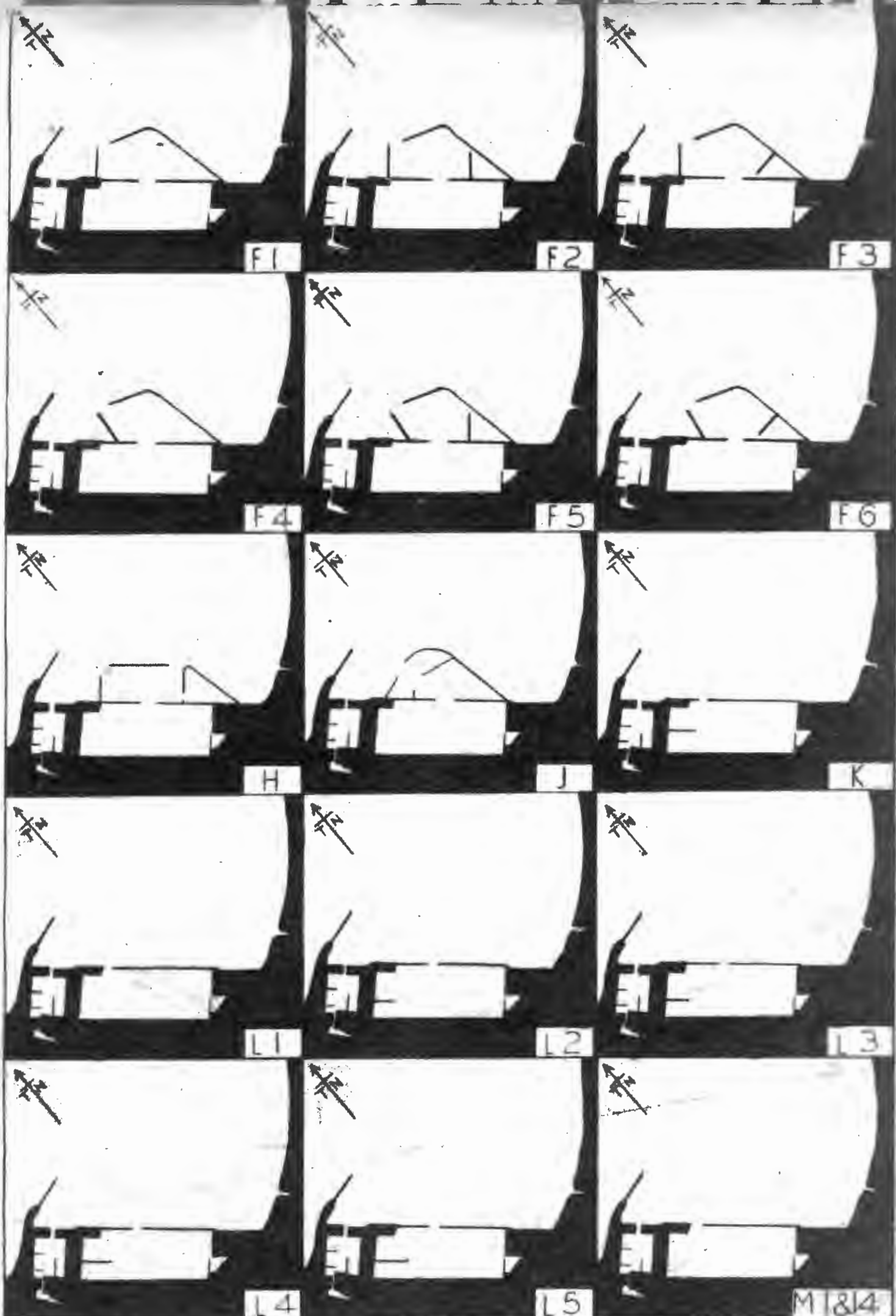
WAVE DIRECTION — W.N.W.

EXISTING HARB.

TRIAL SOL. E 5.

FIG. 182

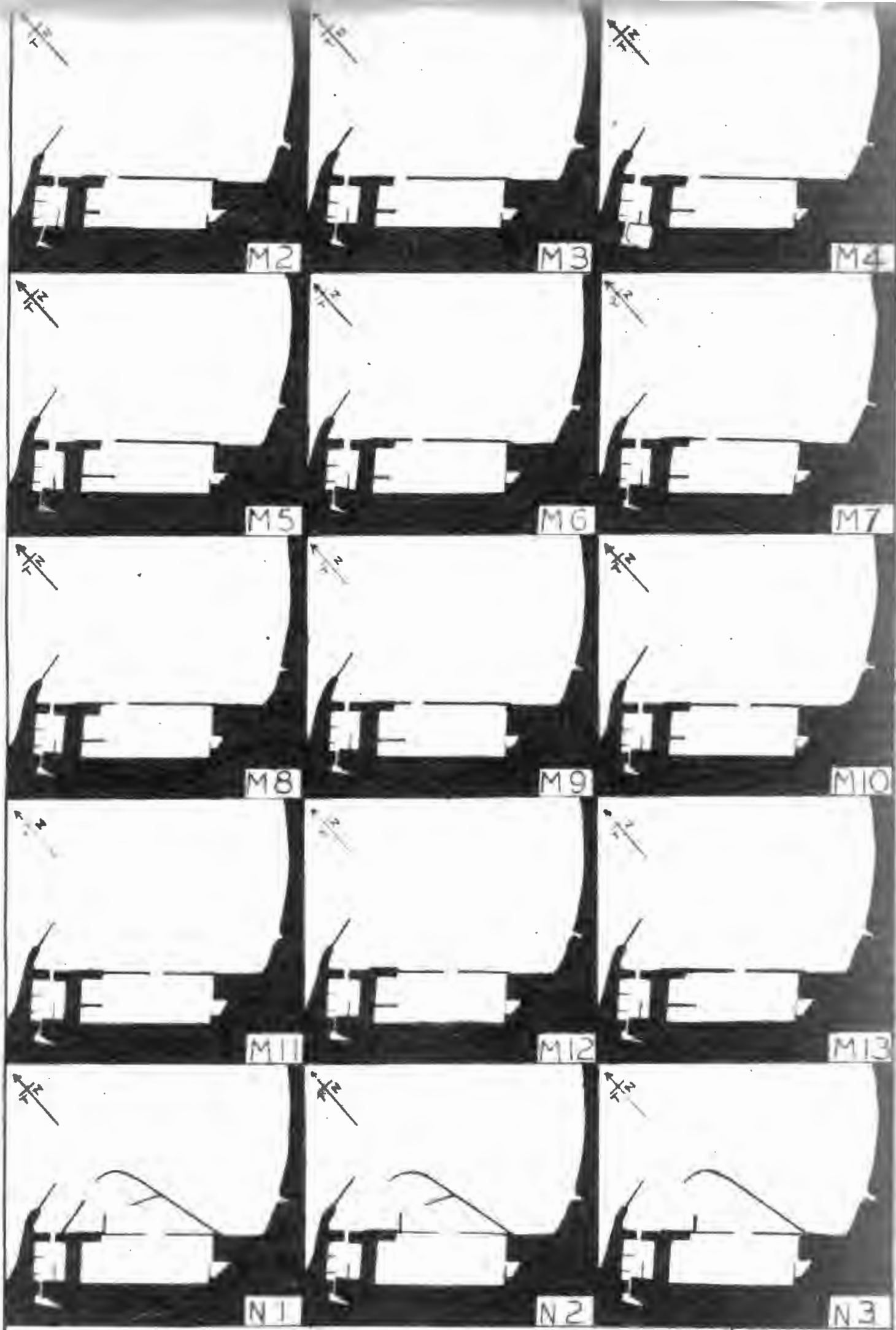
W.H.



DIAGRAMS OF TRIAL SOLUTIONS. 1946

DWG. Nº R.D. 140 F.

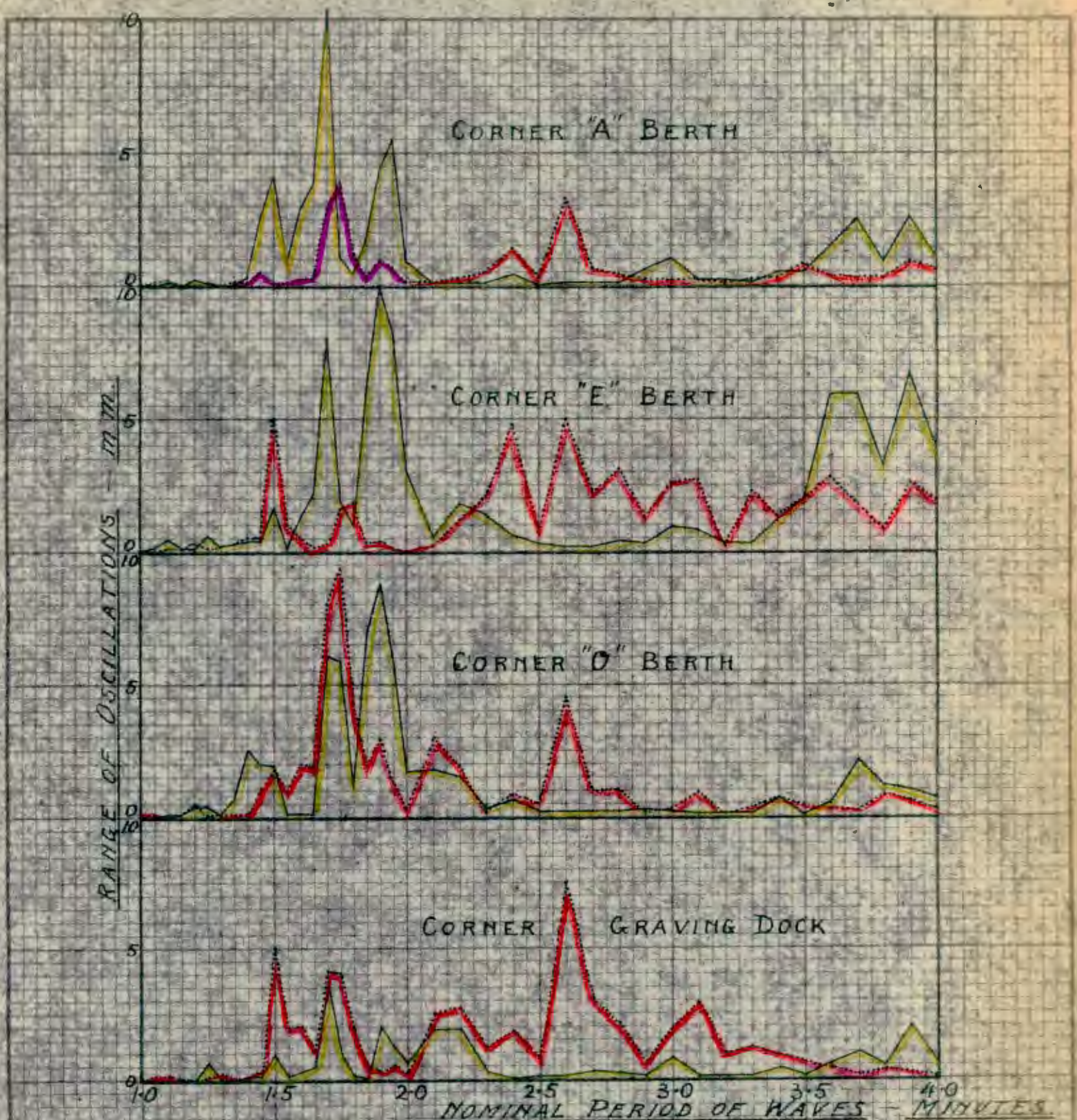
FIG. 183(a)



DIAGRAMS OF TRIAL SOLUTIONS 1946

FIG. 183(b)

DWG. N° R.D. 140G



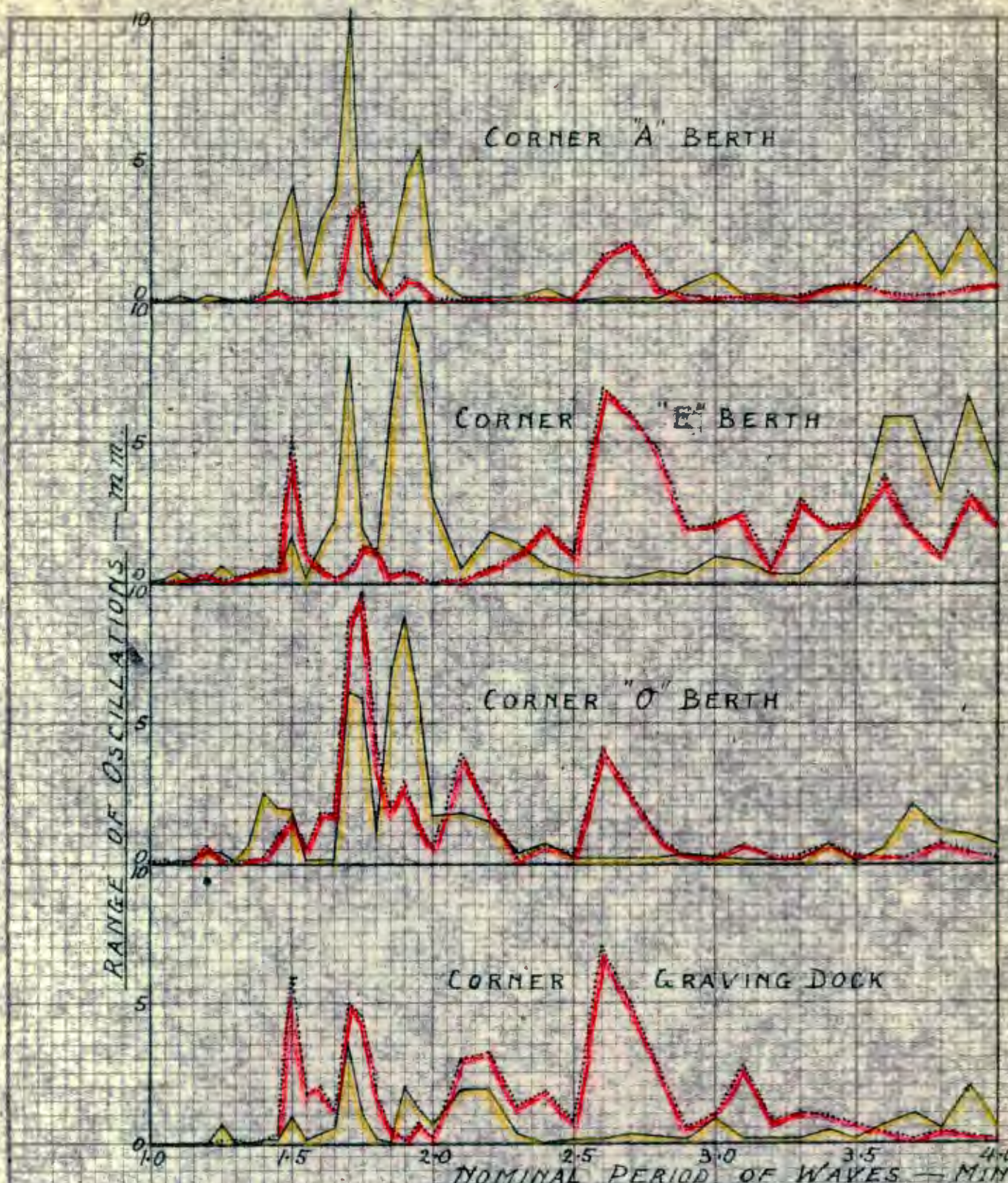
COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION L2 AT VARIOUS PERIODICITIES.

WAVE DIRECTION — W. N.W.

EXISTING HARB.

TRIAL SOL. L 2.

FIG. 184(a)



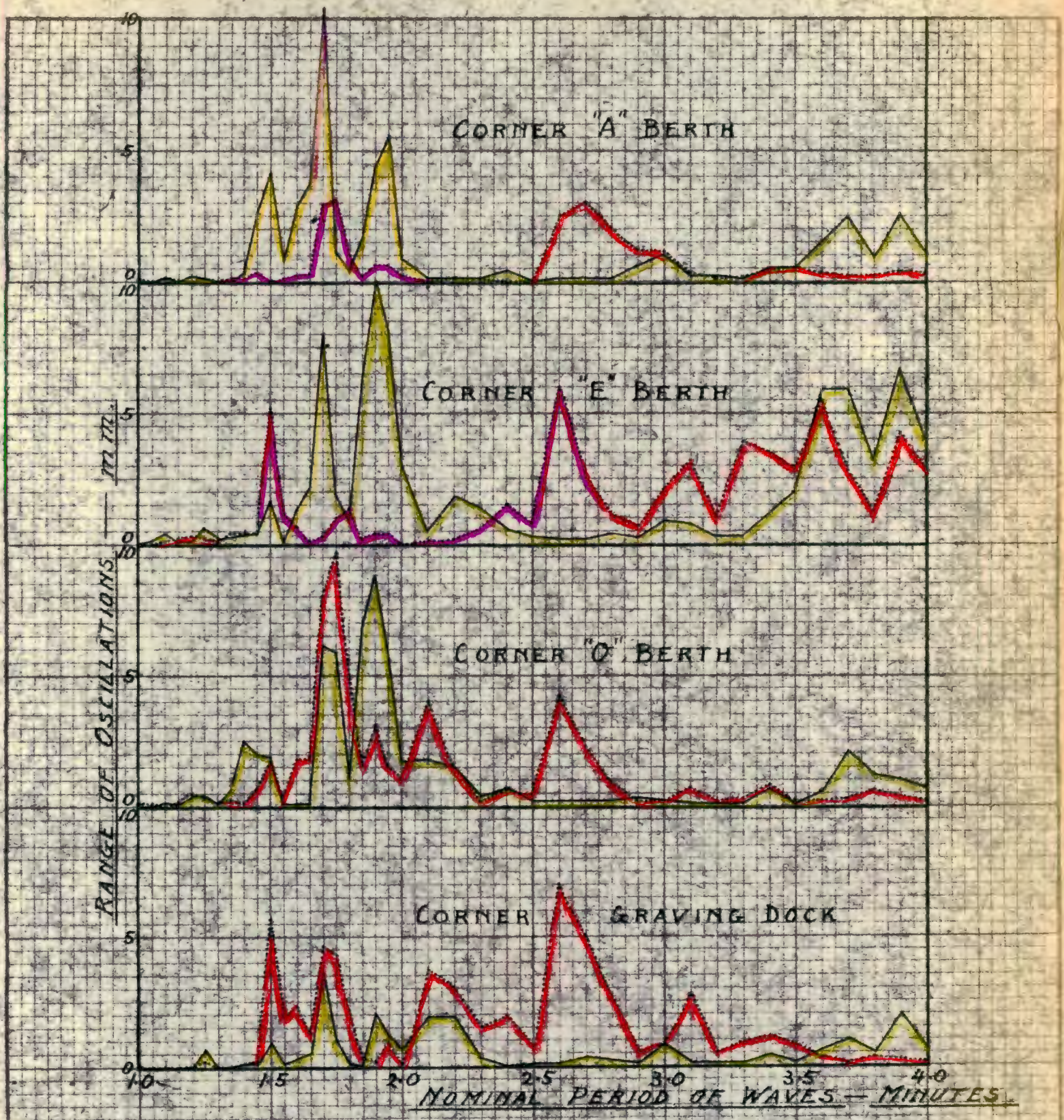
COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION L3 AT VARIOUS PERIODICITIES.

WAVE DIRECTION — W.N.W.

EXISTING HARB.

TRIAL SOL. L3

ENG. 184(b) W.J



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION L4 AT VARIOUS PERIODICITIES.

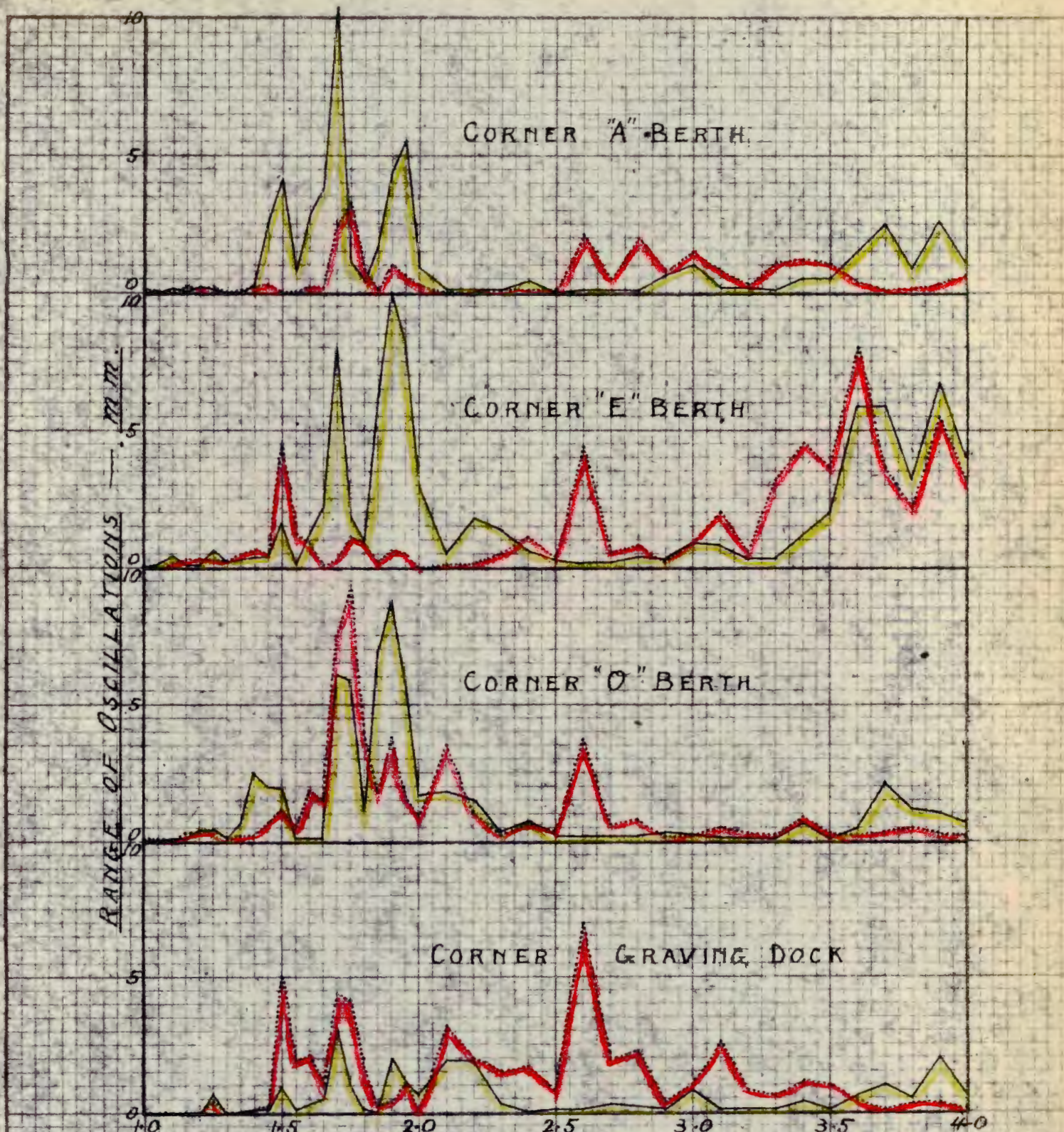
WAVE DIRECTION — W.N.W.

EXISTING HARB.

TRIAL SOL. L4.

FIG. 184(c)

W.J



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION L 5 AT VARIOUS PERIODICITIES.

WAVE DIRECTION — W.N.W.

——— EXISTING HARB.

——— TRIAL SOL. L 5.

FIG. 184(d)

