# The JOURNAL of THE INSTITUTE OF NAVIGATION

OL. IX, NO. 2	APRIL	1956
Observational Errors An Institute Monograph		105
Automatic Dead Reckoning Inst H. C. PRITCHARD	truments for Aircraft	136
A Microwave Course Beacon A. L. P. MILWRIGHT		144
Off the Beaten Track A LECTURE FOR CADETS		147
The Region of Collision F. J. WYLLE		161
Unification of the Abridged Nat	utical Almanac	
and the American Nautical	Almanac	171
G. M. CLEMENCE AND D. H. S	ADLER	
Where Do We Go From Here? D. O. Fraser		177
An Eighteenth Century Voyage P. C. H. CLISSOLD		191
Handling Ships in Narrow Water C. J. WYNNE-EDWARDS	rs	198
FORI	UM	
The Accuracy of Dead Reckoning		224
All Plain Sailing		230
Early Pole Star Tables		232
A Note on the Relative Wind		237
Reviews		240
Record		247

# THE INSTITUTE OF NAVIGATION

AT THE ROYAL GEOGRAPHICAL SOCIETY
1 KENSINGTON GORE LONDON SW7

JOHN MURRAY (PUBLISHERS) LTD., 50 ALBEMARLE STREET, LONDON WI

PRICE SEVEN SHILLINGS AND SIXPENCE

#### THE INSTITUTE OF NAVIGATION

Patron

H.R.H. THE DUKE OF EDINBURGH, K.G., K.T.

OFFICERS AND COUNCIL

President

Captain A. M. A. Majendie

Vice-Presidents

Captain M. E. Butler Bowdon, O.B.E., R.N.

Dr. G. E. R. Deacon, C.B.E., F.R.S.

Hon. Treasurer: Captain J. D. F. Elvish, O.B.E.

Chairman of the Technical Committee

Wing Commander E. W. Anderson, O.B.E., D.F.C., A.F.C.

Chairman of the Membership and Fellowship Committee Captain R. W. Ravenhill, C.B.E., D.S.C., R.N. (ret.).

Other Members of the Council

Squadron Leader D. Bower, M.B.E.,

A.F.C.

Group Captain E. Fennessy, O.B.E.

Mr. D. O. Fraser

Mr. W. L. S. Harrison

Air Vice-Marshal J. W. F. Merer, c.B.

Mr. J. B. Parker

Commander P. G. Satow, D.S.C., R.N.

Captain G. C. Saul

Mr. J. Vivian, D.S.O., D.F.C.

R.N.

The directors of navigation at the Admiralty, the Air Ministry and the Ministry of Transport and Civil Aviation are invited to attend meetings of the Council as ex-officio members.

Executive Secretary: M. W. Richey. Assistant Secretary: Miss L. M. A. Tower

#### The Journal of the Institute of Navigation

The Journal is published quarterly by the Institute and is edited by the Executive Secretary. It contains original papers contributing to the science of navigation, including those presented at meetings of the Institute together with the ensuing discussion. In addition the Journal includes a record of current navigational work, reviews of important books, and other matters of concern to those interested in navigation.

The Journal is free to all members of the Institute. It is sold to the public at seven shillings and sixpence per copy or, by subscription, at thirty-one shillings per annum (post free) and may be obtained through all booksellers and John Murray (Publishers) Ltd., 50 Albemarle Street, London W1. American subscriptions at \$1.50 per copy or \$6 per annum (post free).

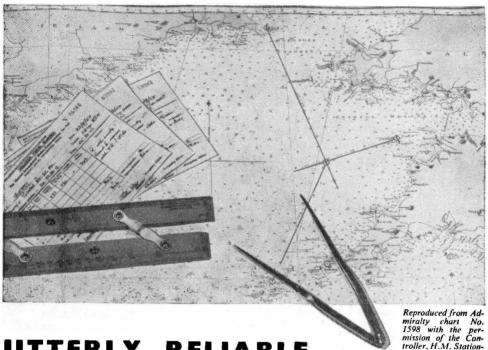
Contributions, which are welcomed from both members and non-members, should be addressed to the Editor.

Enquiries for advertising space should be addressed to the Institute offices.

The postal address of the Institute is:

The Institute of Navigation,
as The Royal Geographical Society,
s Kensington Gore, London SW7.

Telephone: Kensington 5021.



UTTERLY RELIABLE
D.F. BEARINGS

when you need them most

When prolonged bad weather has made it impossible to obtain sights during an ocean passage and the navigator is approaching crowded shipping lanes and a dangerous coast he turns with confidence to his Marconi "Lodestone". He knows it will give him the accurate trustworthy information he needs to enable him to proceed in safety—in foul weather, when the ship is lively, just as in fair.



ery Office and of the Hydrographer of the

#### Marconi "Lodestone" Direction-Finder

The "Lodestone" is sturdy and compact, arranged for desk or bench mounting and may be installed at any distance up to 60 ft. from the loop aerial. Gyro-compass coupling is available if required. Degree and tuning scales are of large

diameter and internally illuminated for precision and easy reading. The use of the "sense check" switch automatically changes the bearing scale to the correct setting. Only in very exceptional cases will correction curves be necessary

# MARCONI MARINE

maintain service facilities in all principal ports

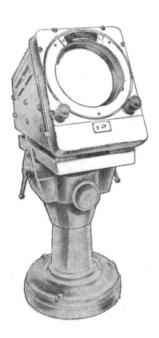
THE MARCONI INTERNATIONAL MARINE COMMUNICATION COMPANY LIMITED

Marconi House, Strand, London, W.C.2. Telephone: COVent Garden 1234

# "SHE WAS ABLE TO FOLLOW THE IGEBREAKER TOWARDS HARBOUR"



says Captain Goldie to his Shipowners-Stone & Rolfe Ltd.



"The vessel s.s. 'Berylstone' arrived off St. Johns, Newfoundland, on the 10th April in dense fog. picked up the Icebreaker, still in dense fog, on her Radar next morning after standing off the Harbour during the night, and was able to follow the Icebreaker towards the Harbour. After this experience Captain Goldie makes this comment: "I would like, once again, to praise the services of the Radar Equipment, as without this equipment the difficulties of navigating these waters around Newfoundland for anyone without years of local knowledge would be much greater." We think you would like to have these comments from ships' Masters who have had to navigate in appalling conditions and so we are happy to pass them on."

Although Decca Radar is serving the mariner in many thousands of ships of all nations, there are occasions when its value under exceptionally bad conditions is of such significance that our users are pleased to write and tell us. In the belief that this is really worthwhile testimony, we present this series of factual incidents in the use of Decca Radar at sea.