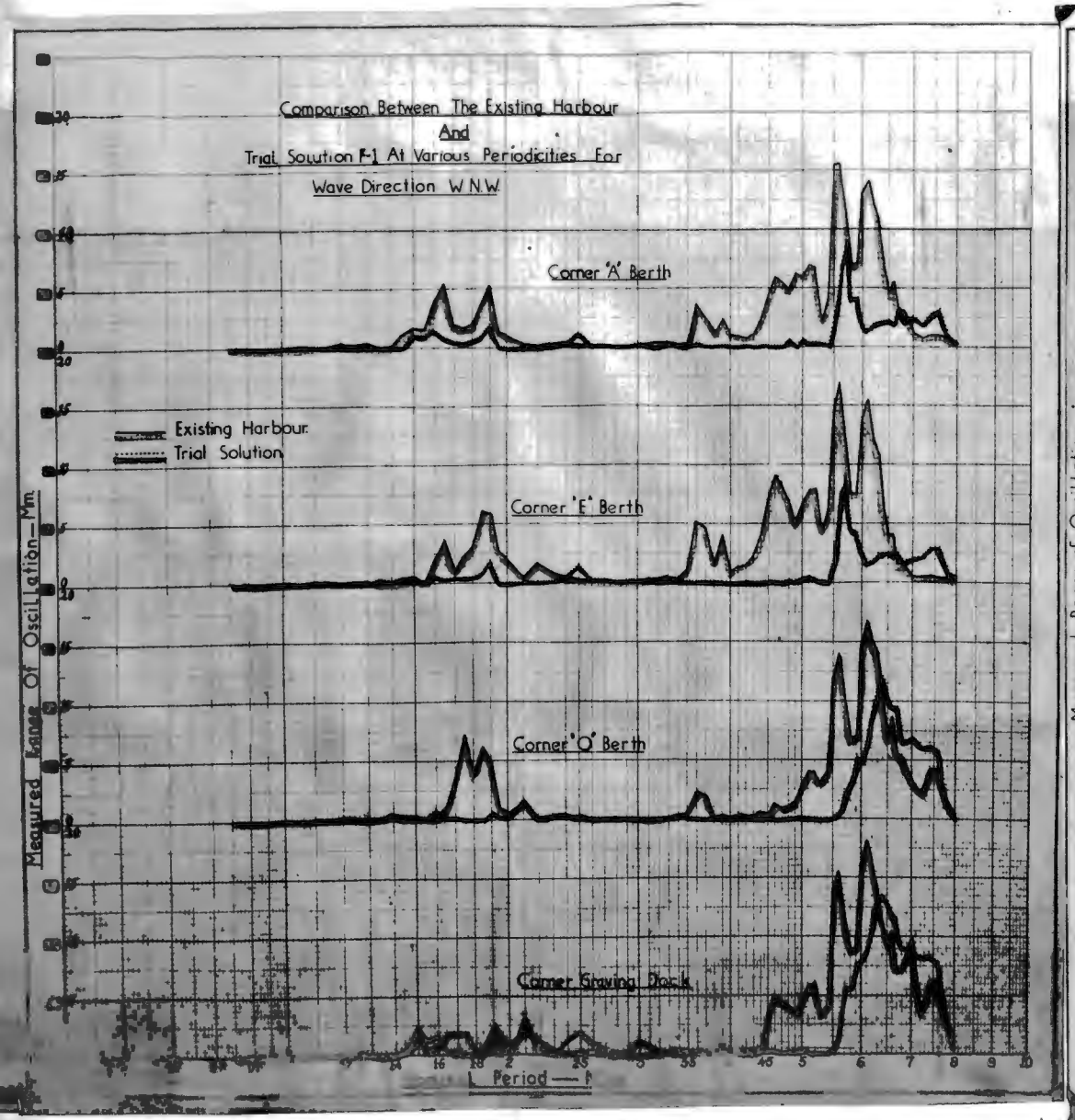


FIG. 185

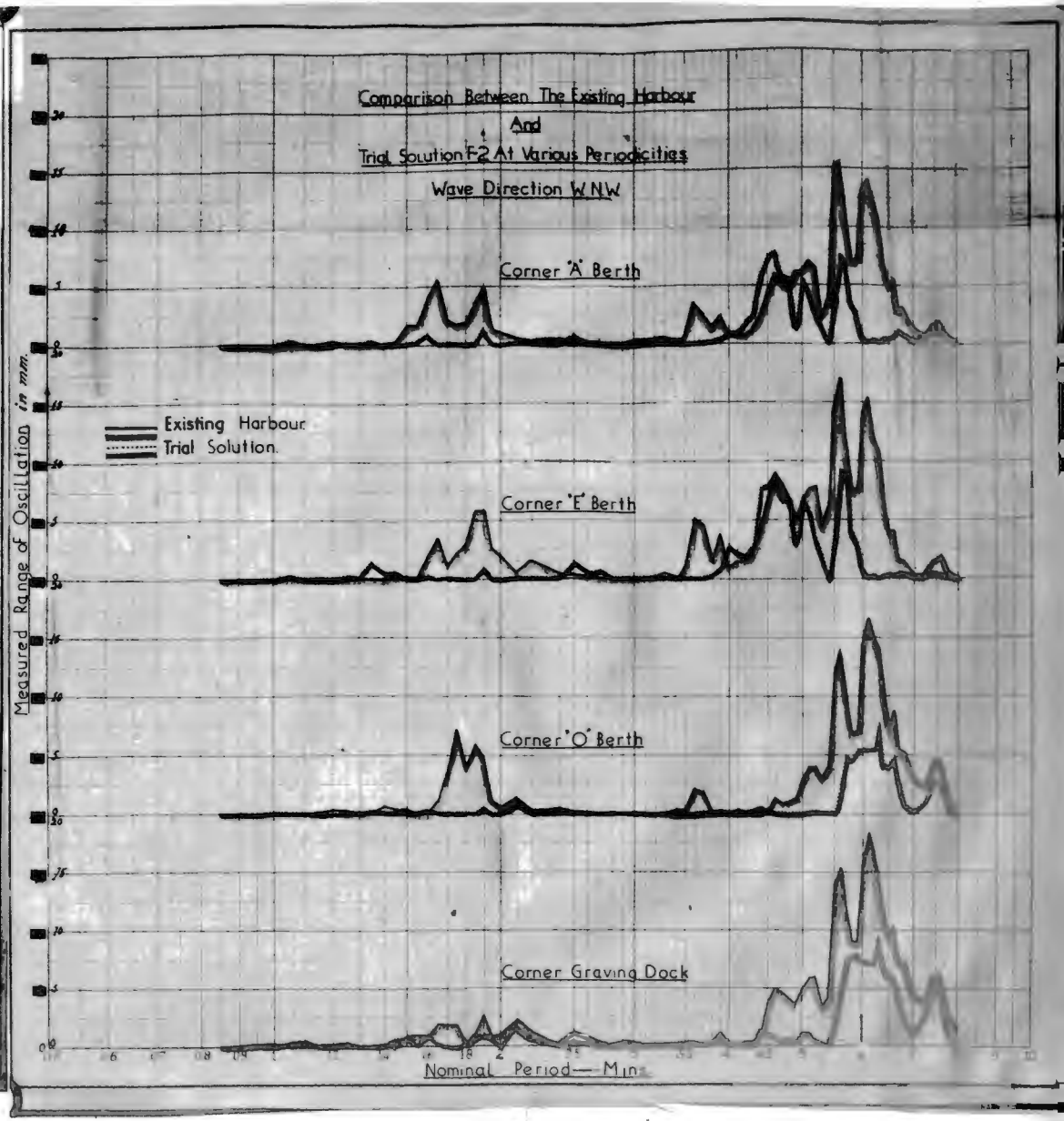


FIG. 185

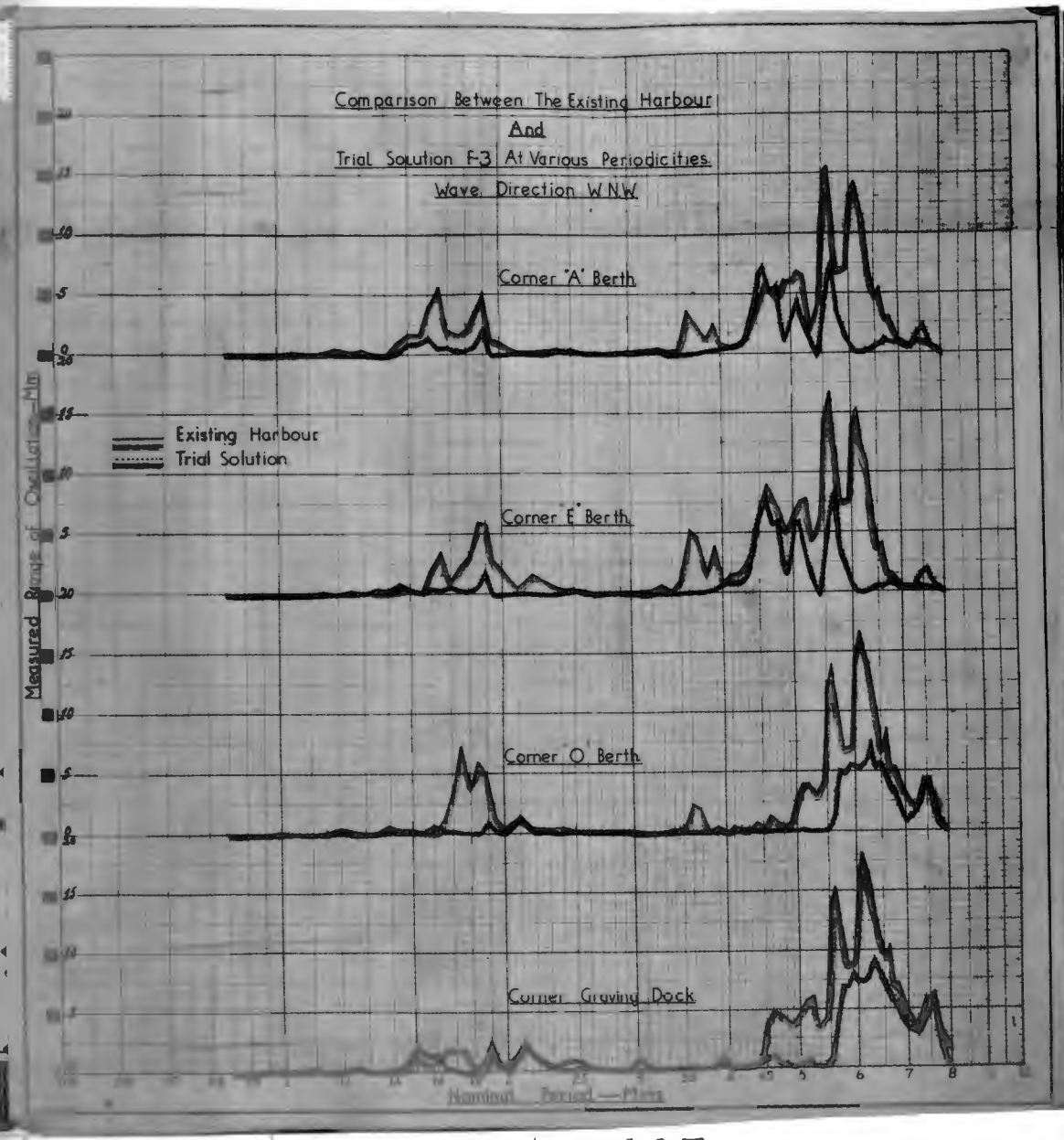


FIG. 185 (c)

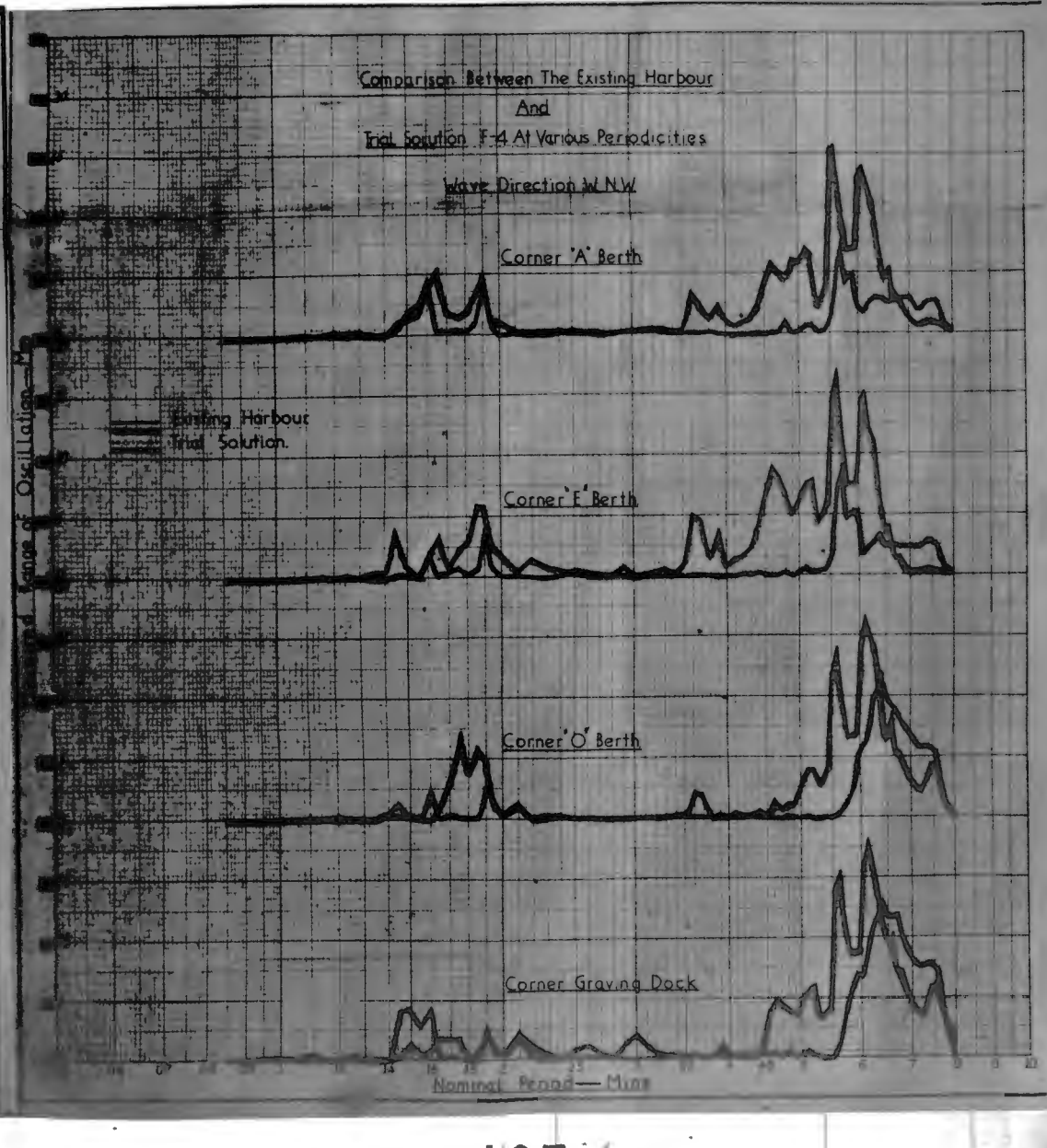


FIG. 185 (d)

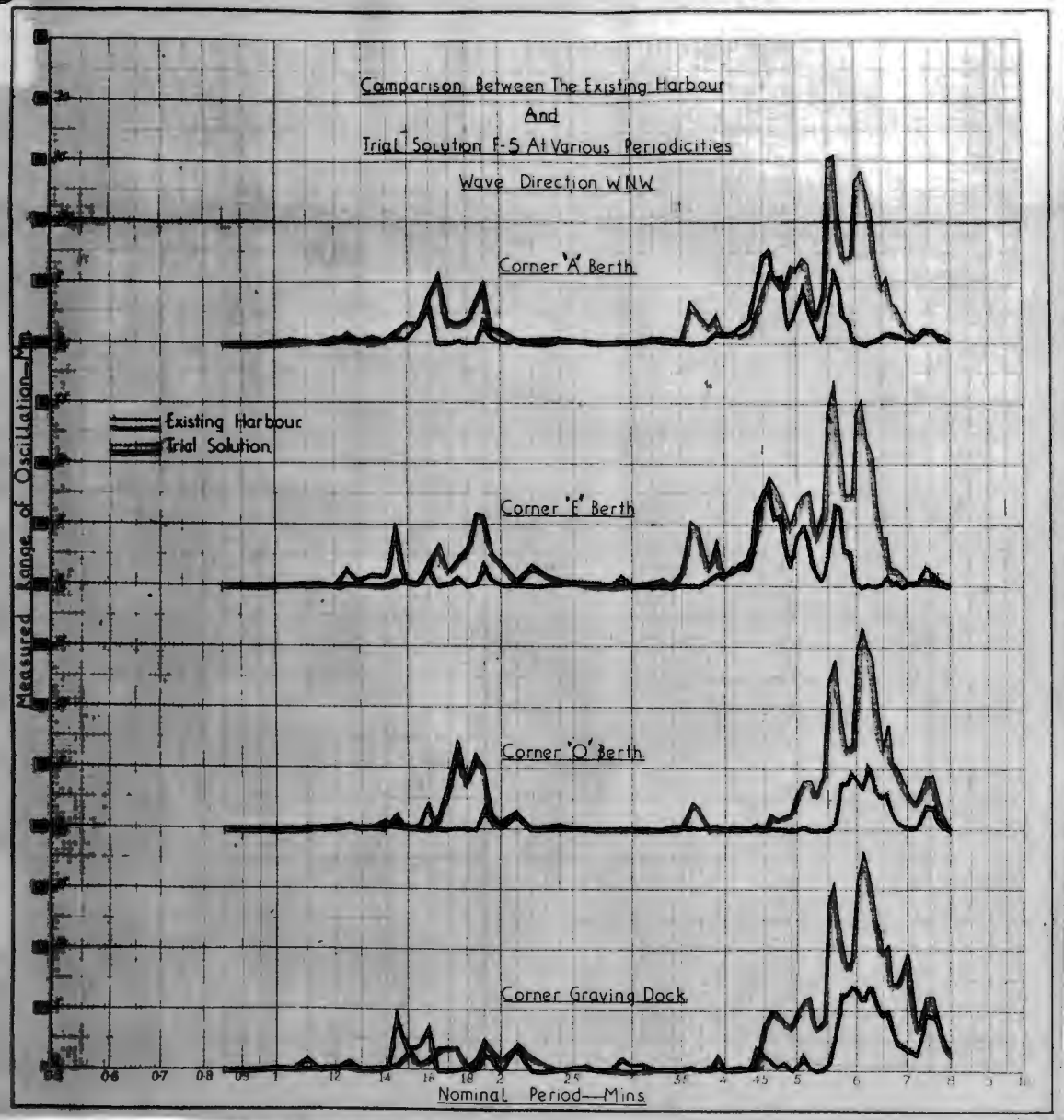


FIG. 185 (e)

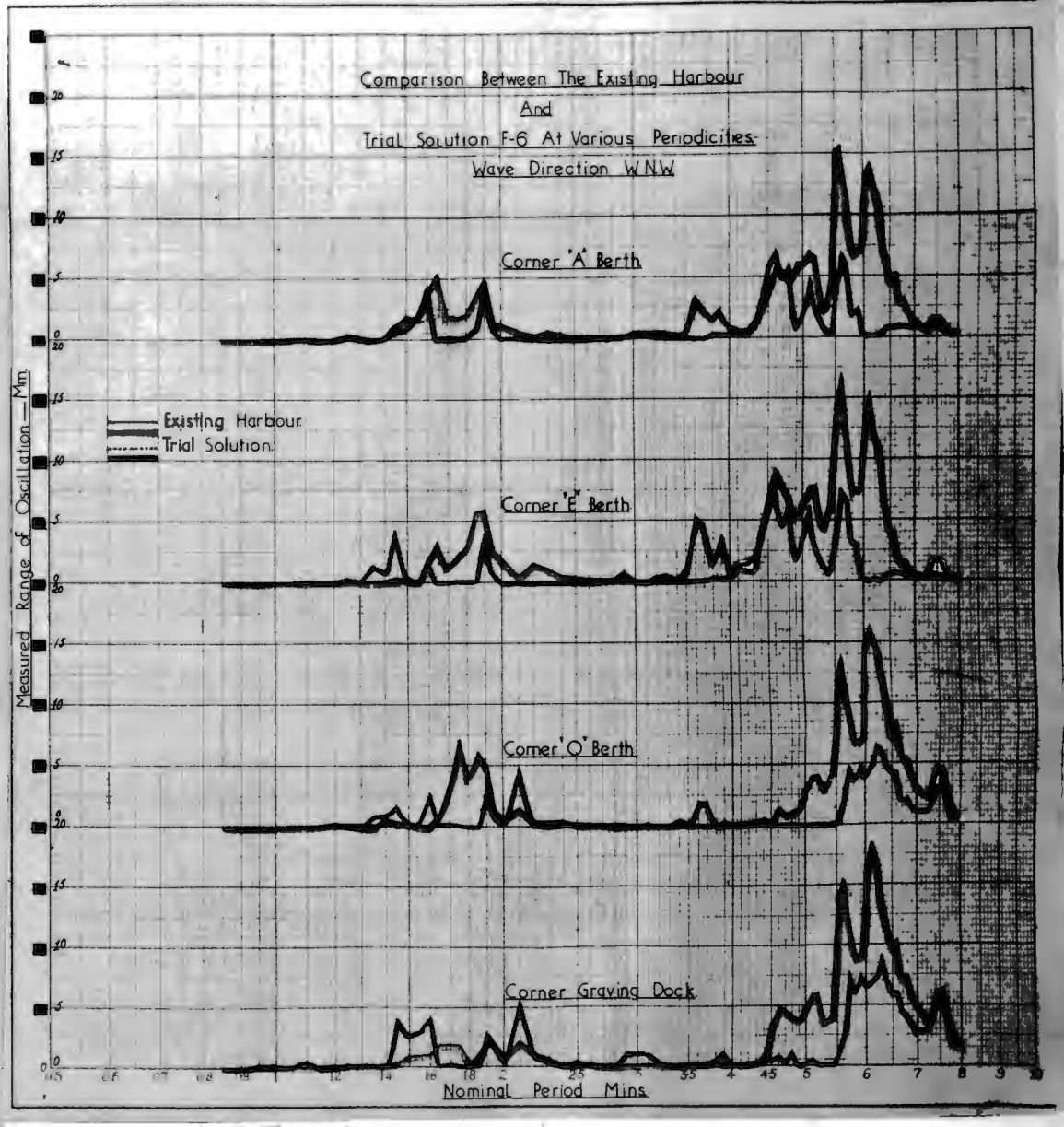


FIG. 185 (f)

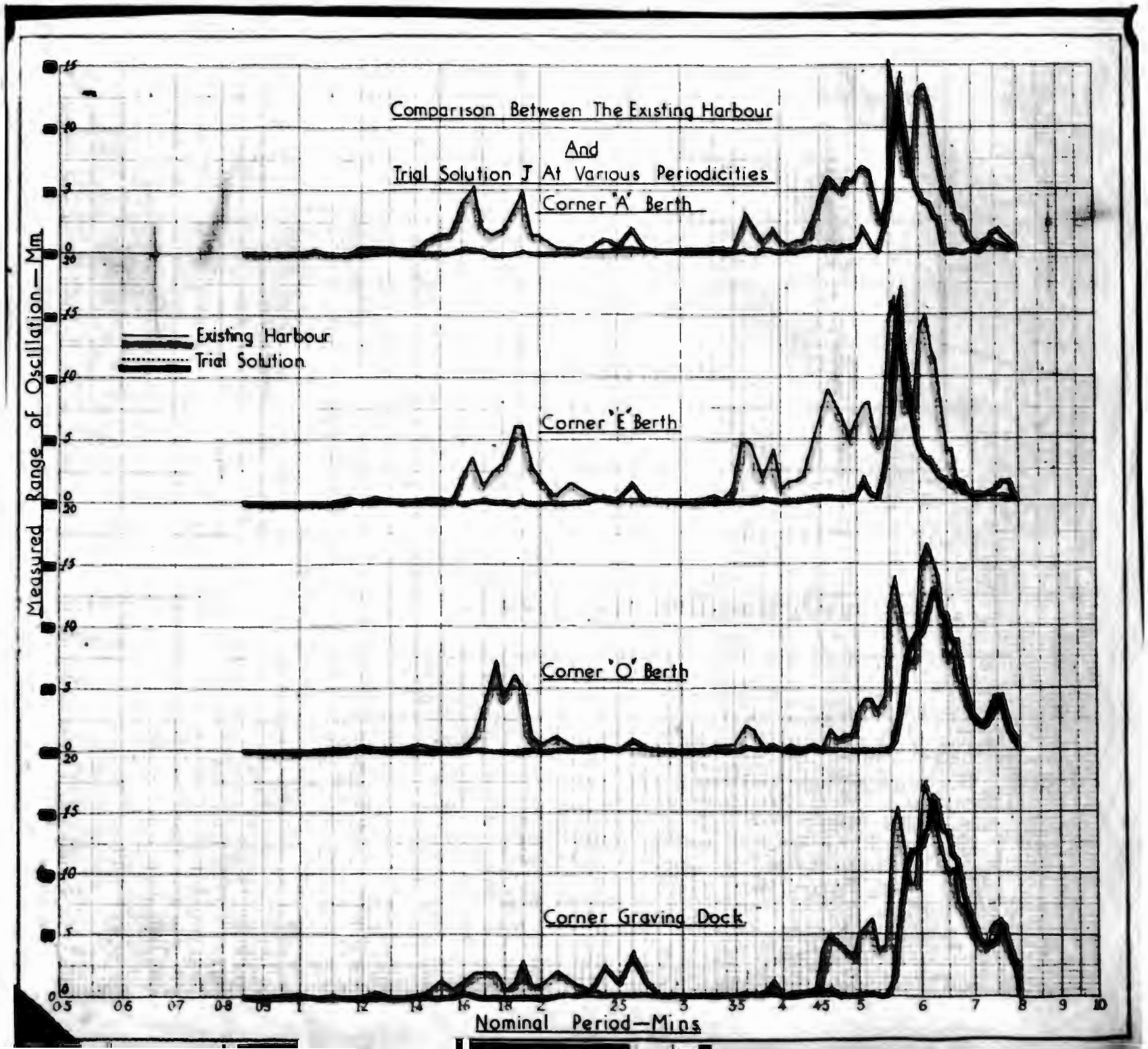

Comparison Between The Existing Harbour
And
Trial Solution J At Various Periodicities
Corner 'A' Berth
Existing Harbour
Trial Solution
Corner 'E' Berth
Corner 'O' Berth
Corner Graving Dock
Measured Range of Oscillation—Mm
Nominal Period—Mins
0·5
0·6
0·7
0·8
0·9
1
1·2
1·4
1·6
1·8
2
2·5
3
3·5
4
4·5
5
6
7
8
9
10

FIG. 186

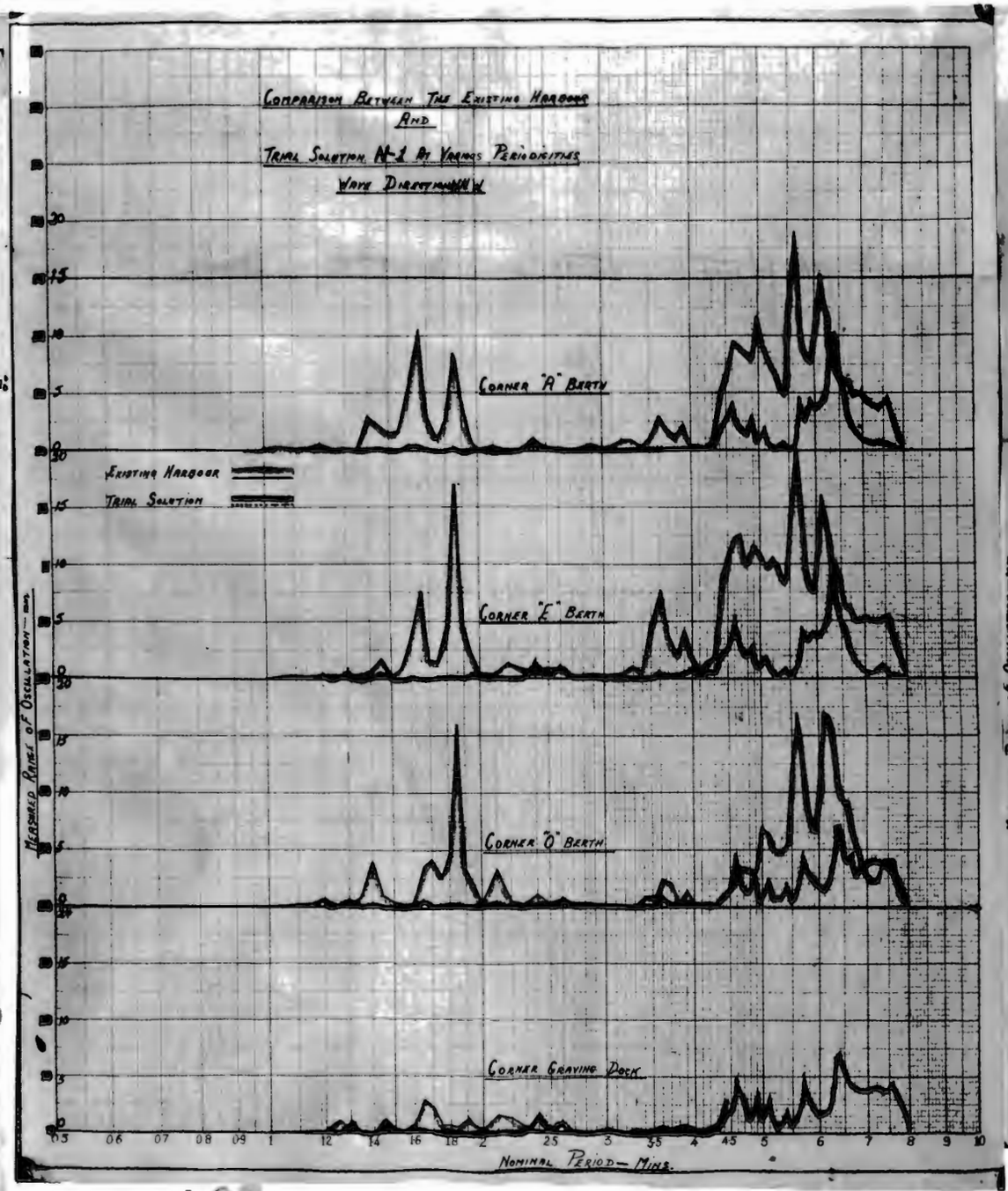


FIG. 187

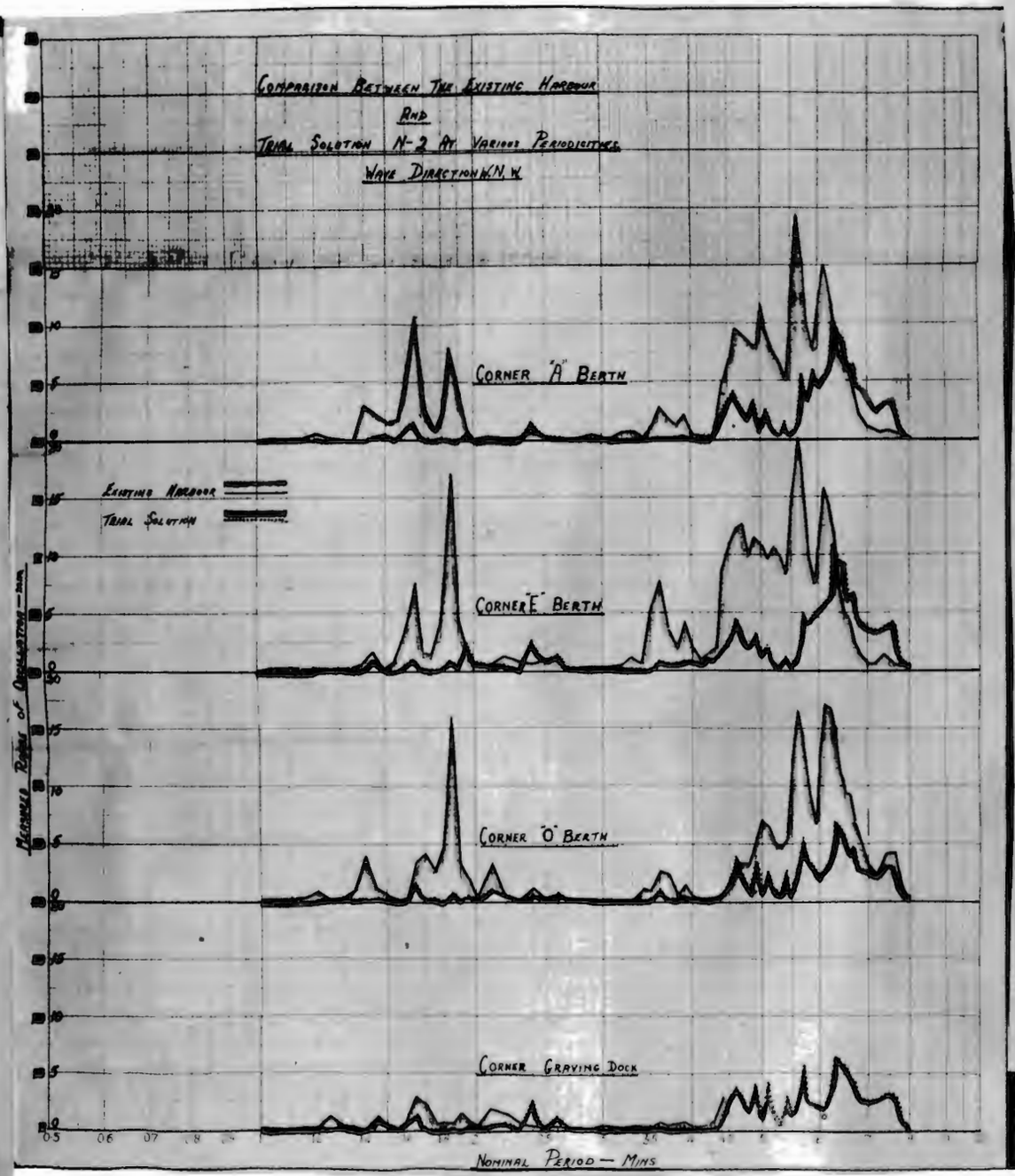


FIG. 187

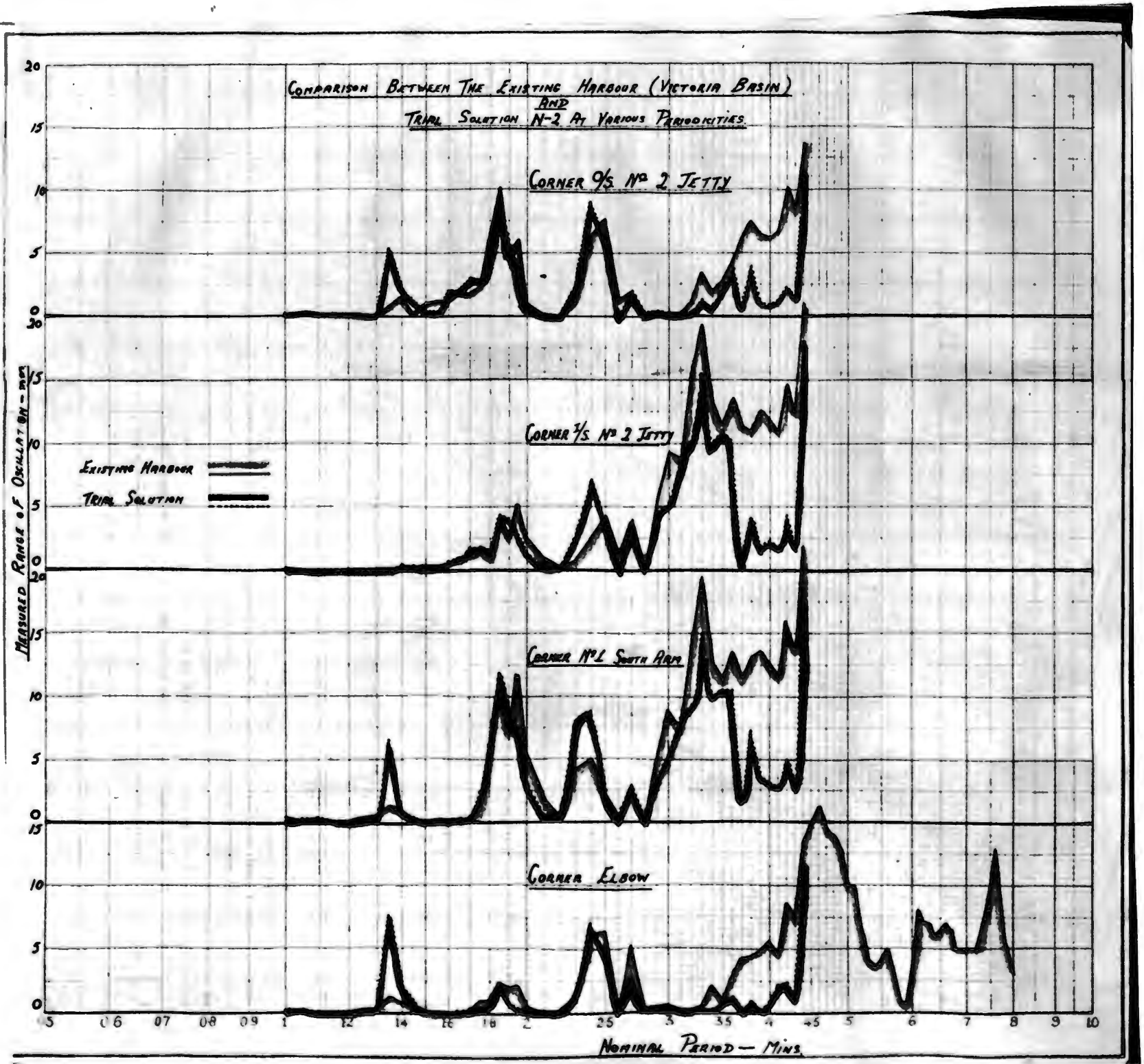

COMPARISON BETWEEN THE EXISTING HARBOUR (VICTORIA BASIN)
AND
TRIAL SOLUTION N-2 AT VARIOUS PERIODICITIES.
CORNER O/S No 2 JETTY
CORNER I/S No 2 JETTY
CORNER No 2 SOUTH ARM
CORNER ELBOW
EXISTING HARBOUR
TRIAL SOLUTION
MEASURED RANGE OF OSCILLATION — MM
NOMINAL PERIOD — MINS
0
5
10
15
20
05
06
07
08
09
1
12
14
16
18
2
25
3
35
4
45
5
6
7
8
9
10

FIG. 187(c)

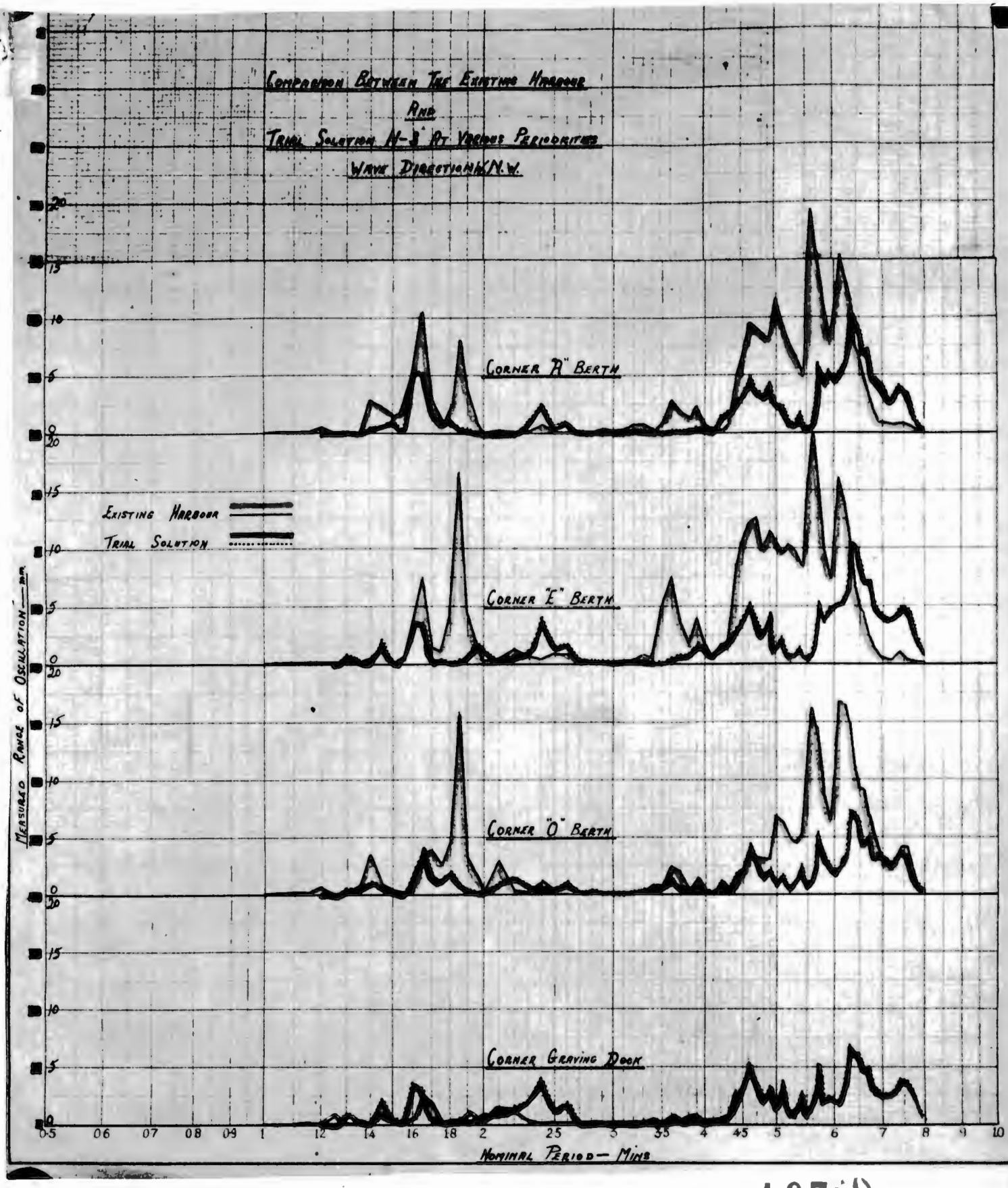
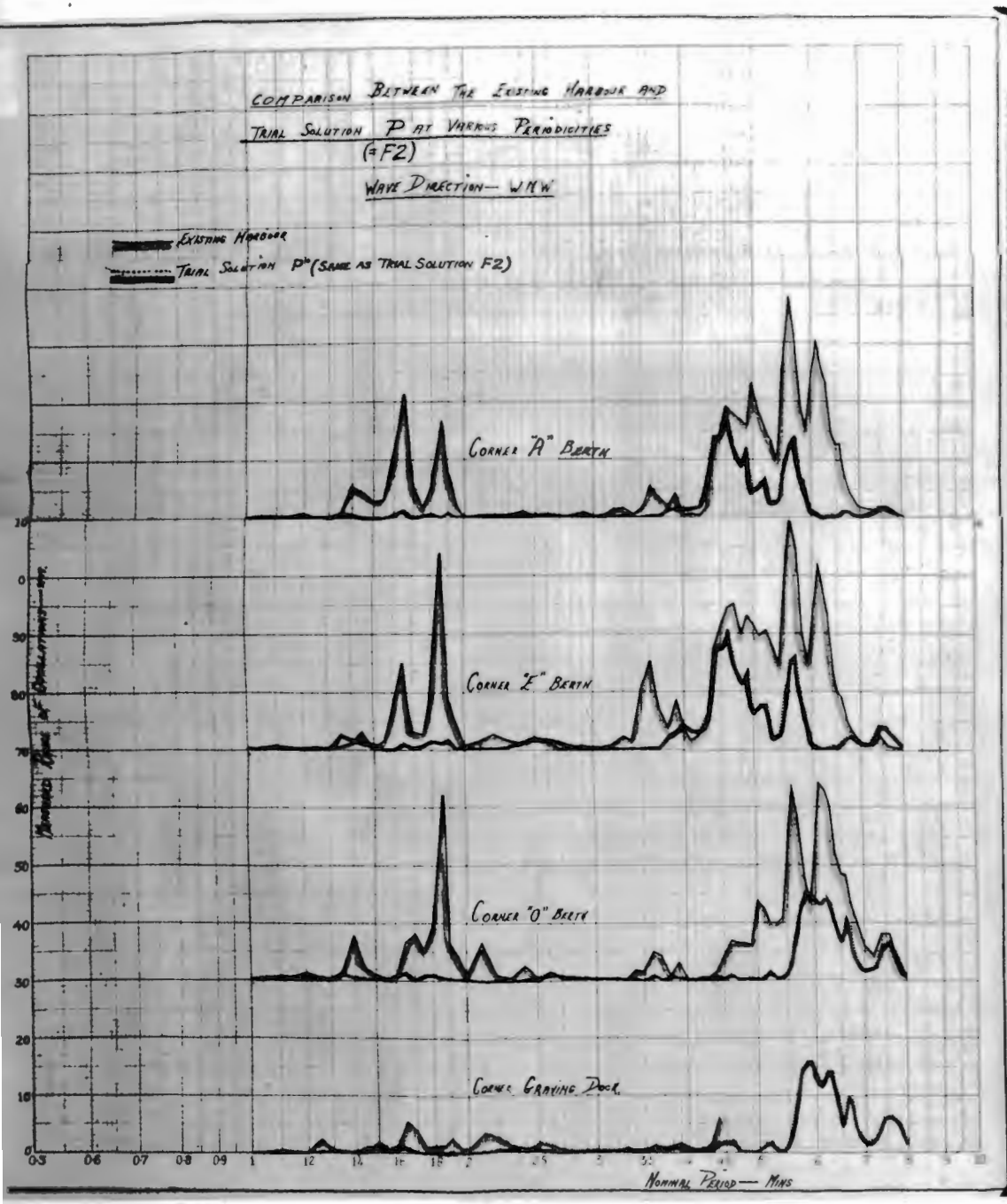
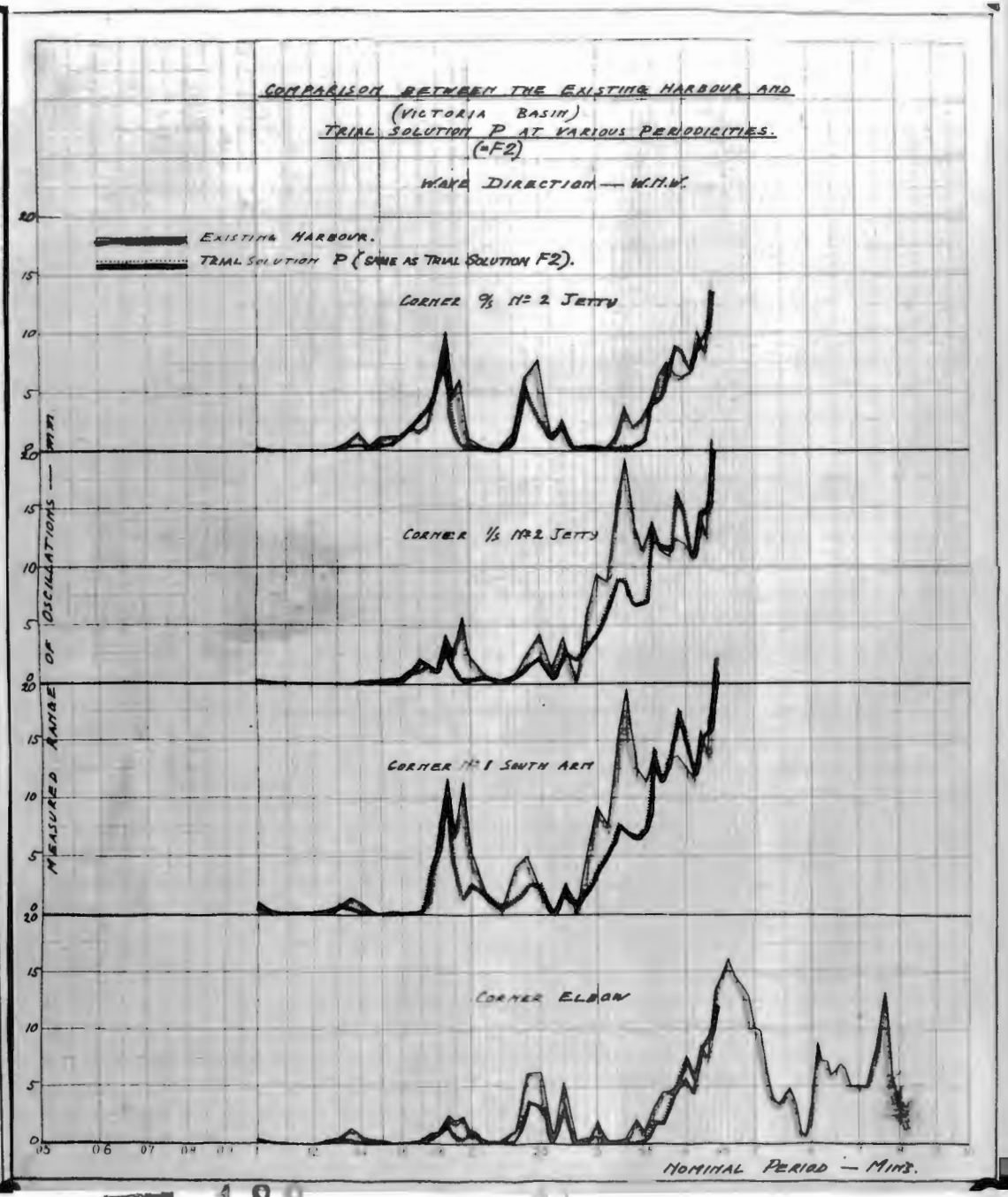

Comparison Between The Existing Harbour
And
Trial Solution N-8 At Various Periodicities
Wave Direction N.N.W.
Existing Harbour
Trial Solution
Corner "A" Berth
Corner "E" Berth
Corner "O" Berth
Corner Graving Dock
Measured Range of Oscillation — mm.
Nominal Period — Mins
0·5
0·6
0·7
0·8
0·9
1
1·2
1·4
1·6
1·8
2
2·5
3
3·5
4
4·5
5
6
7
8
9
10

FIG. 187(d)

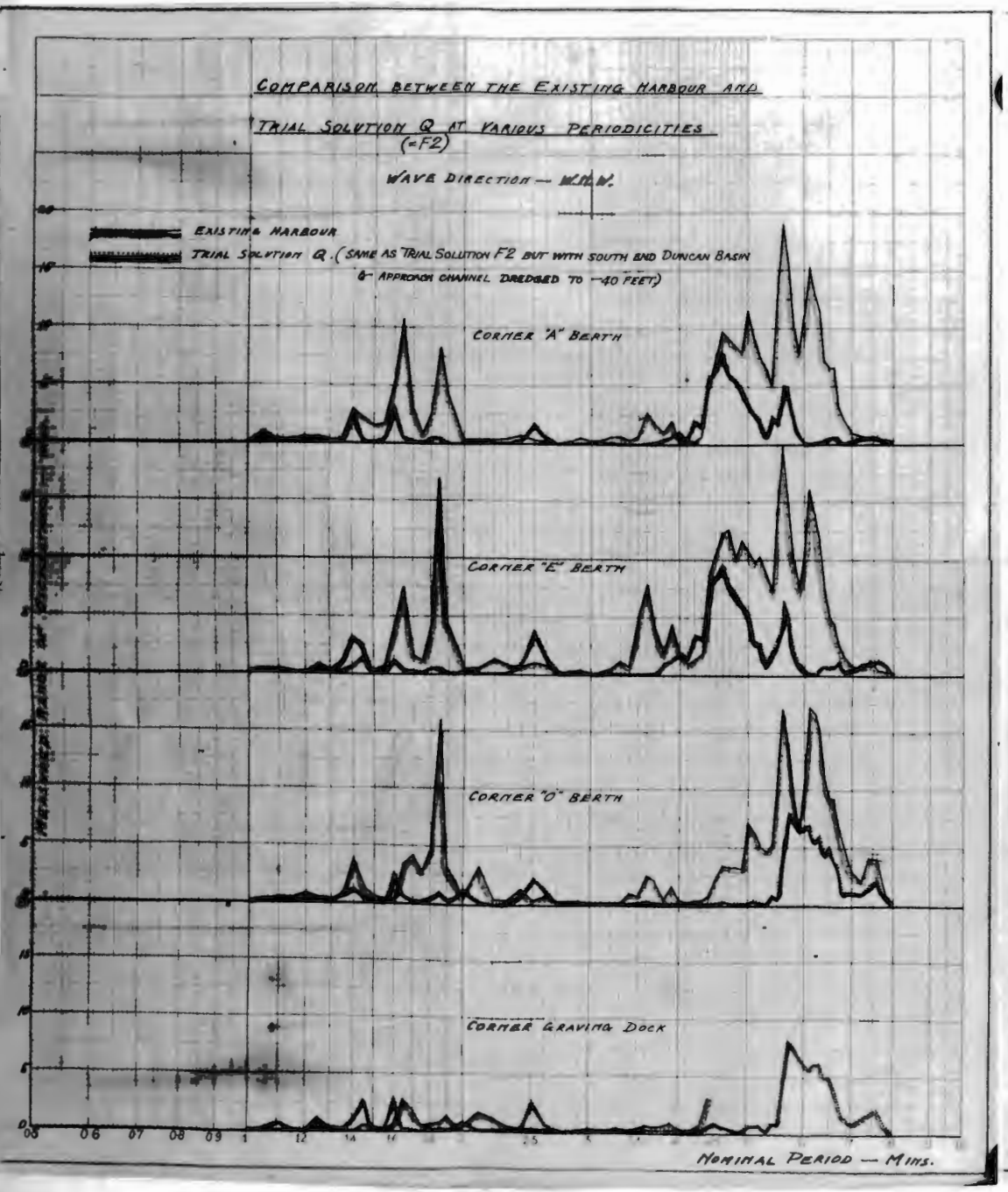

COMPARISON BETWEEN THE EXISTING HARBOUR AND
TRIAL SOLUTION P AT VARIOUS PERIODICITIES
(≡F2)
WAVE DIRECTION — W.N.W.
EXISTING HARBOUR
TRIAL SOLUTION P (SAME AS TRIAL SOLUTION F2)
CORNER "A" BERTH
CORNER "E" BERTH
CORNER "O" BERTH
CORNER GRAVING DOCK
MEASURED RANGE OF OSCILLATIONS — MM
NOMINAL PERIOD — MINS

(a)

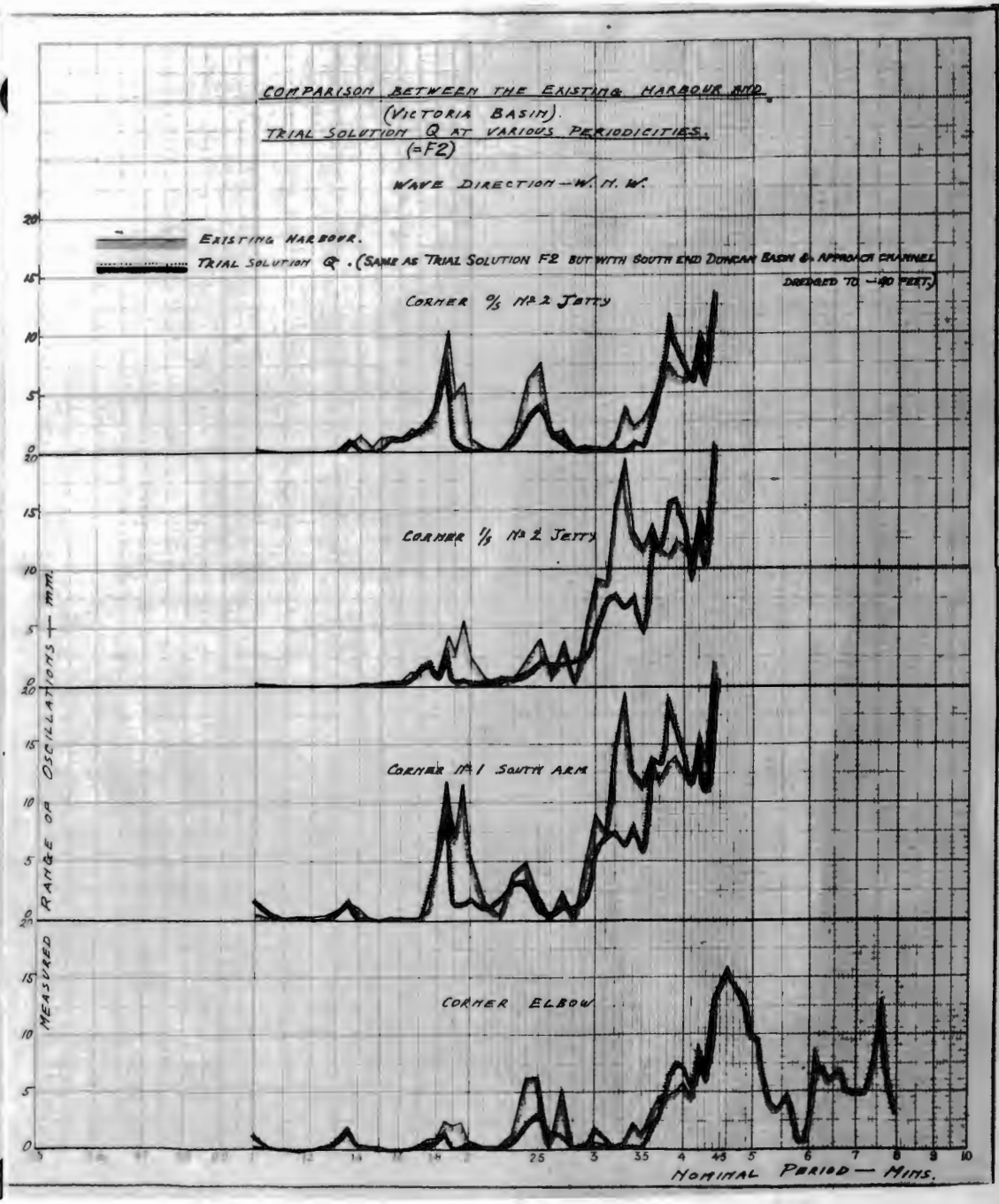

COMPARISON BETWEEN THE EXISTING HARBOUR AND
(VICTORIA BASIN)
TRIAL SOLUTION P AT VARIOUS PERIODICITIES.
(≡F2)
WAVE DIRECTION — W.N.W.
EXISTING HARBOUR.
TRIAL SOLUTION P (SAME AS TRIAL SOLUTION F2).
CORNER 0/S No 2 JETTY
CORNER I/S No 2 JETTY
CORNER No 1 SOUTH ARM
CORNER ELBOW
MEASURED RANGE OF OSCILLATIONS — MM
NOMINAL PERIOD — MINS.

(b)

FIG. 188


COMPARISON BETWEEN THE EXISTING HARBOUR AND
TRIAL SOLUTION Q AT VARIOUS PERIODICITIES
(=F2)
WAVE DIRECTION — W.N.W.
EXISTING HARBOUR
TRIAL SOLUTION Q. (SAME AS TRIAL SOLUTION F2 BUT WITH SOUTH END DUNCAN BASIN & APPROACH CHANNEL DREDGED TO −40 FEET)
CORNER "A" BERTH
CORNER "E" BERTH
CORNER "O" BERTH
CORNER GRAVING DOCK
MEASURED RANGE OF OSCILLATIONS — MM.
NOMINAL PERIOD — MINS.

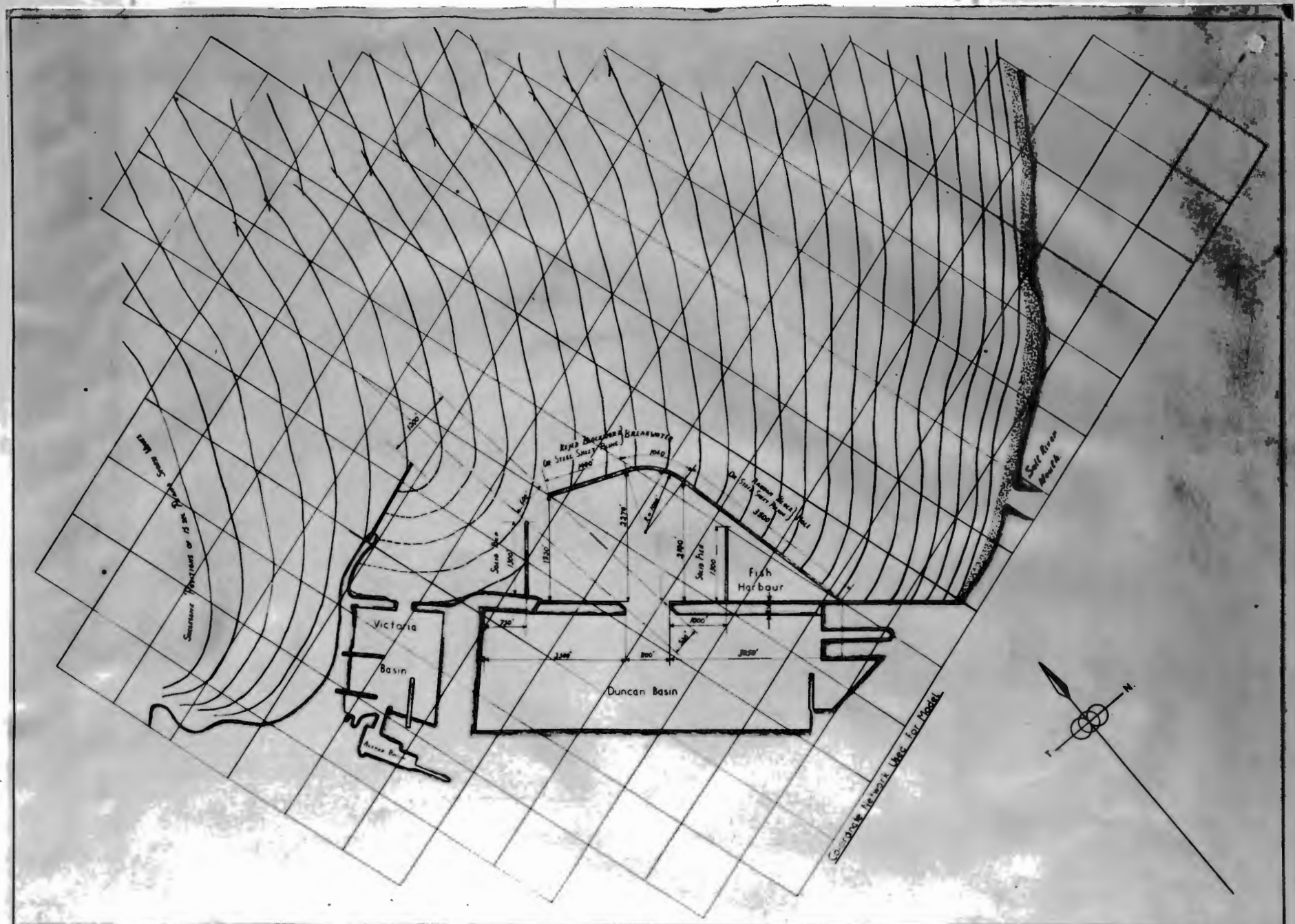
(a)


COMPARISON BETWEEN THE EXISTING HARBOUR AND
(VICTORIA BASIN).
TRIAL SOLUTION Q AT VARIOUS PERIODICITIES.
(=F2)
WAVE DIRECTION — W. N. W.
EXISTING HARBOUR.
TRIAL SOLUTION Q. (SAME AS TRIAL SOLUTION F2 BUT WITH SOUTH END DUNCAN BASIN & APPROACH CHANNEL DREDGED TO −40 FEET.)
CORNER ⅔ No 2 JETTY
CORNER ⅓ No 2 JETTY
CORNER No 1 SOUTH ARM
CORNER ELBOW
MEASURED RANGE OF OSCILLATIONS — MM.
NOMINAL PERIOD — MINS.

(b)

FIG. 189

FIG. 190. PHOTOGRAPH OF F2-SCHEME IN THE MODEL.



OUTER BASIN SOLUTION TO RANGE PROBLEM

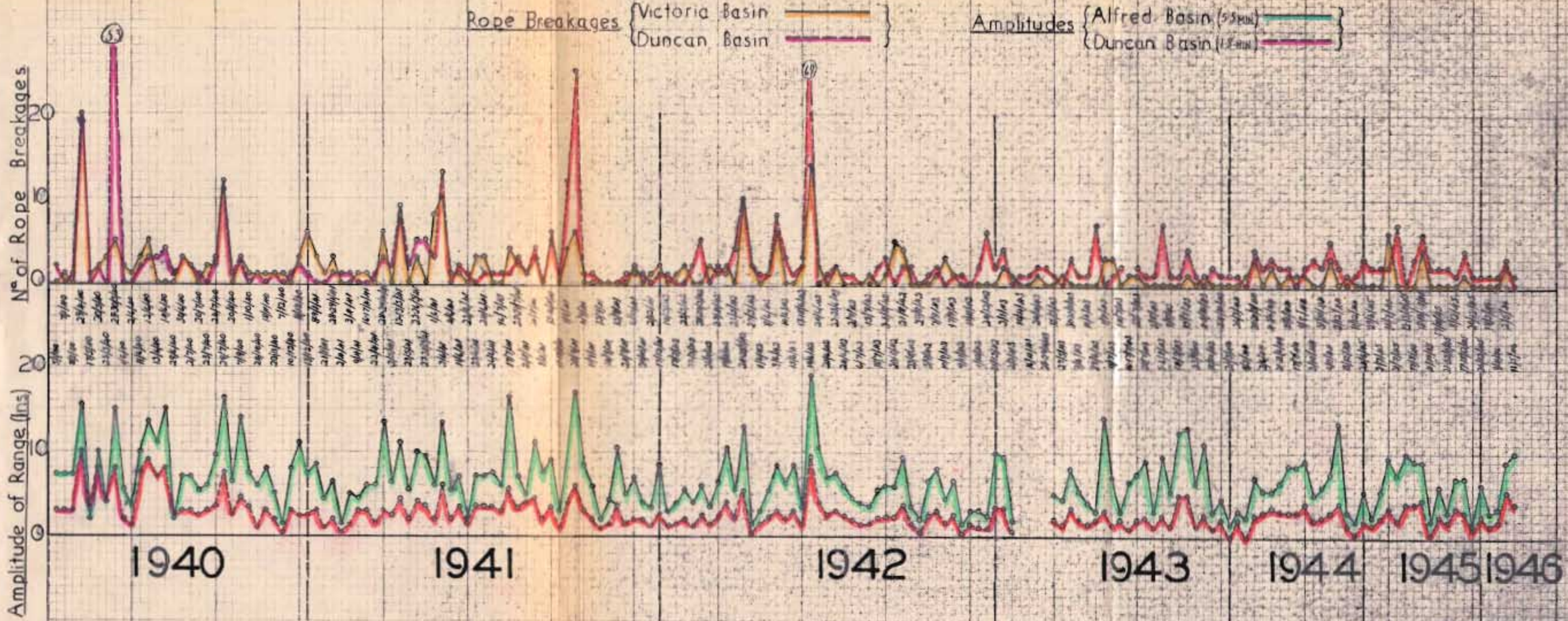
FIG. 191

Date	22/11/44
Drawn by	
Traced by	
Checked by	

S.A.R.&H.
C.C.E.'s RESEARCH SECTION
Investigation into Range
Table Bay Harbour
Scale 1 in. = 800 ft.

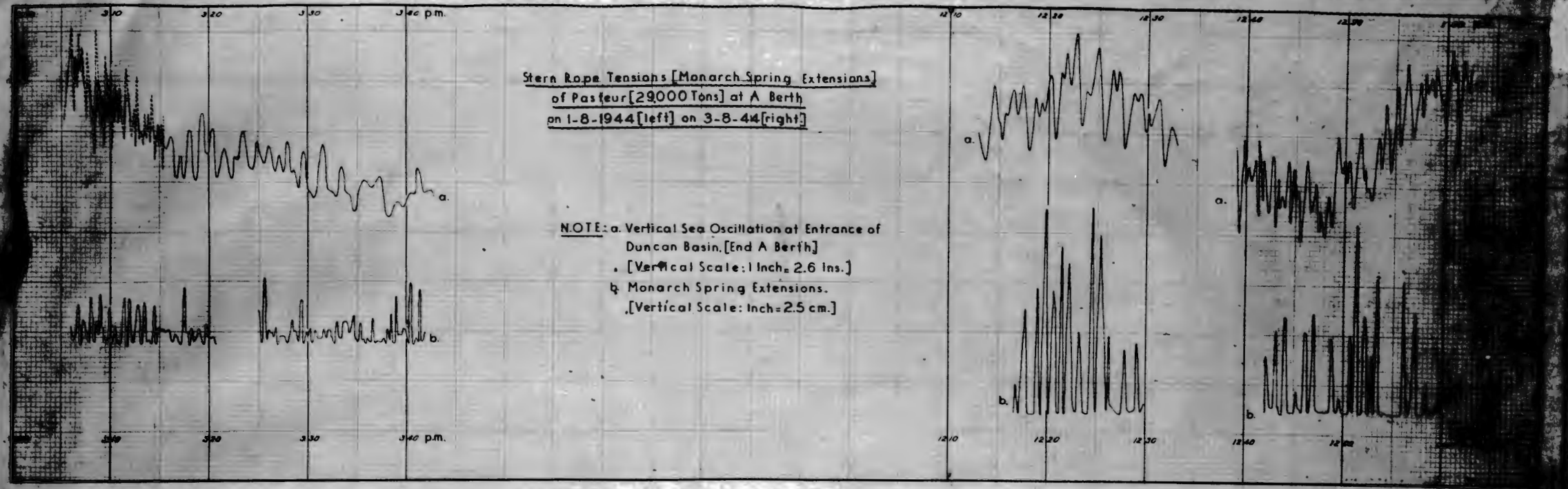
for Chief Civil Engineer

DWG No. RD 153



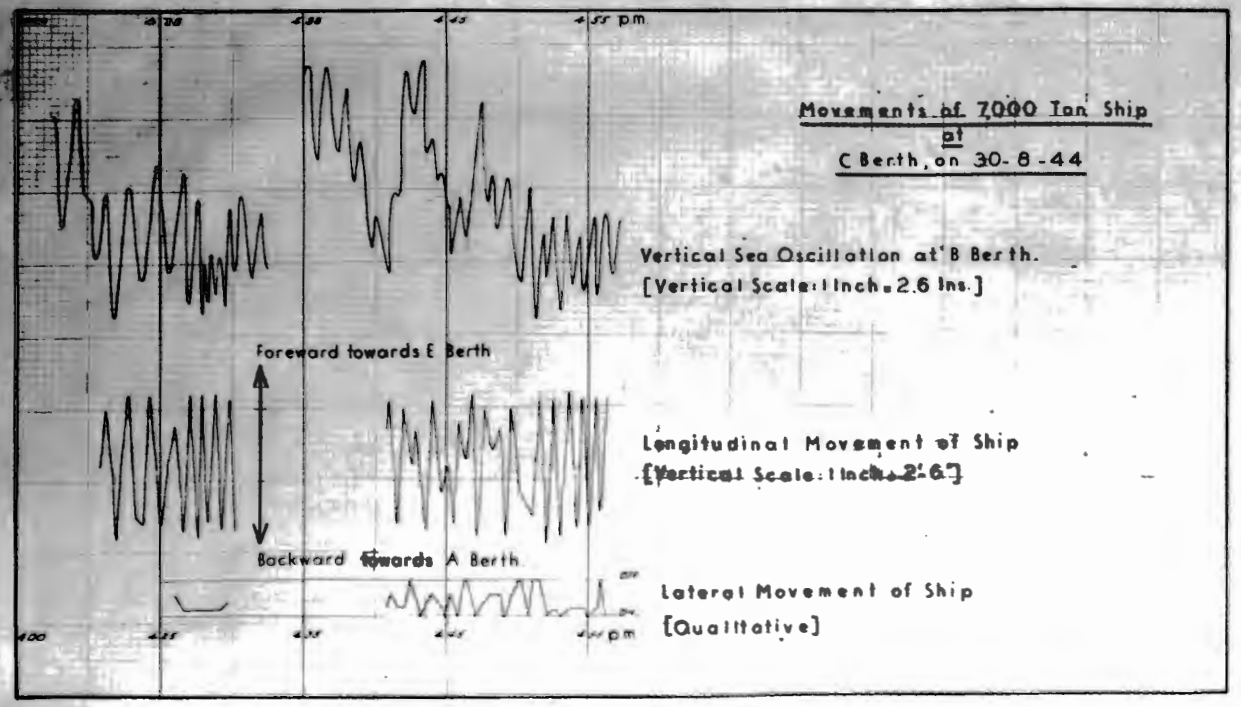
CORRELATION BETWEEN RANGE ACTION AND DAMAGE (ROPE BREAKAGES)

FIG. 192



Stern Rope Tensions [Monarch Spring Extensions]
of Pasteur [29000 Tons] at A Berth
on 1-8-1944 [left] on 3-8-44 [right]

NOTE: a. Vertical Sea Oscillation at Entrance of Duncan Basin. [End A Berth]
[Vertical Scale: 1 Inch = 2.6 Ins.]
b. Monarch Spring Extensions.
[Vertical Scale: Inch = 2.5 cm.]



Movements of 7000 Ton Ship
at
C Berth, on 30-8-44

Vertical Sea Oscillation at B Berth.
[Vertical Scale: 1 Inch = 2.6 Ins.]

Longitudinal Movement of Ship
[Vertical Scale: 1 Inch = 2.6]

Lateral Movement of Ship
[Qualitative]

CORRELATION BETWEEN SEA OSCILLATIONS AND SHIP MOVEMENTS IN DUNCAN BASIN.

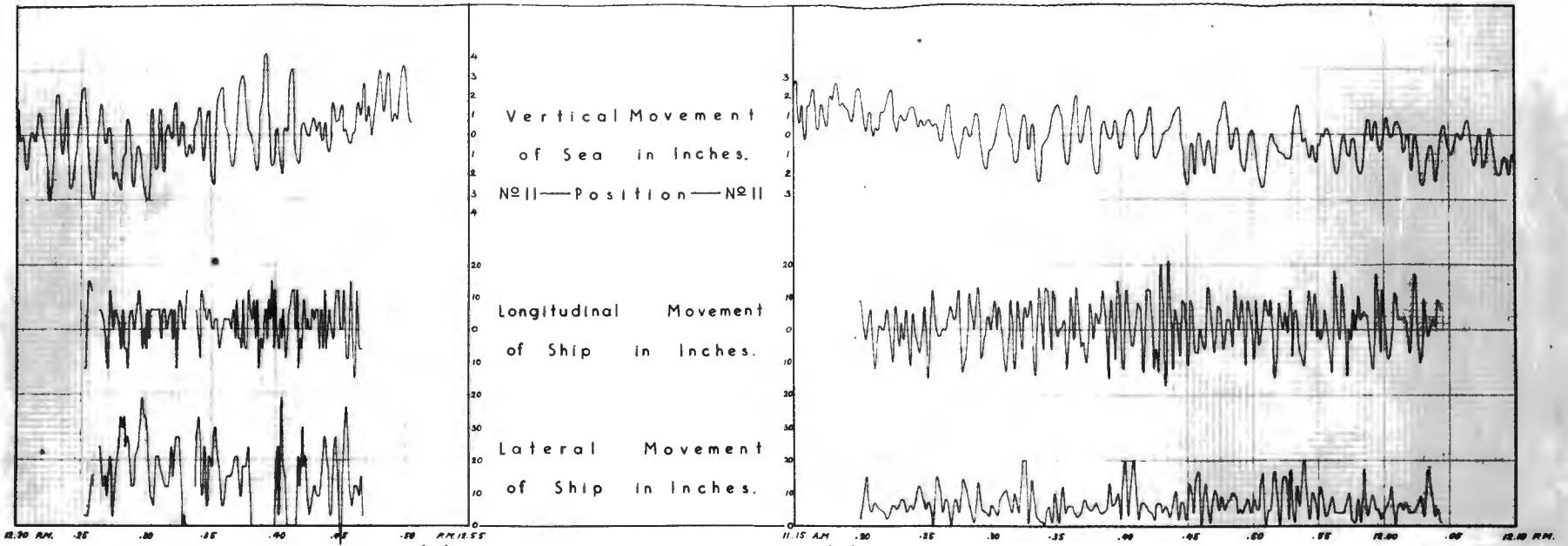
FIG. 193

Date	10-1-1945
Drawn by	R.J. de B.
Traced by	R.J. de B.
Checked by	[illegible]

S. A. R. & H.
CCE's RESEARCH SECTION
Investigation into Range Table Bay Harbour.

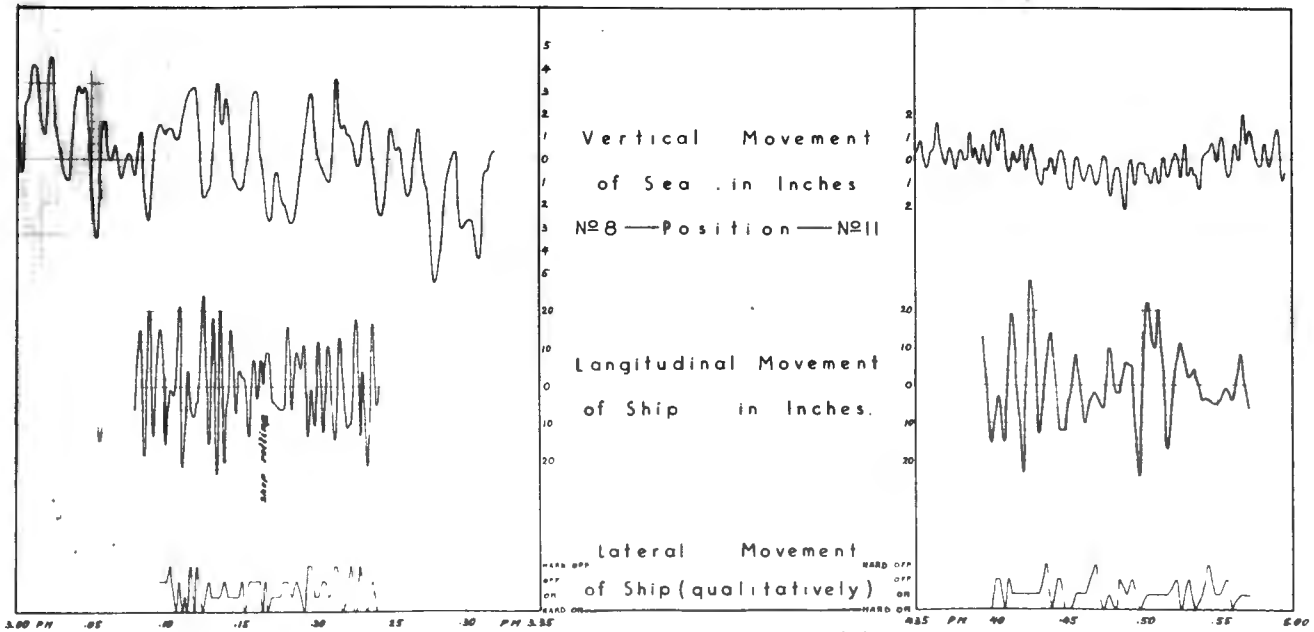
for B.W. Wilson
Chief Civil Engineer

DWG No: R.D. 117



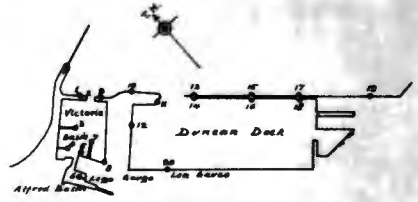
"DAHLIA" "C" BERTH 7/7/45
5 000 Tons; Length 421 Ft.; Beam 55 Ft.; Draught 25 Ft.

31/7/45 "ANNA H. SHAW" "D" BERTH
8 000 Tons



H.M.S. L.E. "TIGER" Nº 243 CROSS BERTH 20/6/45
900 Tons

21/6/45 "NIEUW AMSTERDAM" "A" BERTH
36 000 Tons; Length 759 ft; Beam 88·3 ft; Draught 33'-4"



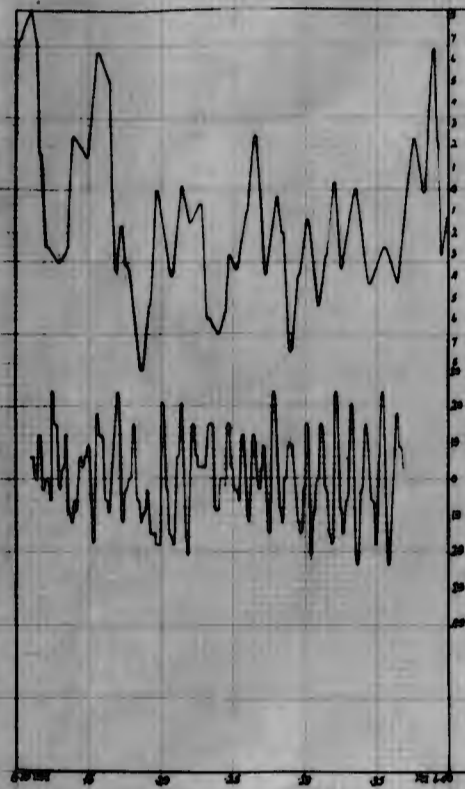
Key to Position of Recorders.

CORRELATION BETWEEN SEA OSCILLATIONS & SHIPMOVEMENTS.

FIG. 194

Date	16/11/45
Drawn by	WCQ J.
Traced by	WCQ J.
Checked by	

S.A.R.&H.
C.C.E's RESEARCH SECTION.
Investigation into Range
Table Bay Harbour.
for Chief Civil Engineer

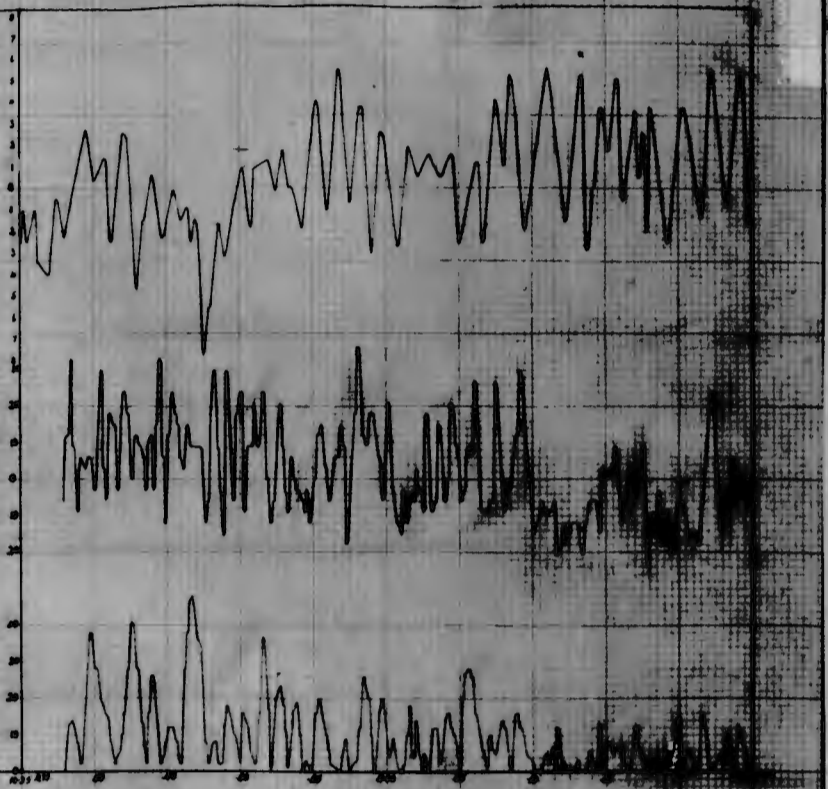


'DEFOE' 'A' BERTH 7/12/45
8000 Tons: Draught 26 Ft

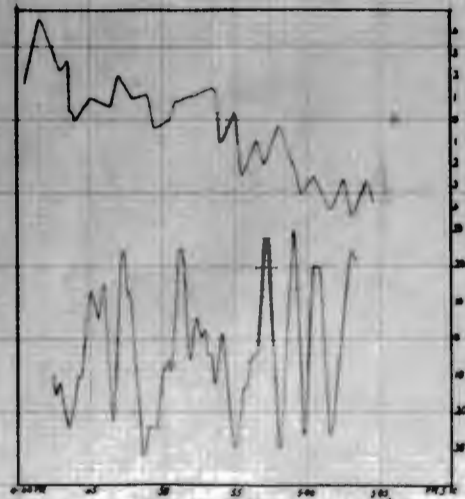
Vertical Movement of Sea in Inches (Lea Gauge) Nº 20 — Position — Nº 20

Longitudinal Movement of Ship in Inches

Lateral Movement of Ship in Inches



'CHARLES PADDOCK' 'F' BERTH
7200 Tons: Length 422ft; Beam 57ft; Draught 26'-6"

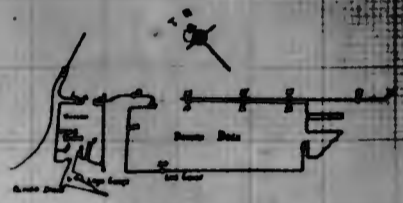


"CALIFORNIA" 17/1/45
42000 Tons: Length 624ft Beam 97'-6"; Draught 30'-6"

Vertical Movement of Sea in Inches (Lea Gauge) Nº 20 — Position — Nº 20

Longitudinal Movement of Ship in Inches

CORRELATION BETWEEN SEA OSCILLATIONS & SHIP MOVEMENTS

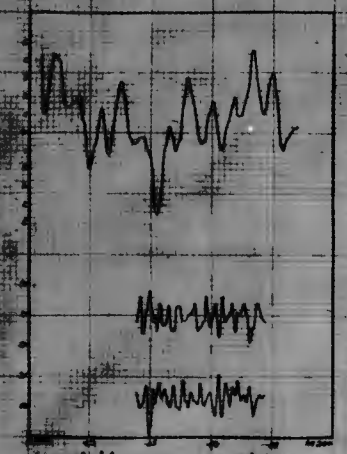


Key to Position of Recorders

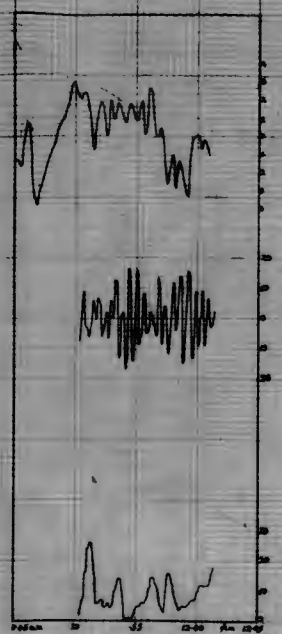
FIG. 195

Date	8/7/46
Drawn by	AE
Traced by	AE
Checked by	

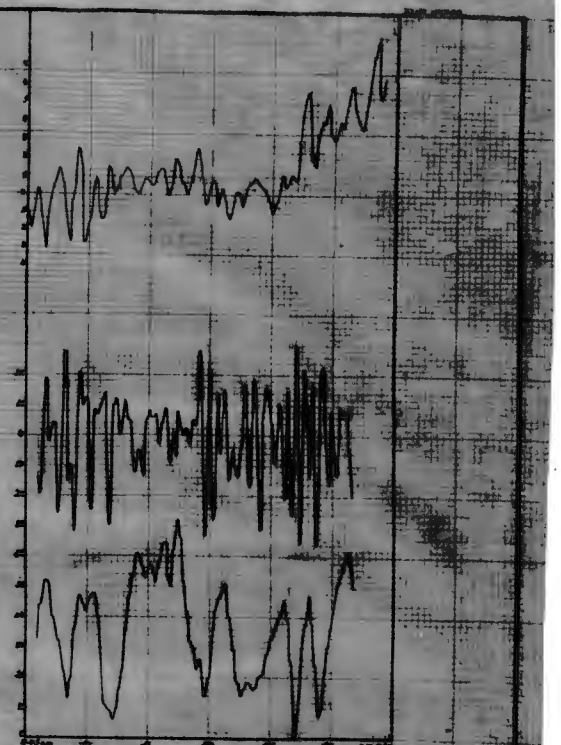
S A R & H
CCE's RESEARCH SECTION
Investigation into Range
Table Bay Harbour
for Chief Civil Engineer
DWG Nº RD 1178



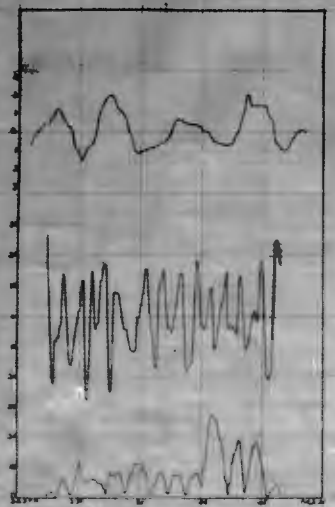
"ERICA" 'A' BERTH 6/8/46.
5112 Tons: Length 404 9 Ft: Beam 53 Ft



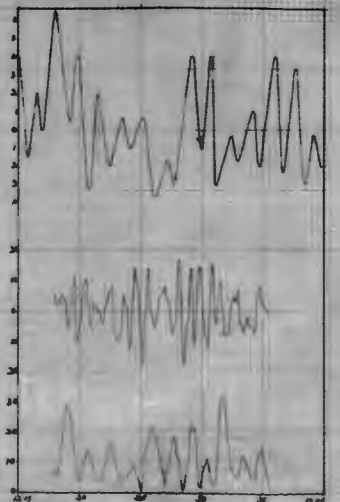
ORANJEFONTEIN 'C' BERTH 23/8/46
10000 Tons, Length 499 3 Ft, Beam 62 9 Ft



CARNARVON CASTLE 'A' BERTH 23/8/46.
20122 Tons: Length 661 Ft. Beam 73 5 Ft

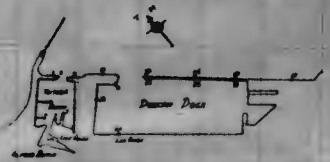


"UMTATA" 'C' BERTH 6/8/46.
7288 Tons: Length 452 8 Ft: Beam 59 Ft



"CITY OF SWANSEA" 'E' BERTH 22/7/46

CORRELATION BETWEEN SEA OSCILLATIONS & SHIP-MOVEMENTS

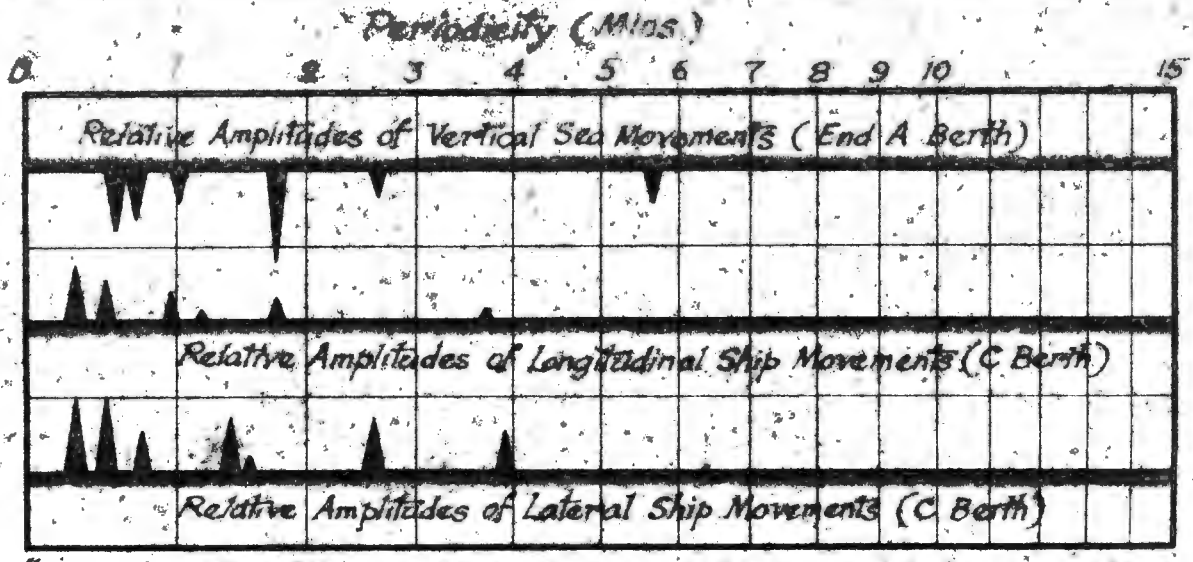


Key to Position of Recorders

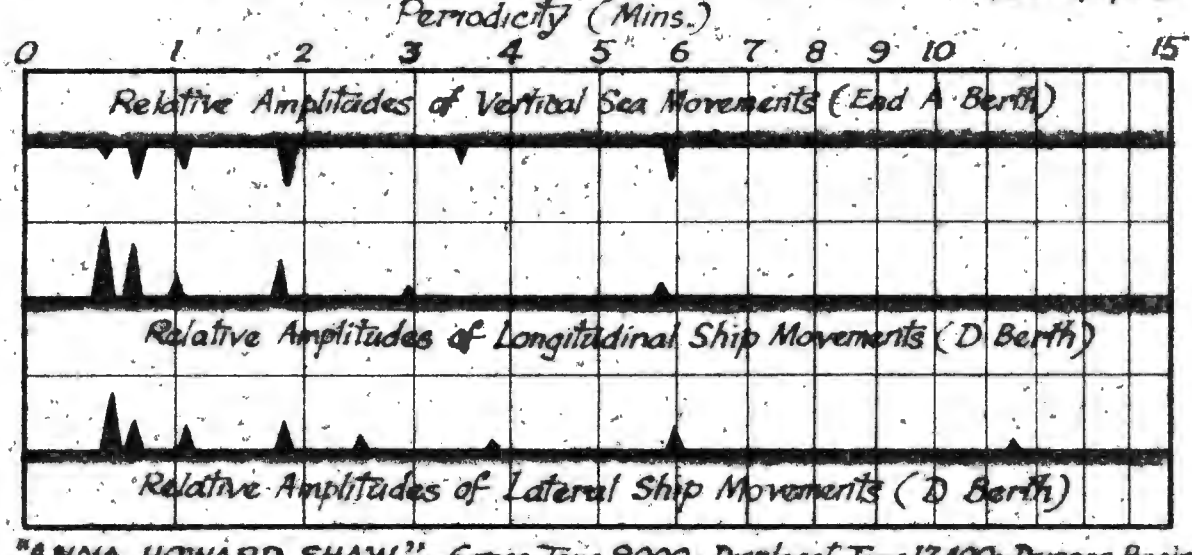
Date	4/10/46
Drawn by	AL
Traced by	AL
Checked by	[illegible]

S A R & H
C C E's RESEARCH SECTION
Investigation into Range
Table Bay Harbour
[illegible] DWG. No
for Chief Civil Engineer R.D. 1176

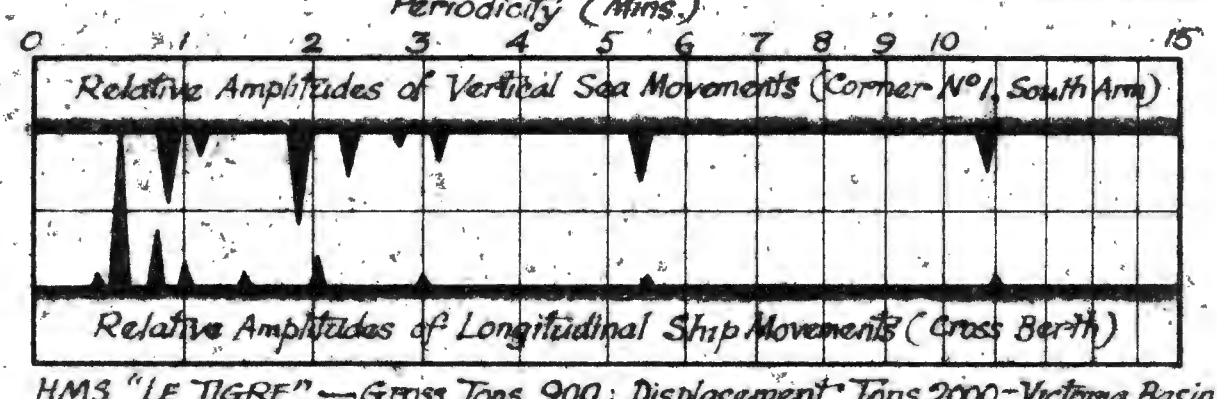
FIG. 196



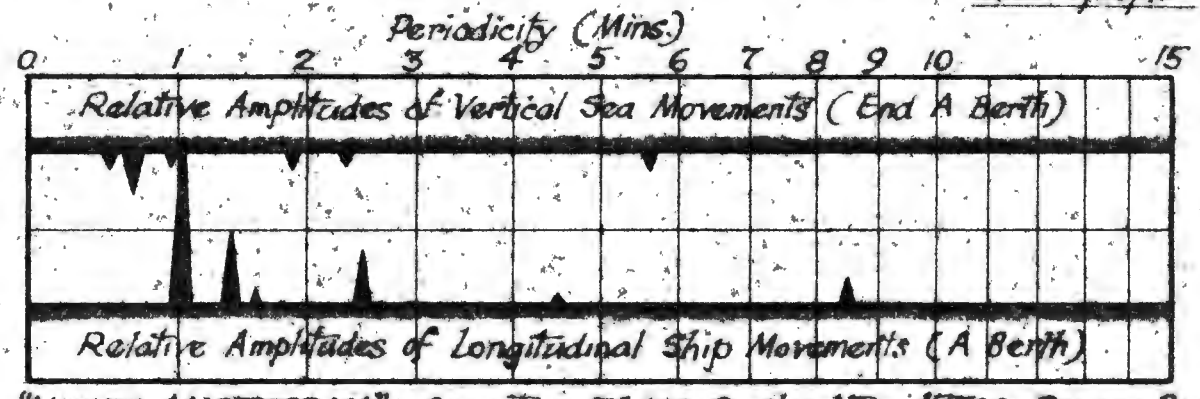
"DALIA" — Gross Tonnage 5000; Displacement Tonnage 6400 – Duncan Basin
Date: 7/7/45



"ANNA HOWARD SHAW" — Gross Tons 8000; Displace! Tons 13400 – Duncan Basin
Date: 7/31/45



H.M.S. "LE TIGRE" — Gross Tons 900; Displacement Tons 2000 – Victoria Basin
Date: 6/20/45



"NIEUW AMSTERDAM" — Gross Tons 36,000; Displace! Tons 47,700 – Duncan Basin
Date: 6/21/45

FIG. 197

FIG. 197: CORRELATION BETWEEN SHIP MOVEMENTS & SEA OSCILLATIONS
PERIODICITIES & AMPLITUDES OF APPARENT COMPONENTS

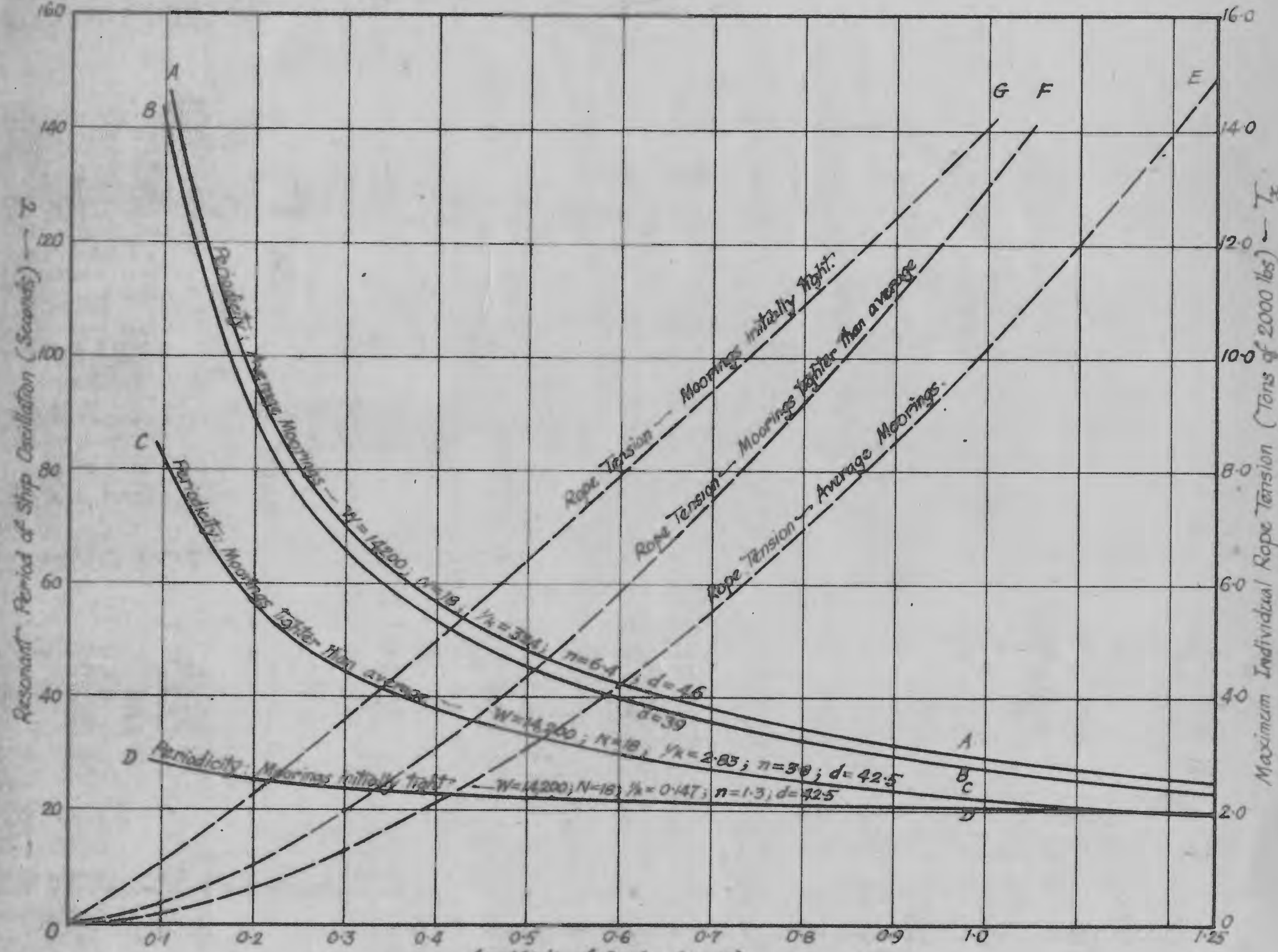
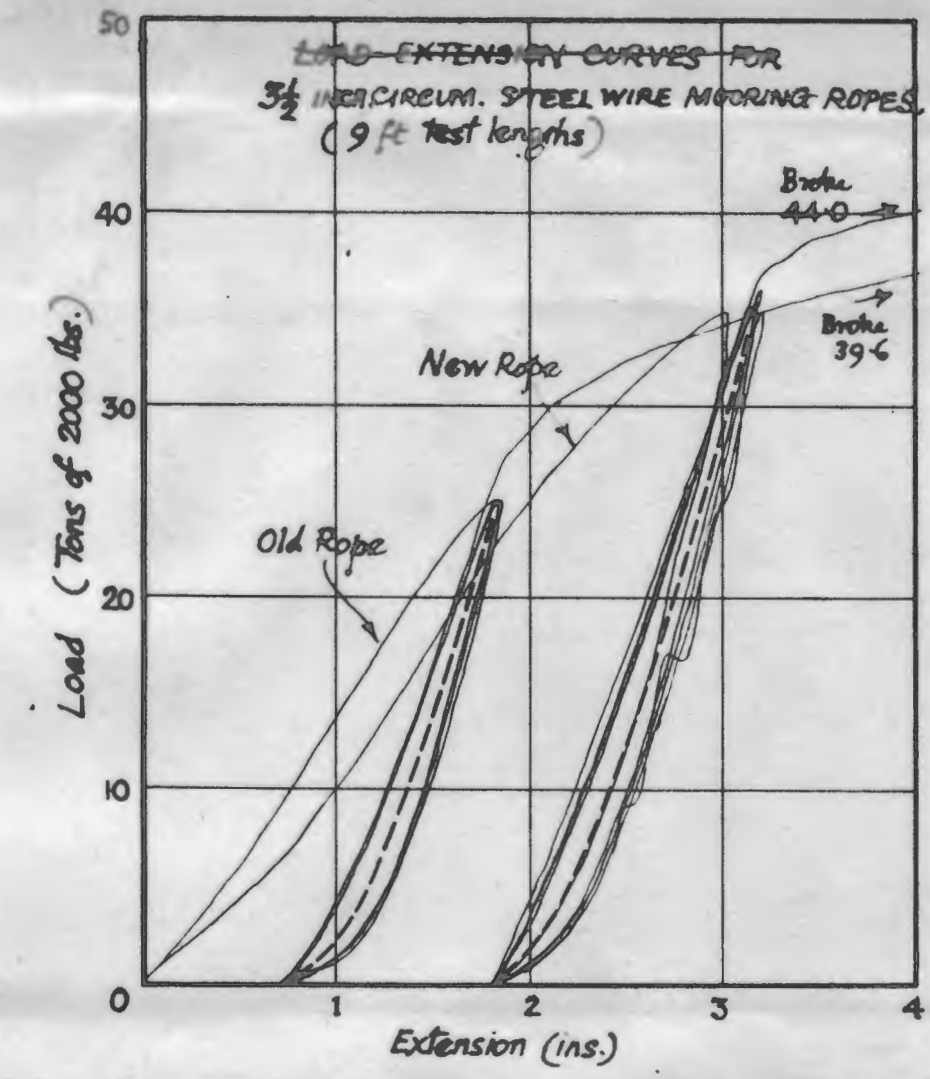
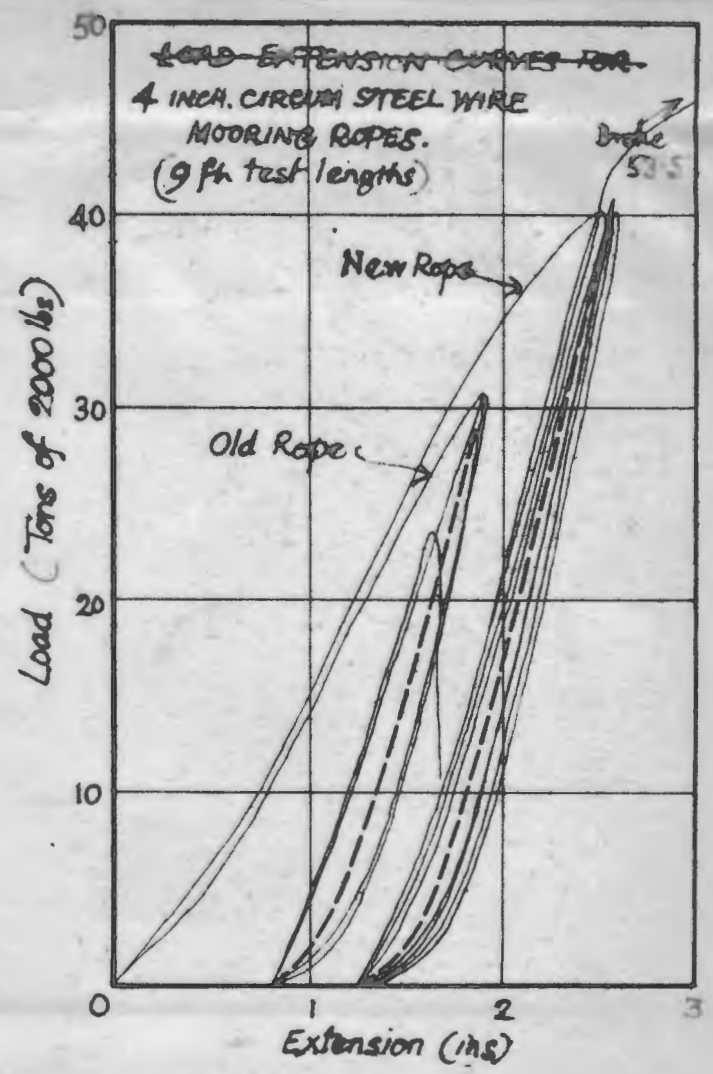
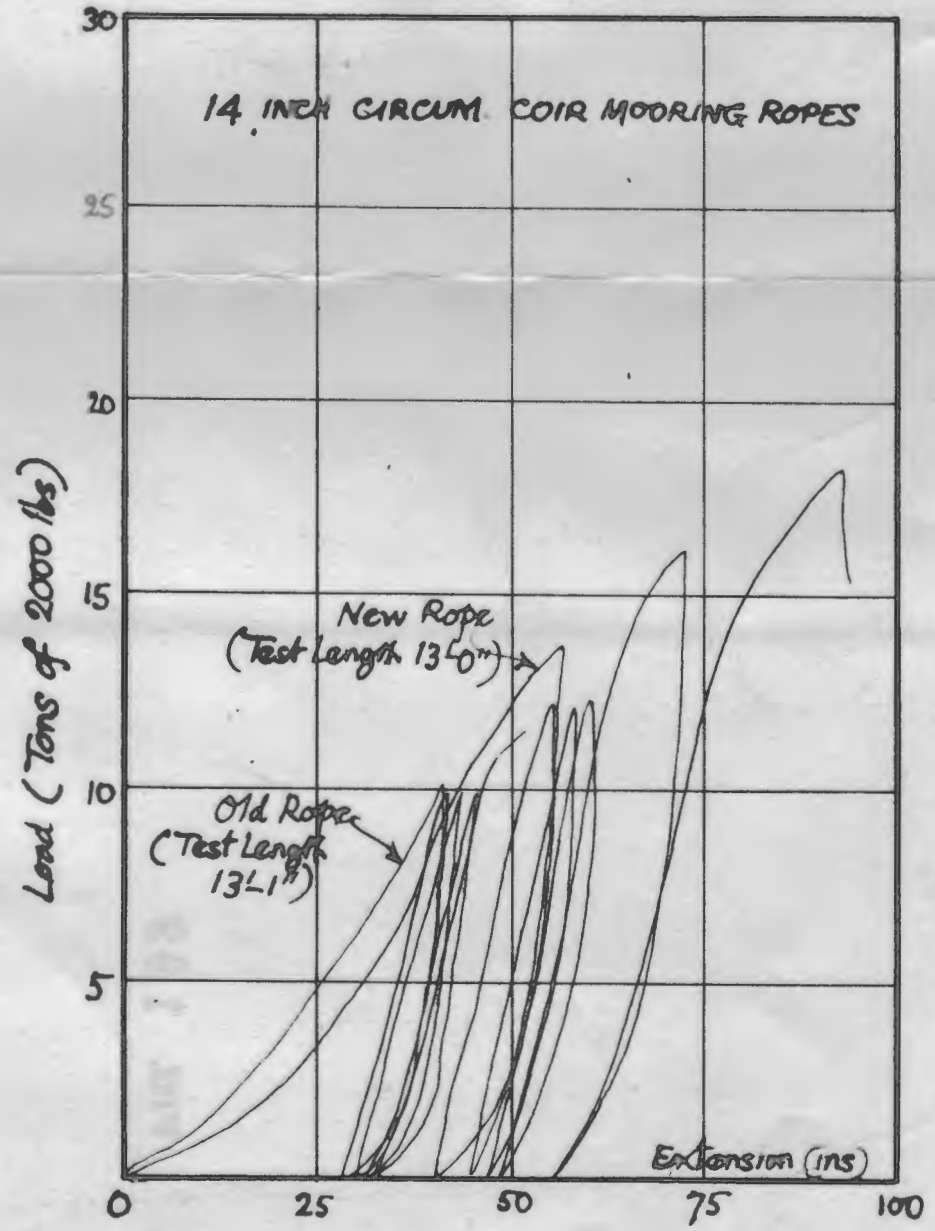


FIG 198 RESONANCE IN LONGITUDINAL SHIP MOTION
(INFLUENCE OF ROPE TIGHTNESS)







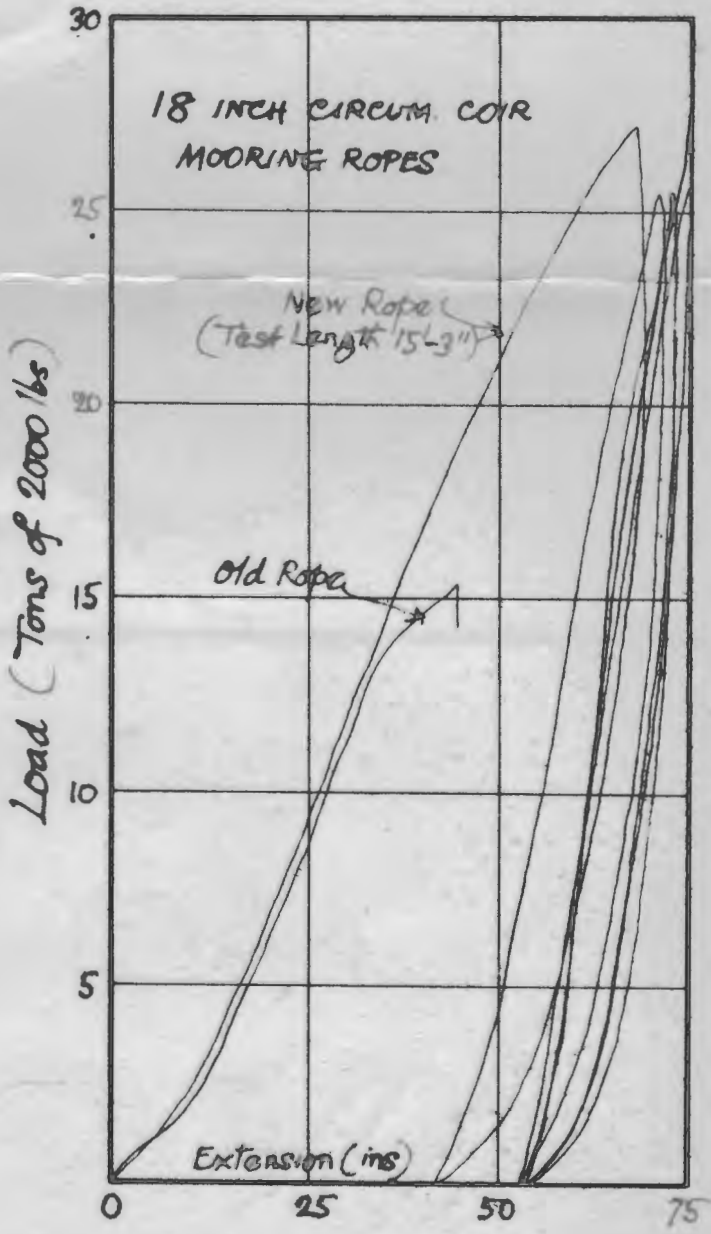


Fig. 199 : LOAD-EXTENSION CURVES FOR STEEL & COIR MOORING ROPES

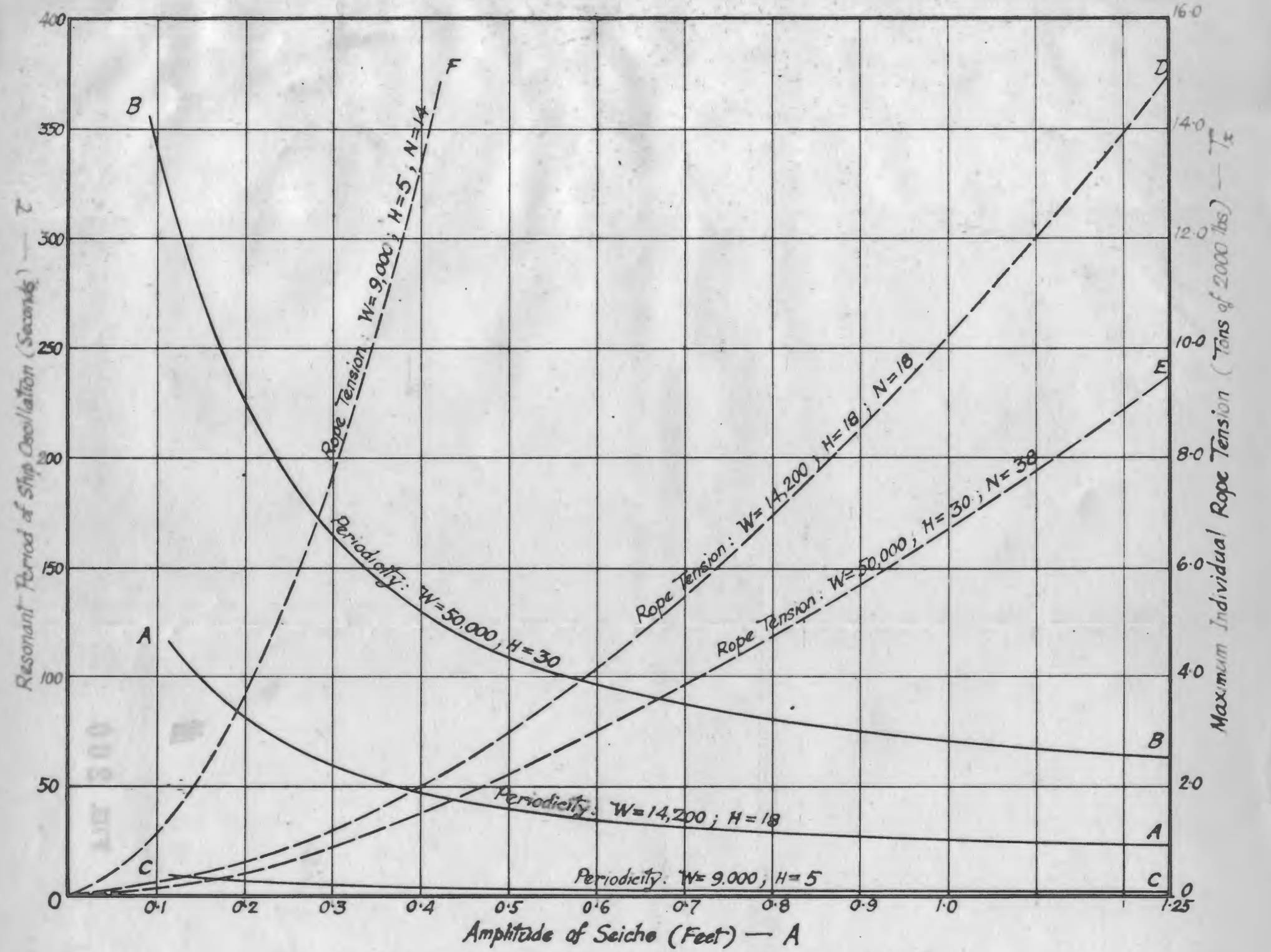


FIG. 800: RESONANCE IN LONGITUDINAL SHIP MOTION
(INFLUENCE OF SHIP SIZE)

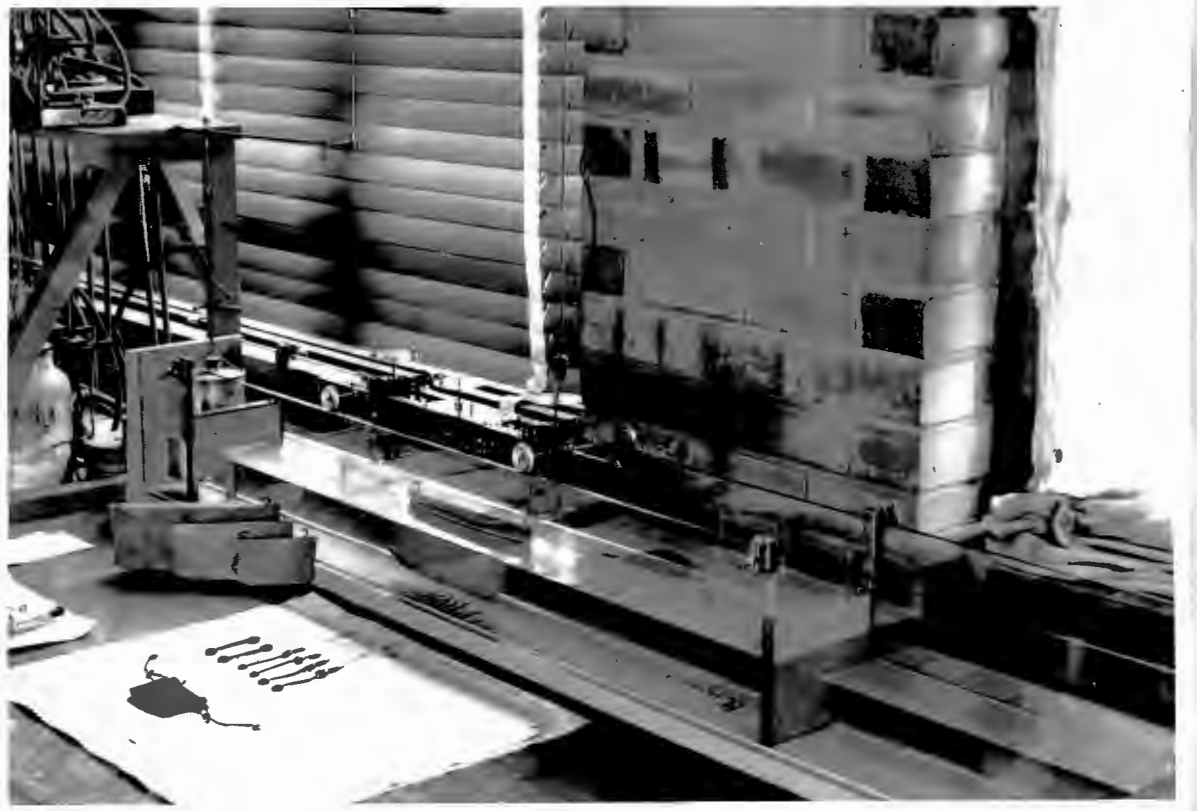


FIG. 201. EXPERIMENTAL TANK FOR STUDY OF SHIP MOTIONS.

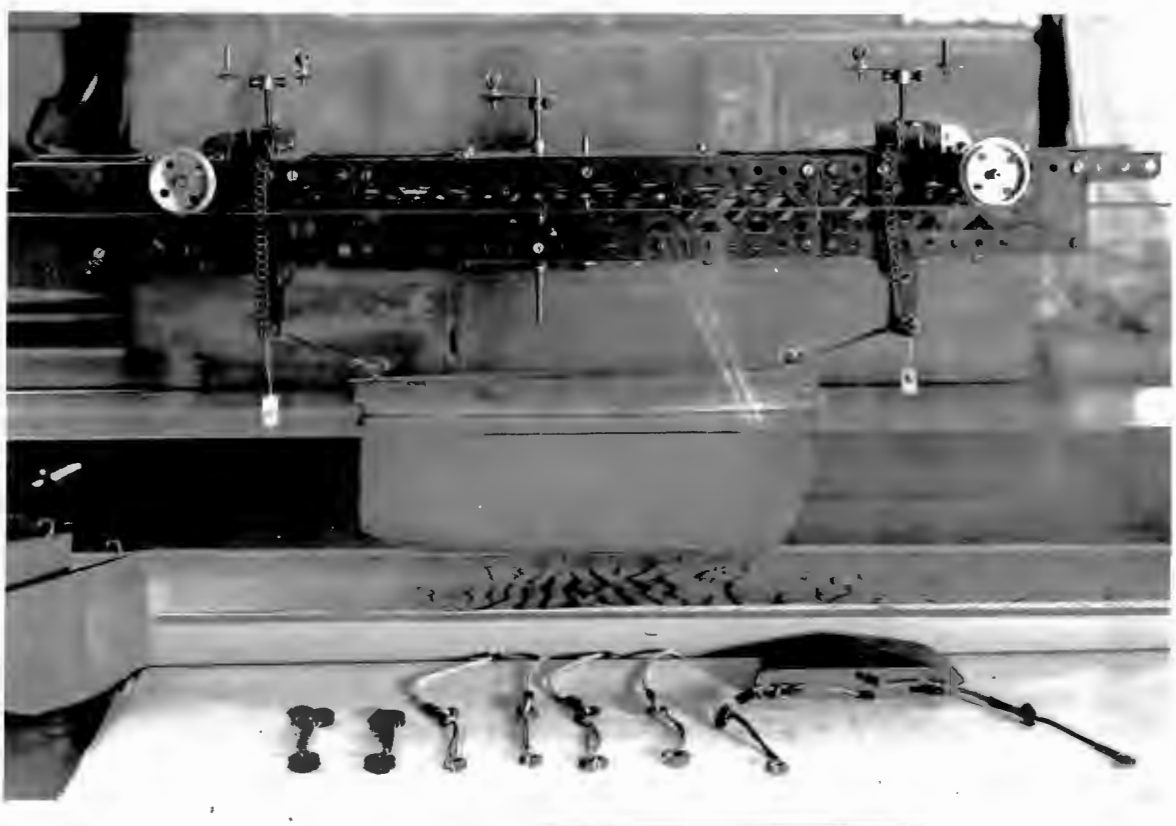
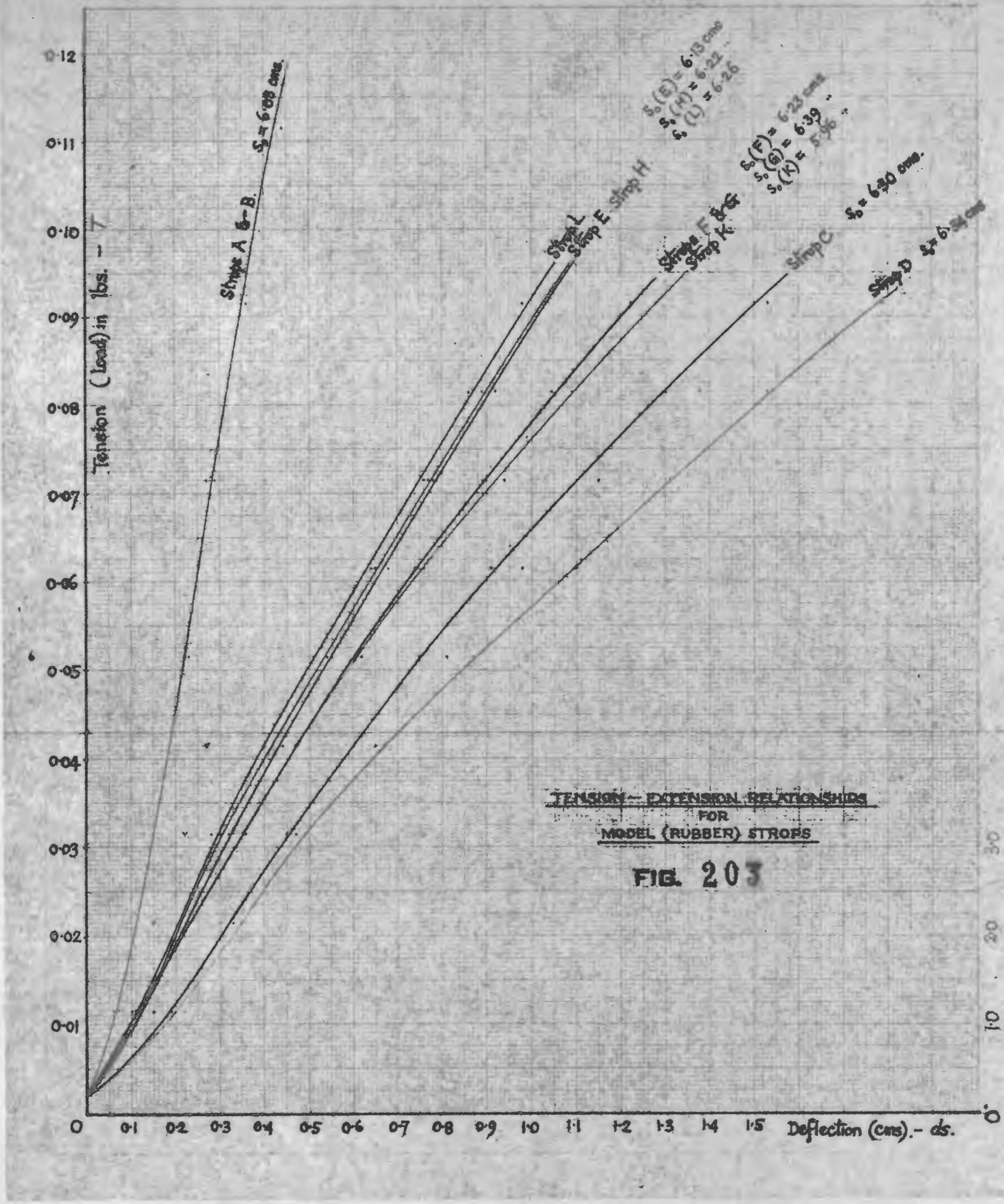


FIG. 202. MOORING CARRIAGE FOR EXPERIMENTAL STUDY OF SHIP MOVEMENTS.



TENSION — EXTENSION RELATIONSHIPS
FOR
MODEL (RUBBER) STROPS

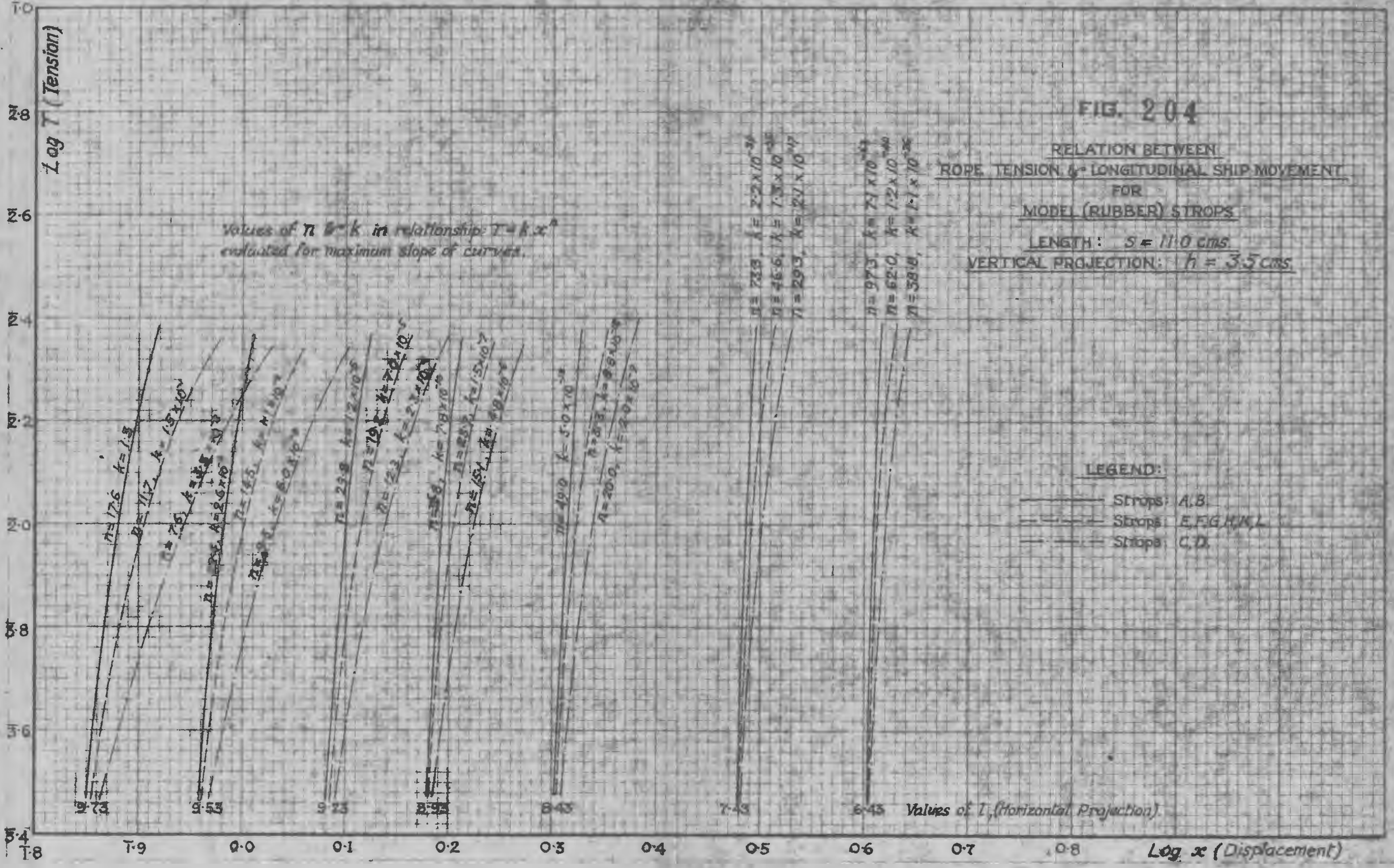
FIG. 203

FIG. 204

RELATION BETWEEN
ROPE TENSION & LONGITUDINAL SHIP MOVEMENT
FOR
MODEL (RUBBER) STROPS

LENGTH: $S = 11{\cdot}0$ cms
VERTICAL PROJECTION: $h = 3{\cdot}5$ cms

Values of n & k in relationship: $T = k\,x^n$
evaluated for maximum slope of curves.



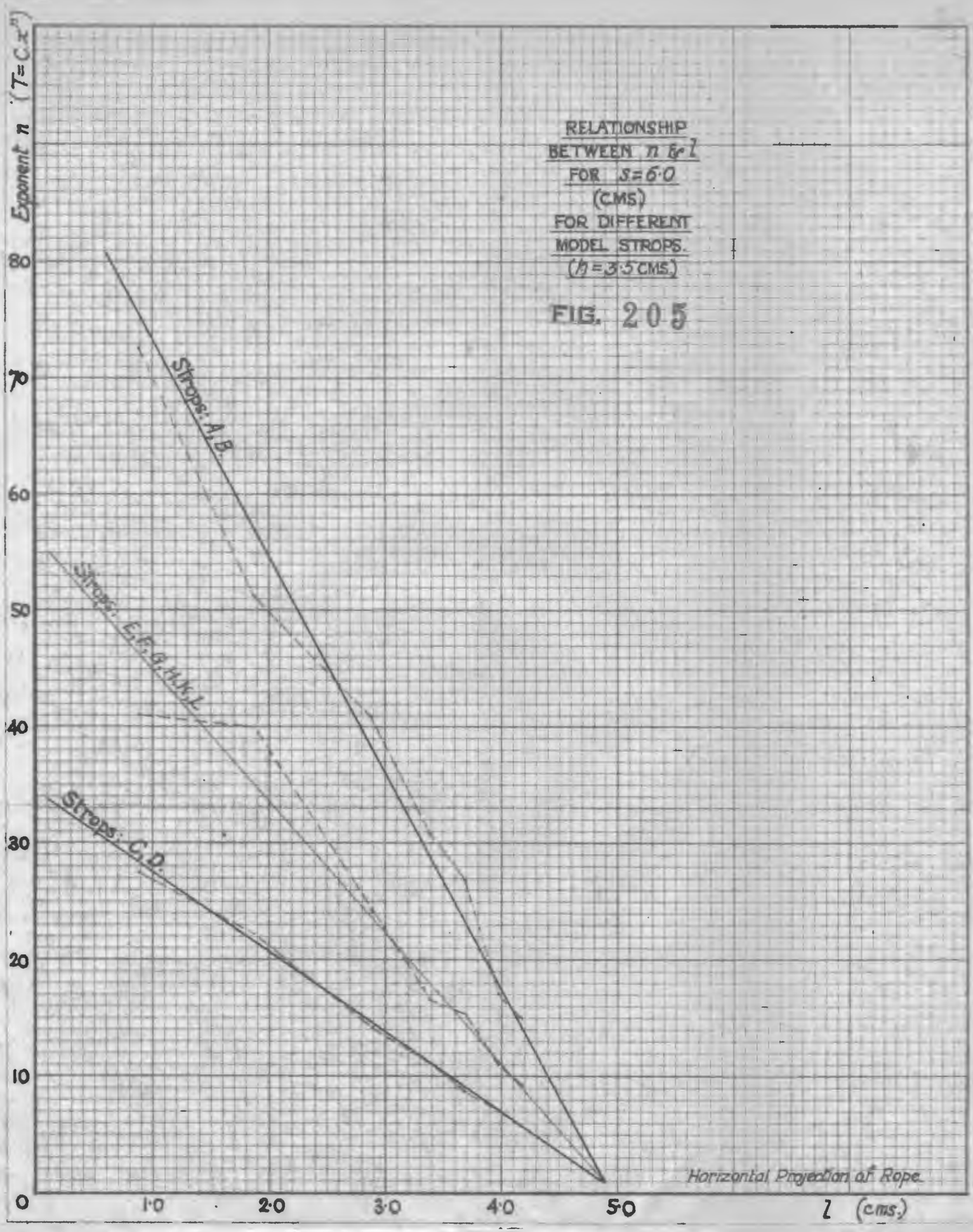


FIG. 205 (b). CHARACTERISTICS OF MODEL ROPES.

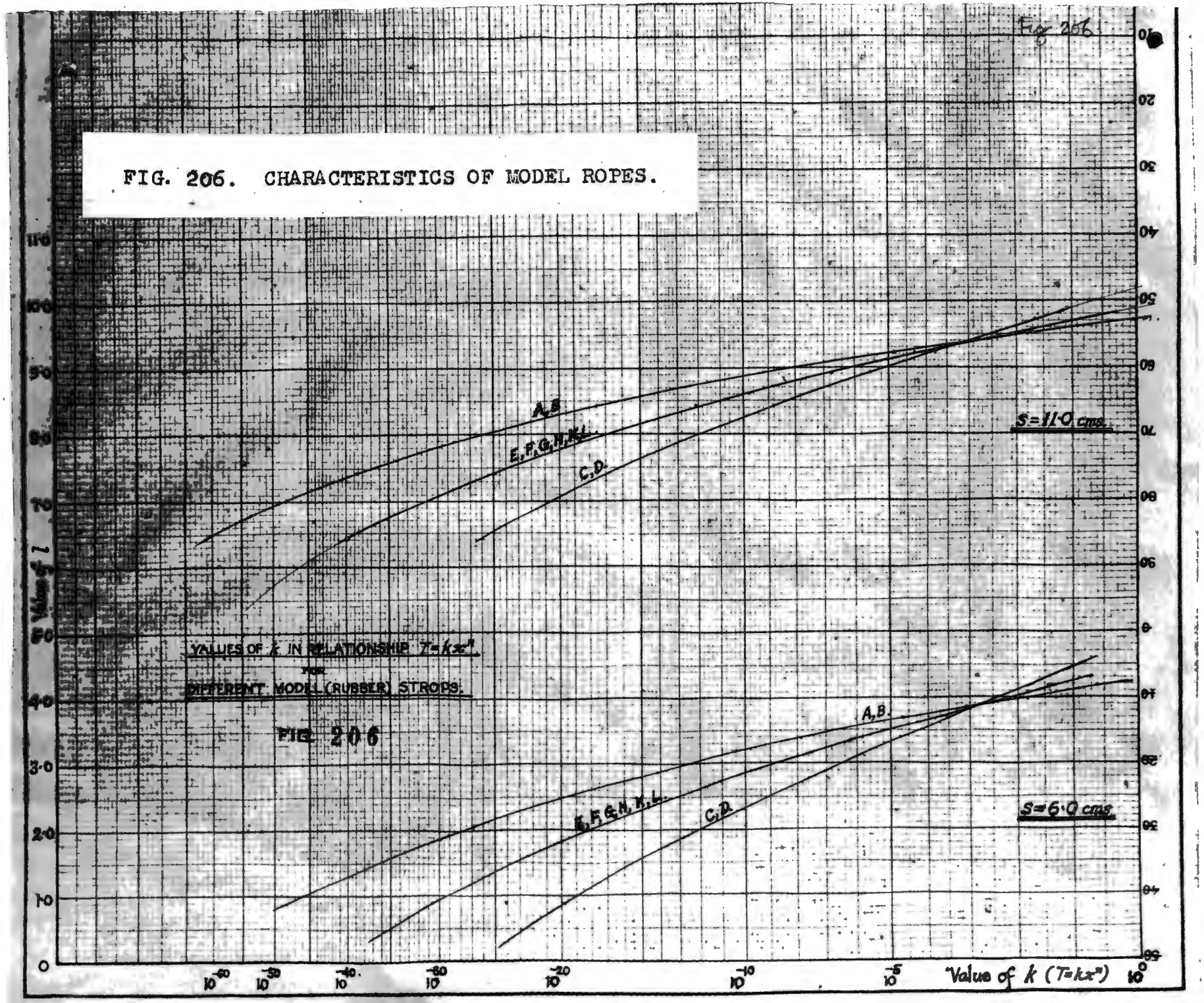
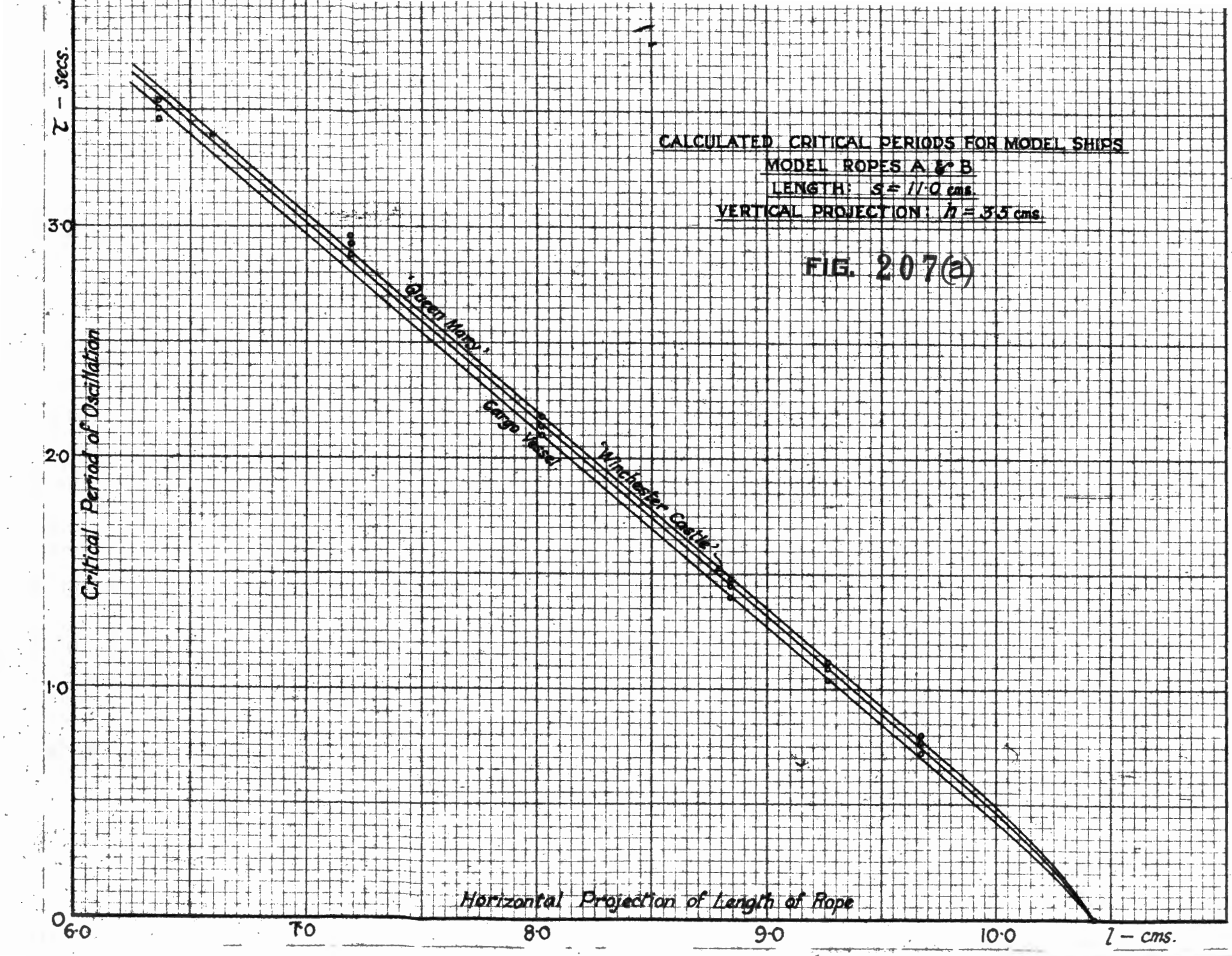
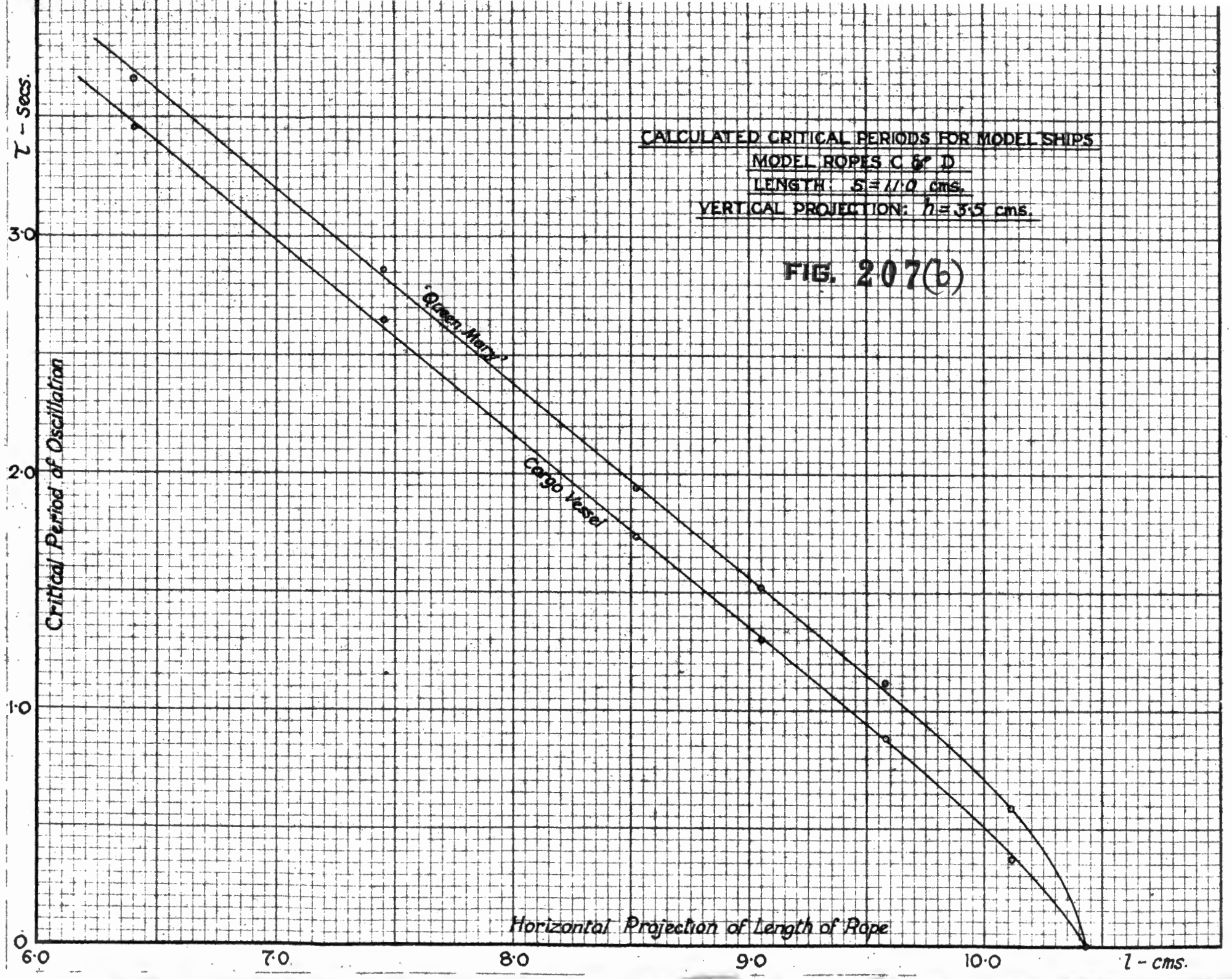


Fig 206
FIG. 206. CHARACTERISTICS OF MODEL ROPES.
A,B
E,F,G,H,K,L.
C,D.
S=11·0 cms.
S=6·0 cms.
A,B.
E,F,G,H,K,L.
C,D.
Value of k (T=kx^n)
VALUES OF k IN RELATIONSHIP T=kx^n
FOR
DIFFERENT MODEL (RUBBER) STROPS.
FIG. 206

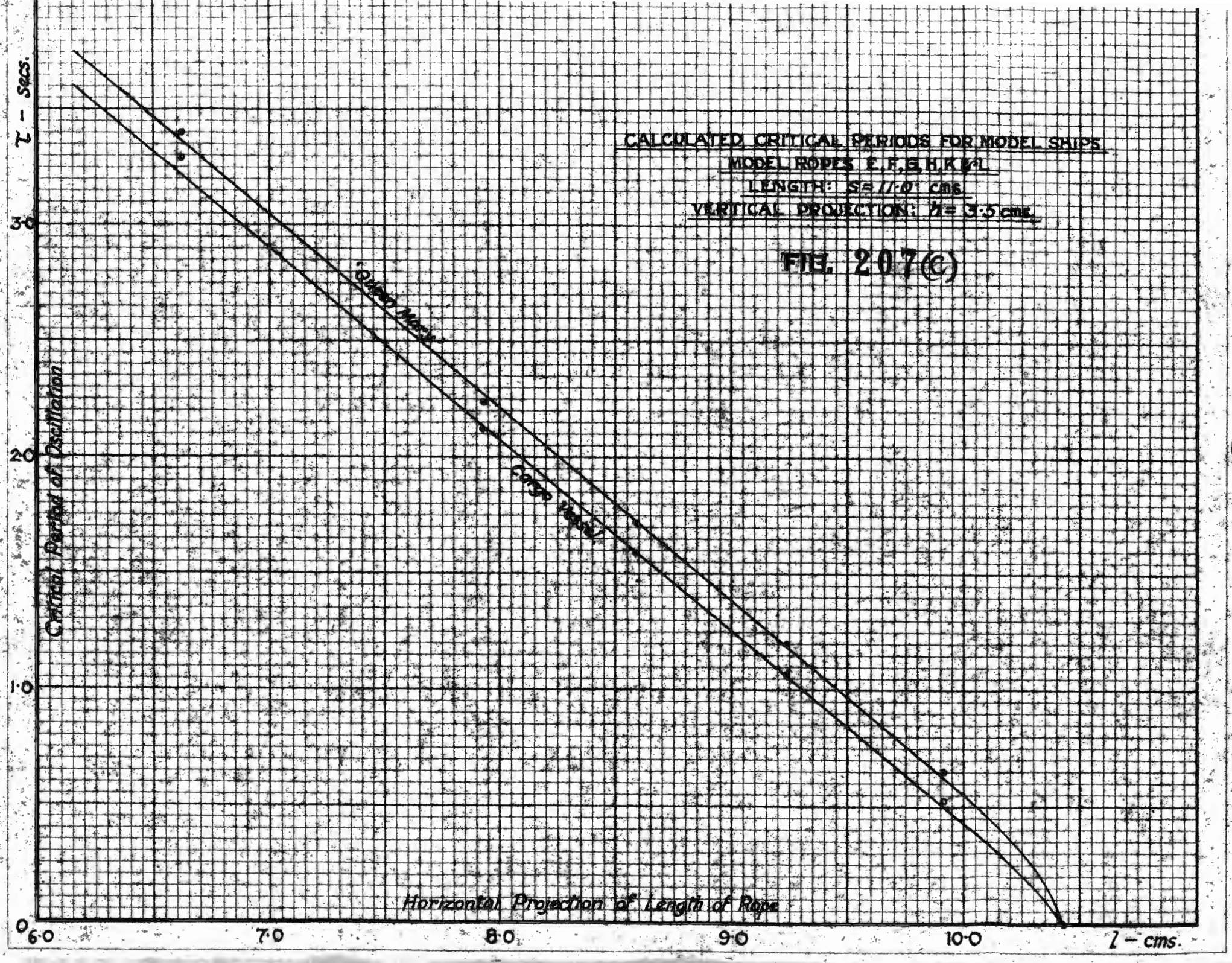
FIG. 206



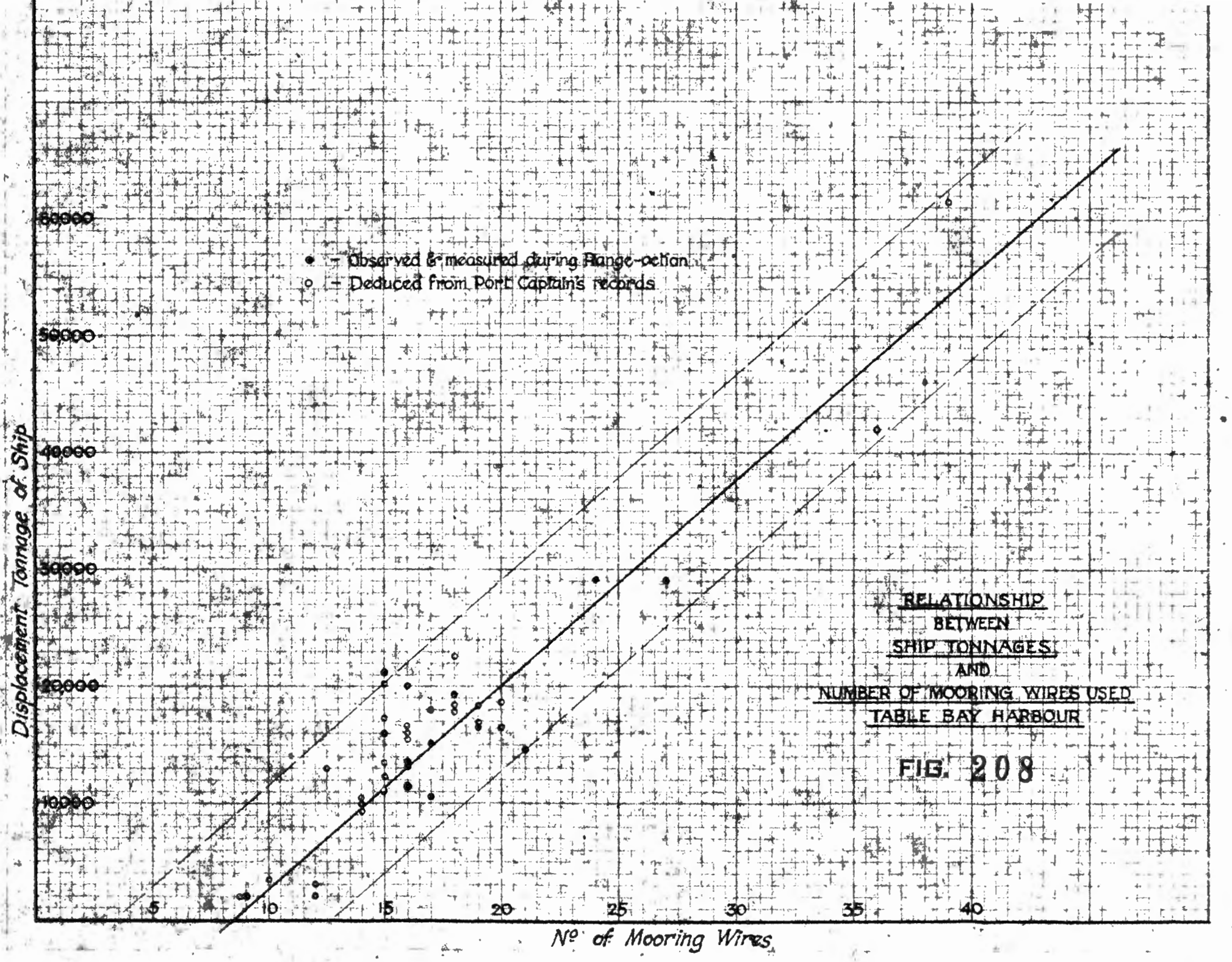
ORANGE SERIES NUMBER 175
J. J. LEDGER & CO. LTD.



ORANGE SERIES NUMBER 175
J. J. LESSON & CO. LTD.

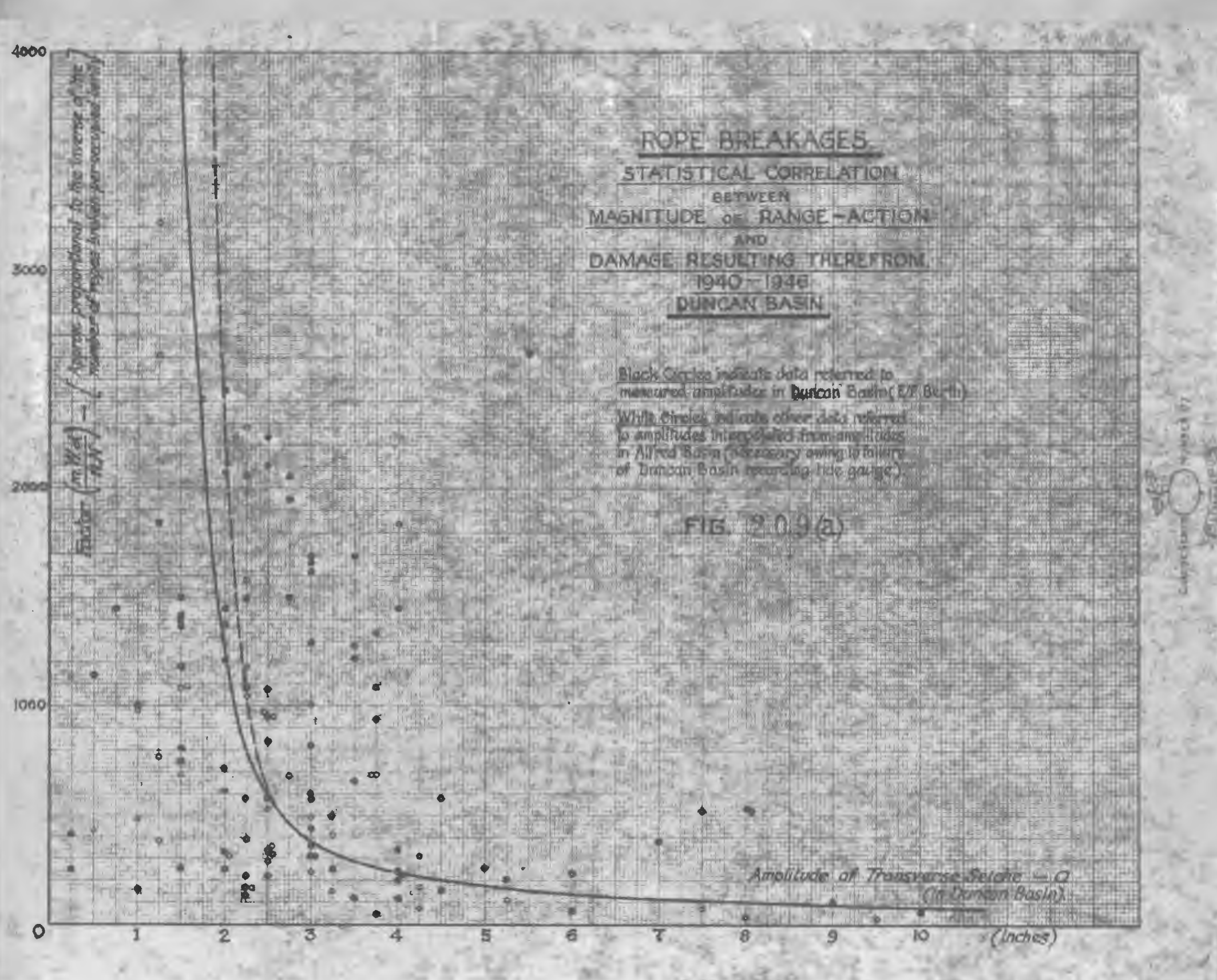


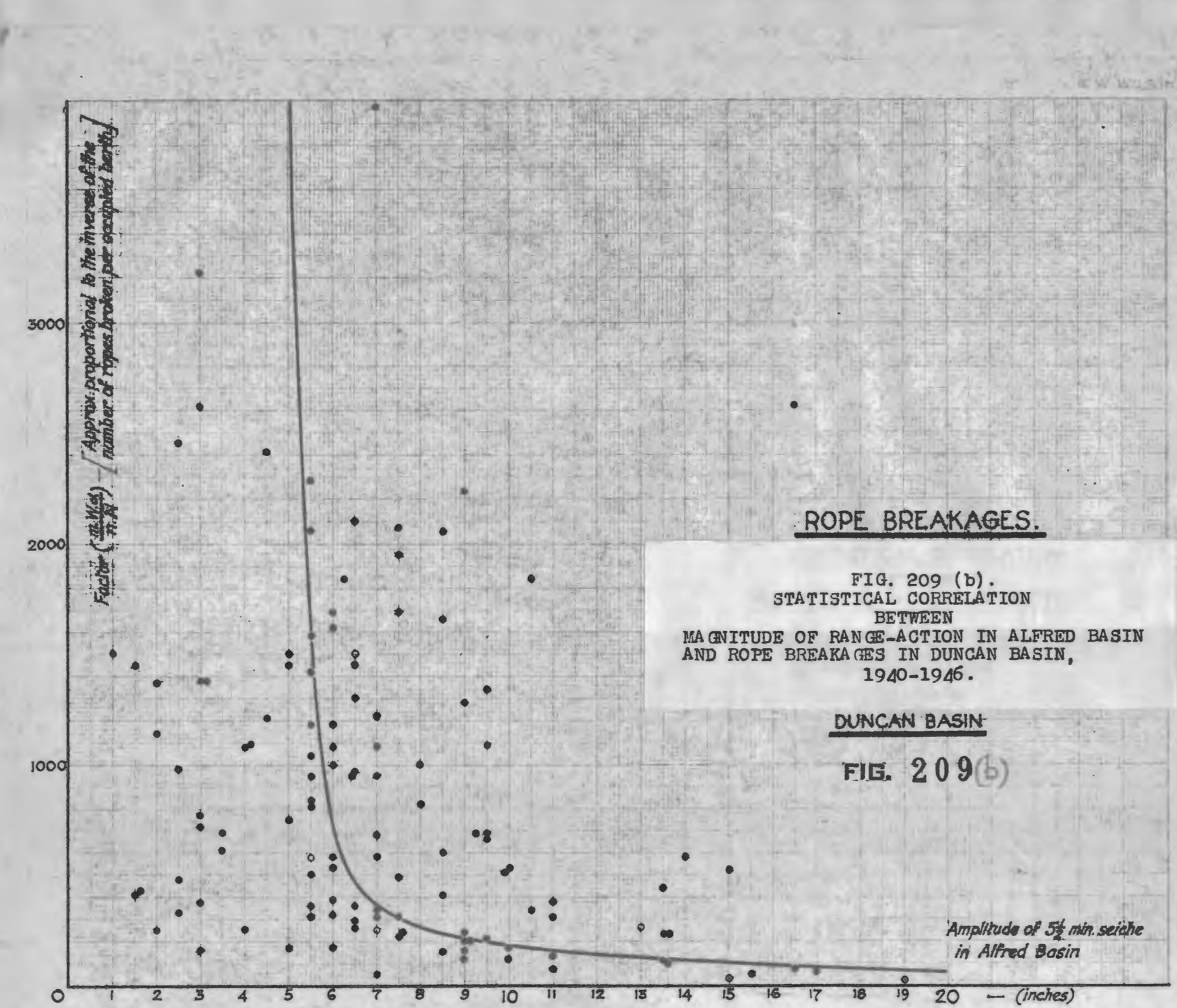
ORANGE SERIES NUMBER 175
JOHANNESBURG



RELATIONSHIP
BETWEEN
SHIP TONNAGES
AND
NUMBER OF MOORING WIRES USED
TABLE BAY HARBOUR

FIG. 208


ROPE BREAKAGES
STATISTICAL CORRELATION
BETWEEN
MAGNITUDE OF RANGE-ACTION
AND
DAMAGE RESULTING THEREFROM.
1940-1946
DUNCAN BASIN
Black Circles indicate data referred to measured amplitudes in Duncan Basin (E/F Berth)
White Circles indicate other data referred to amplitudes interpolated from amplitudes in Alfred Basin (necessary owing to failure of Duncan Basin recording tide gauge).
FIG. 209(a)
Factor $\left(\frac{m\,W\,a^2}{A\,\lambda^2}\right)^{\frac{1}{4}}$ (Approx. proportional to the inverse of the number of ropes broken per unit quantity)
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
(Inches)
Amplitude of Transverse Seiche = a (in Duncan Basin)


Factor ($\frac{W.W.(t)}{H.A.}$) / Approx: proportional to the inverse of the number of ropes broken per accepted berth.
3000
2000
1000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 — (inches)
ROPE BREAKAGES.
FIG. 209 (b).
STATISTICAL CORRELATION
BETWEEN
MAGNITUDE OF RANGE-ACTION IN ALFRED BASIN
AND ROPE BREAKAGES IN DUNCAN BASIN,
1940-1946.
DUNCAN BASIN
FIG. 209(b)
Amplitude of 5½ min. seiche in Alfred Basin

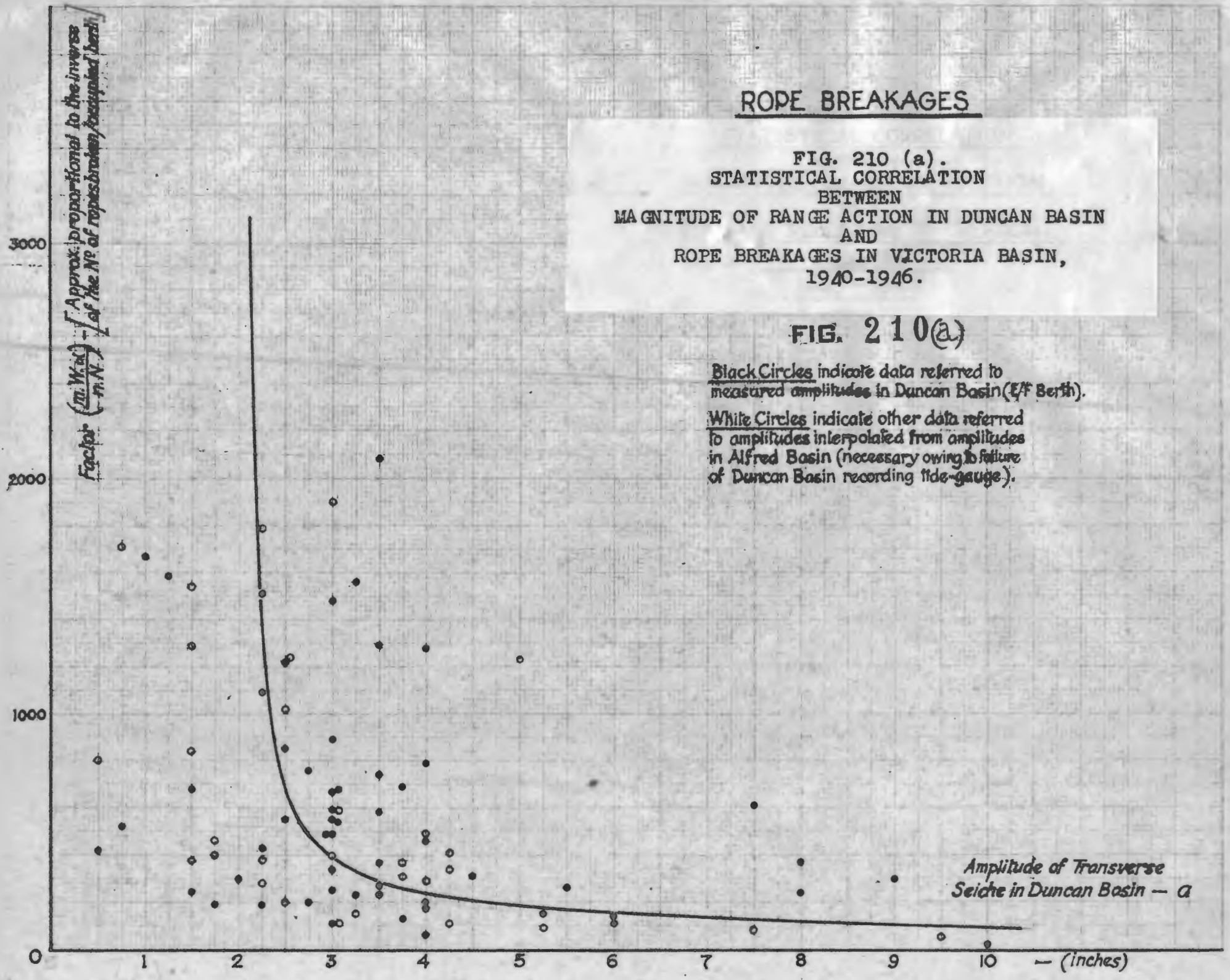
ROPE BREAKAGES

FIG. 210 (a).
STATISTICAL CORRELATION
BETWEEN
MAGNITUDE OF RANGE ACTION IN DUNCAN BASIN
AND
ROPE BREAKAGES IN VICTORIA BASIN,
1940-1946.

FIG. 210(a)

Black Circles indicate data referred to measured amplitudes in Duncan Basin (E/F Berth).

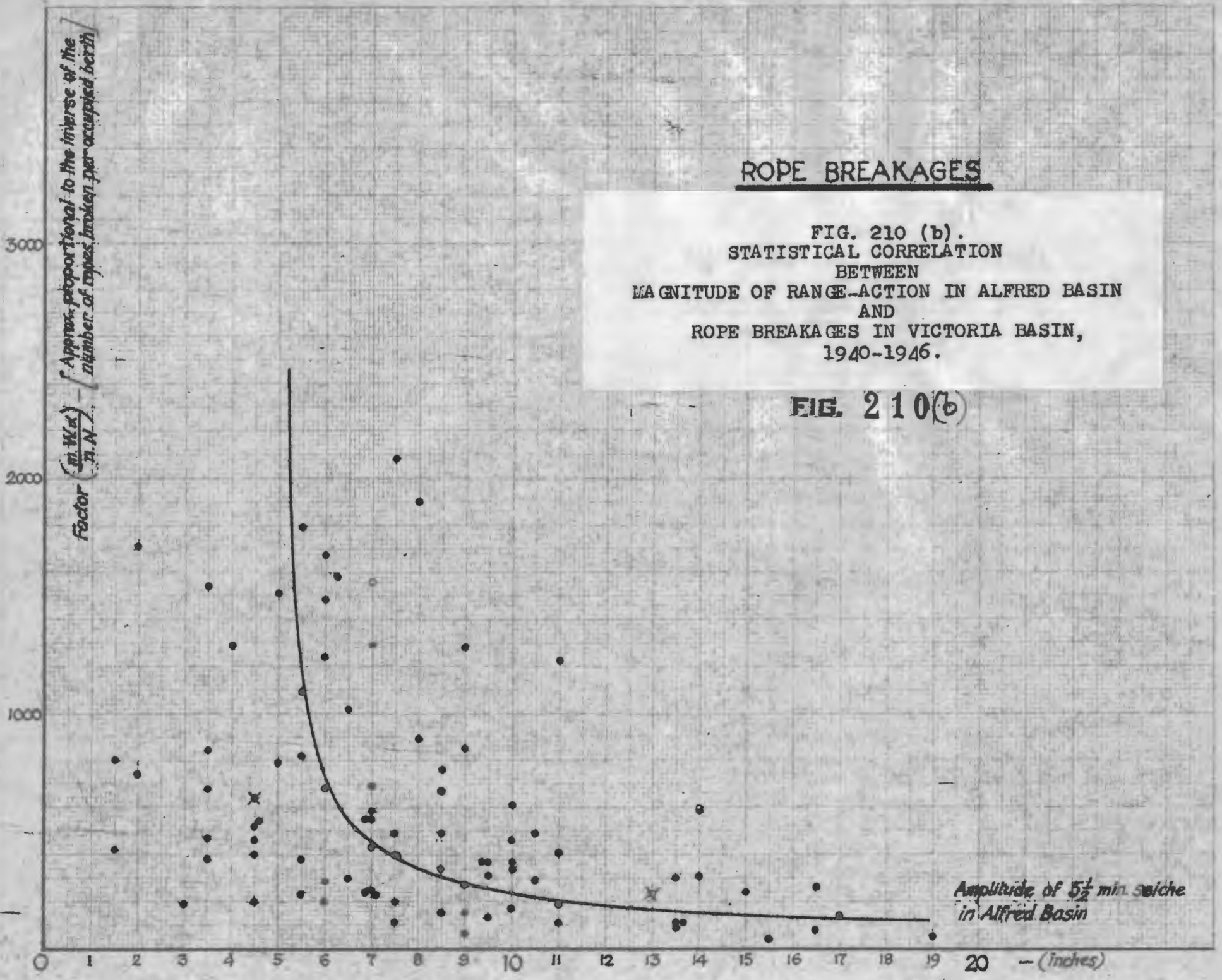
White Circles indicate other data referred to amplitudes interpolated from amplitudes in Alfred Basin (necessary owing to failure of Duncan Basin recording tide-gauge).

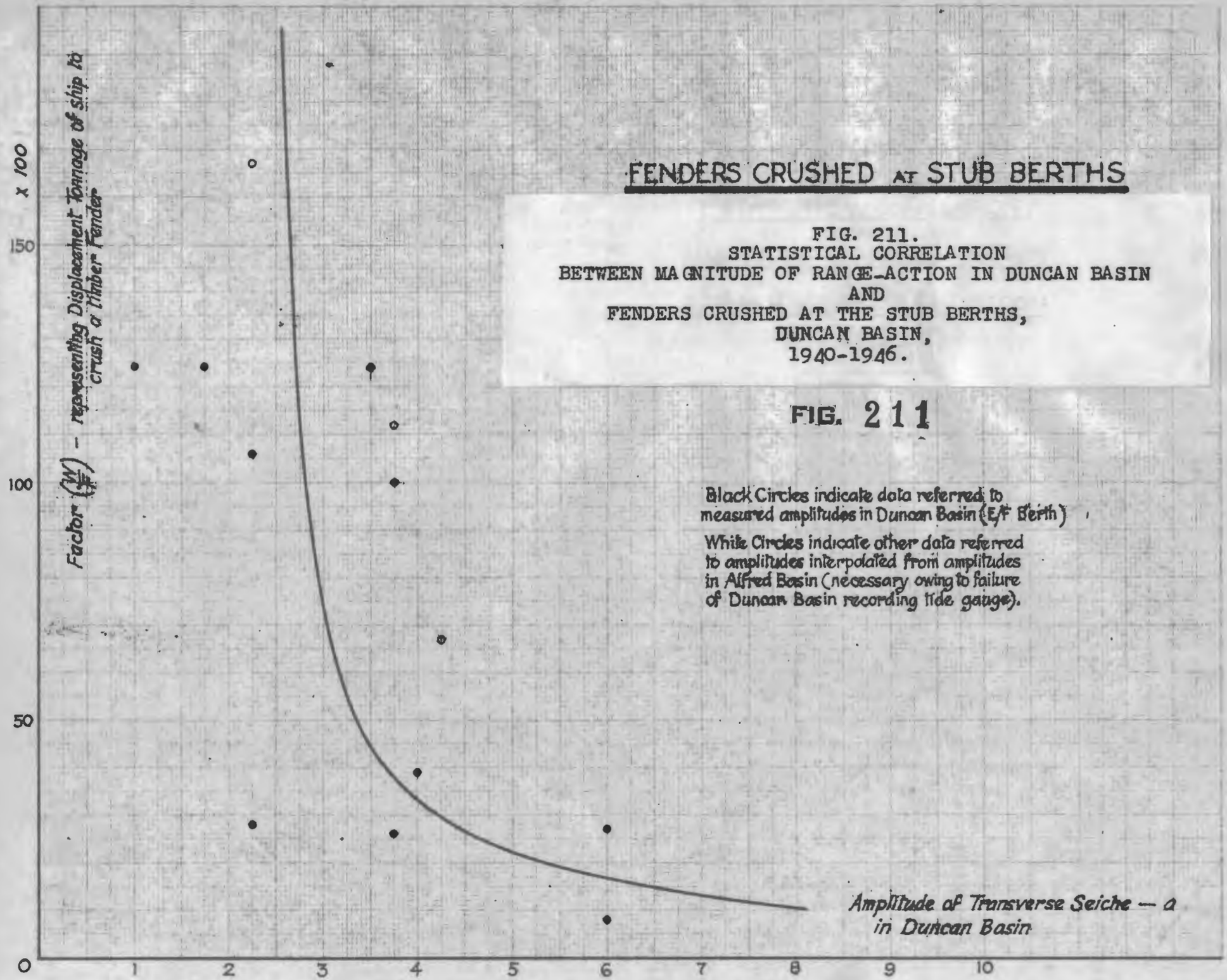


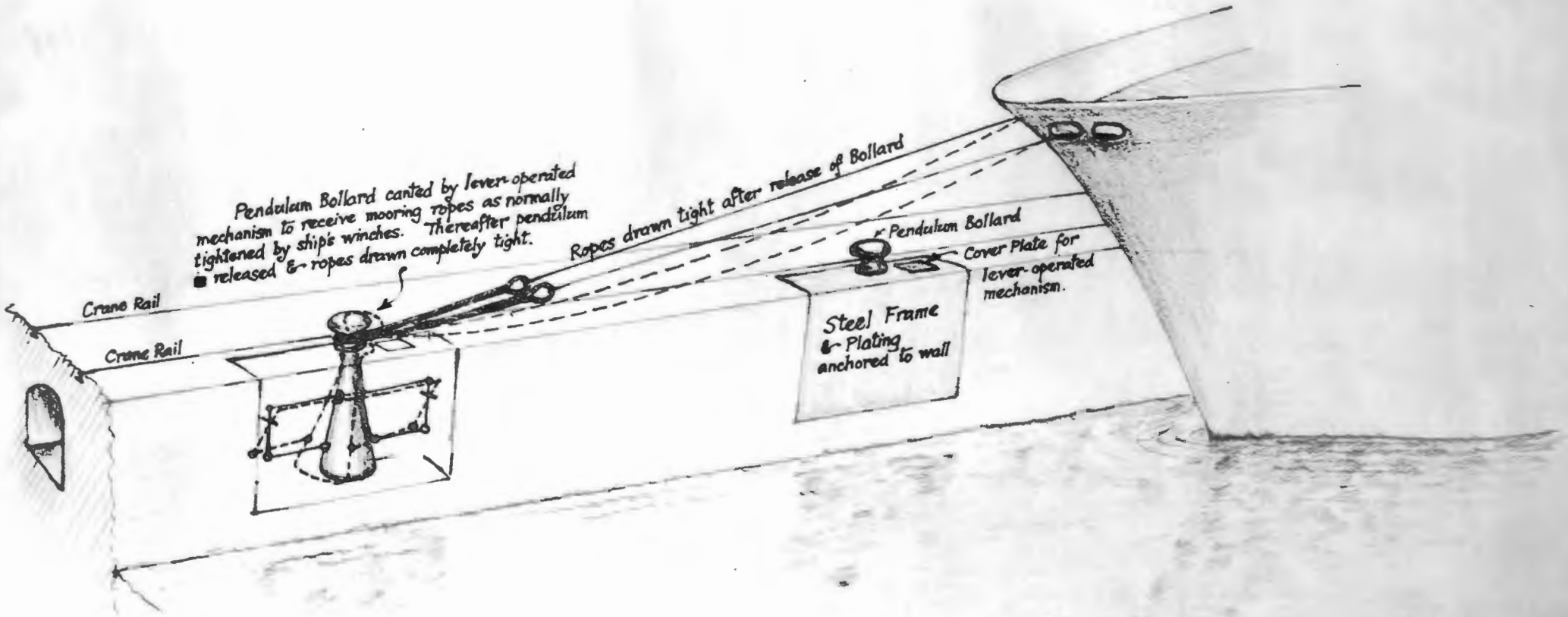
ROPE BREAKAGES

FIG. 210 (b).
STATISTICAL CORRELATION
BETWEEN
MAGNITUDE OF RANGE-ACTION IN ALFRED BASIN
AND
ROPE BREAKAGES IN VICTORIA BASIN,
1940-1946.

FIG. 210(b)




FENDERS CRUSHED AT STUB BERTHS
FIG. 211.
STATISTICAL CORRELATION
BETWEEN MAGNITUDE OF RANGE-ACTION IN DUNCAN BASIN
AND
FENDERS CRUSHED AT THE STUB BERTHS,
DUNCAN BASIN,
1940-1946.
FIG. 211
Black Circles indicate data referred to measured amplitudes in Duncan Basin (E/F Berth)
White Circles indicate other data referred to amplitudes interpolated from amplitudes in Alfred Basin (necessary owing to failure of Duncan Basin recording tide gauge).
Factor (W/F) - representing Displacement Tonnage of ship to crush a Timber Fender
x 100
150
100
50
0
1
2
3
4
5
6
7
8
9
10
Amplitude of Transverse Seiche — a in Duncan Basin



SUGGESTED PENDULUM-BOLLARDS FOR ENSURING TIGHT MOORING ROPES

FIG. 212 (a)

B.R.W.

SUGGESTED
PENDULUM BOLLARD
& MECHANISM
(as viewed from the ship side)

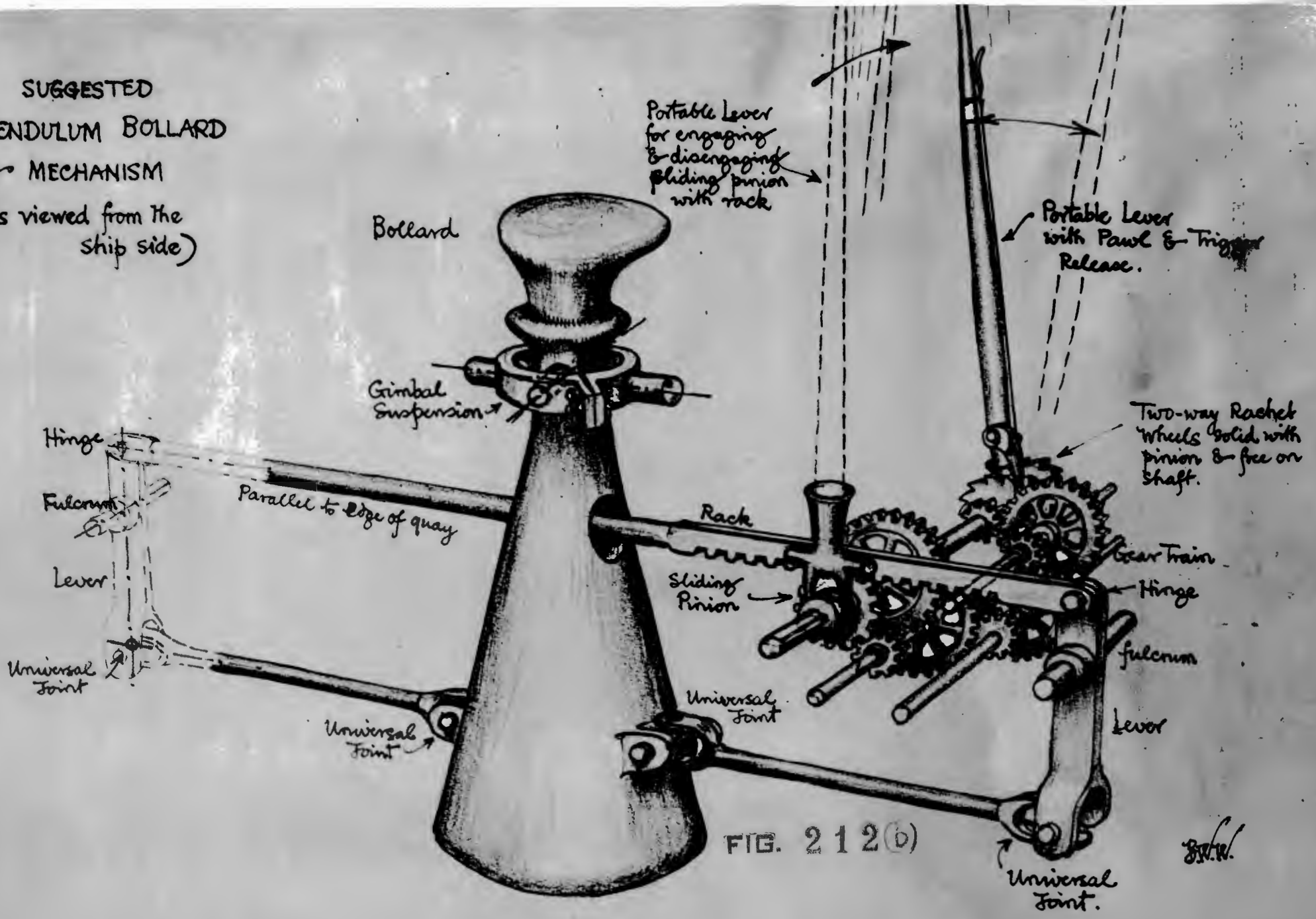


FIG. 212(b)

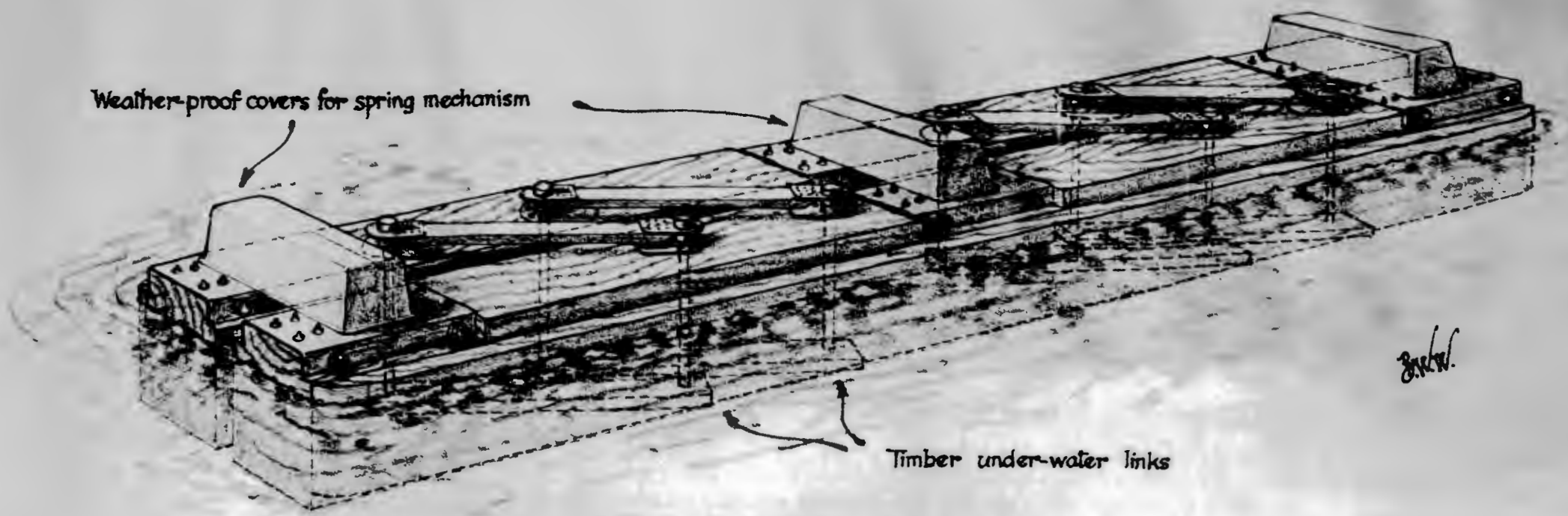
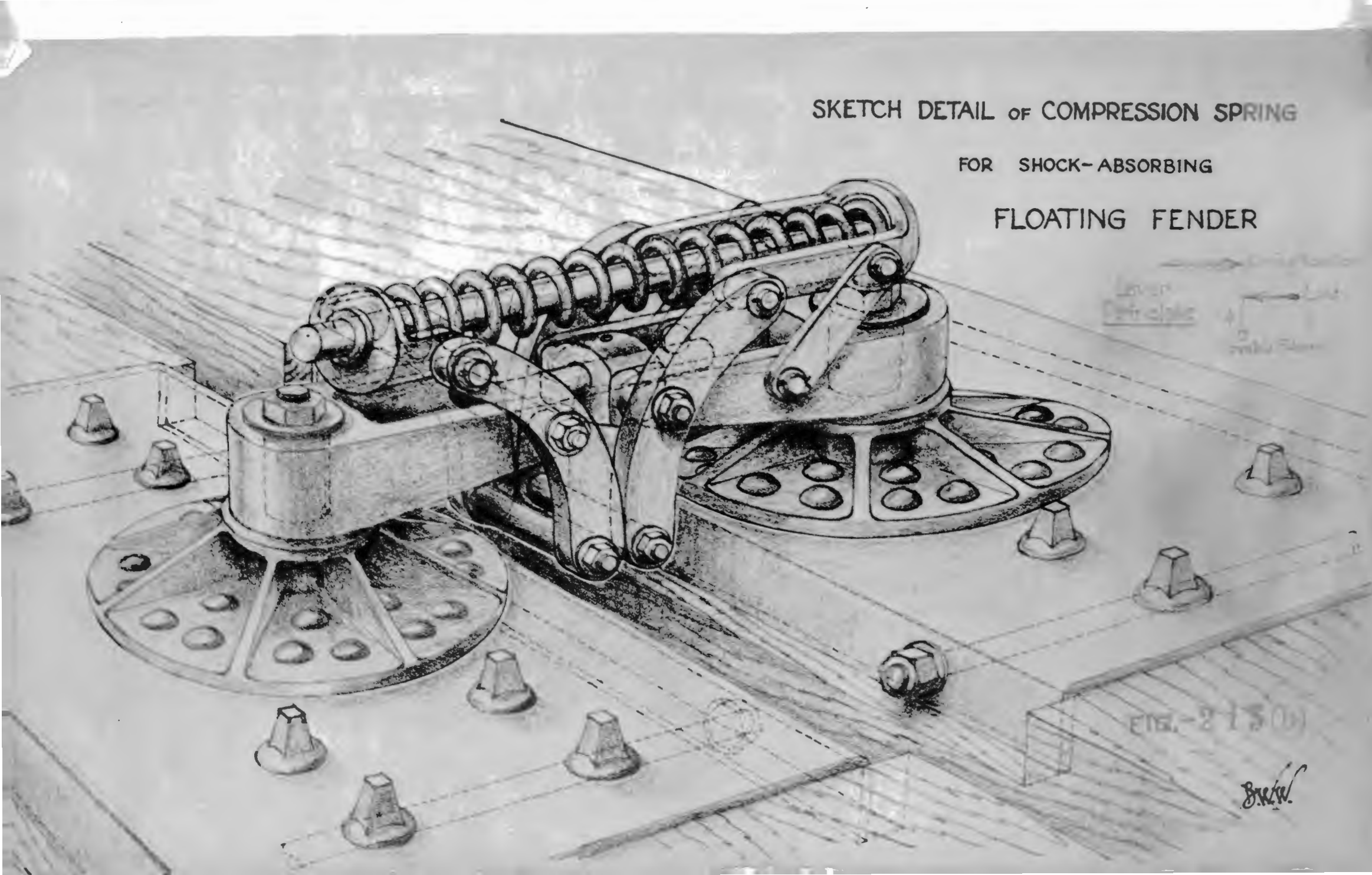
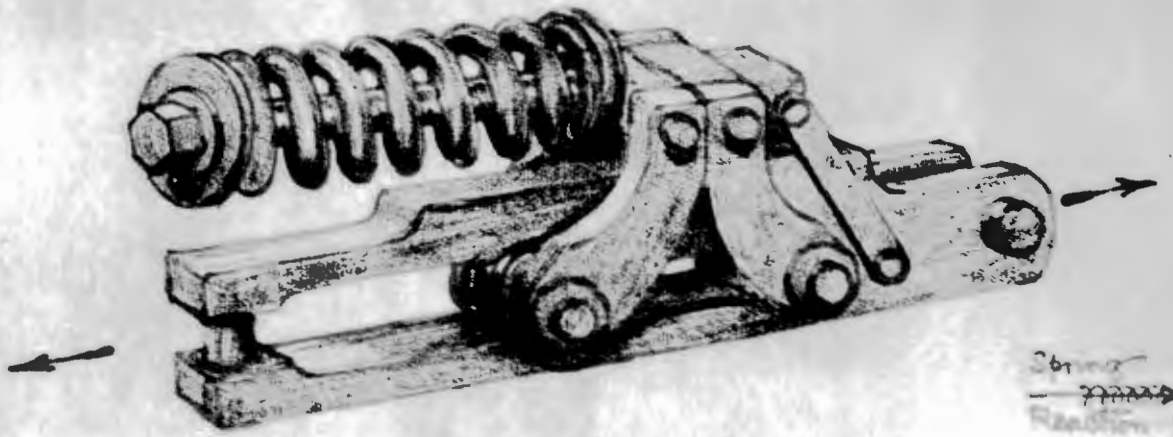


FIG. 213(a)

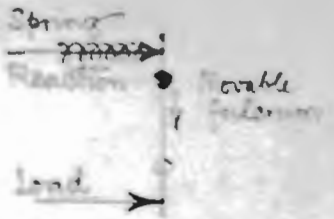
SKETCH OF SPRING FLOATING FENDER


SKETCH DETAIL OF COMPRESSION SPRING
FOR SHOCK-ABSORBING
FLOATING FENDER

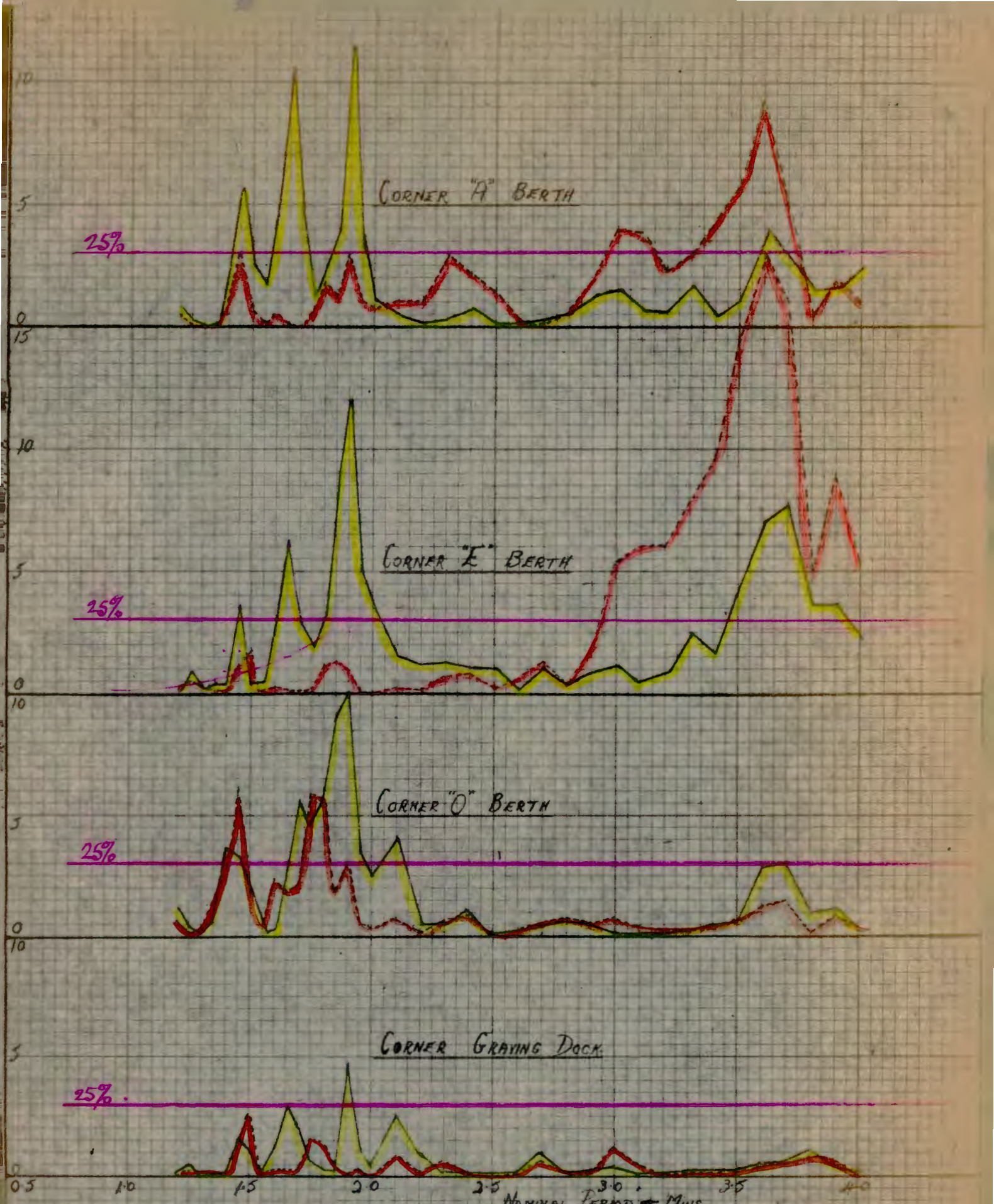


Monarch Spring.

FIG. 214

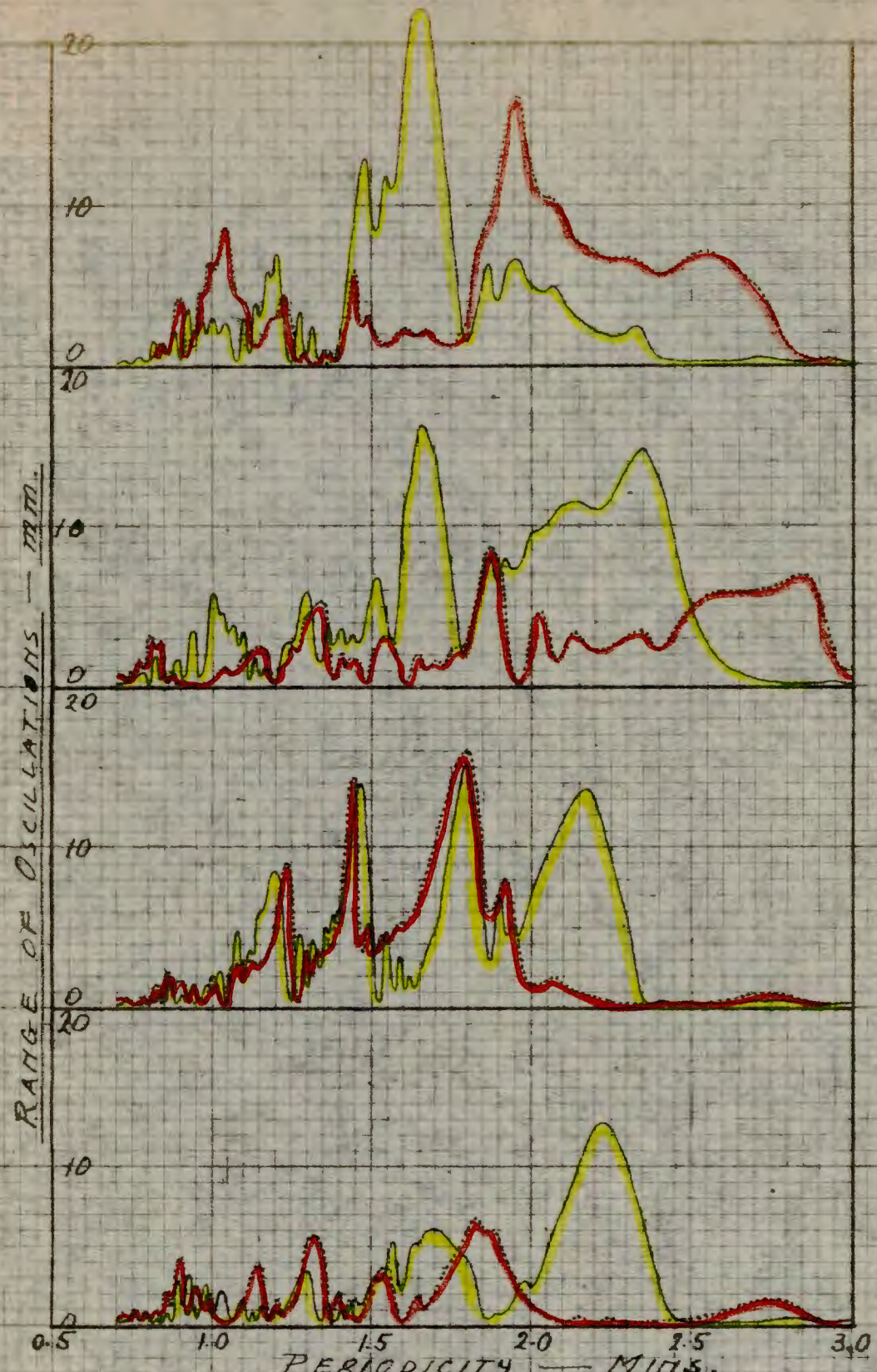


Lever Principle.



COMPARISON BETWEEN THE EXISTING HARBOUR AND TRIAL SOLUTION M-5 AT VARIOUS PERIODICITIES

FIG. 215



TEST WITH PLUNGER IN FRONT OF ENTRANCE OF DUNCAN DOCK.

EXISTING HARBOUR.

PIER 850' OUT FROM "C-D" BERTH
850' FROM "E" BERTH.

FIG. 216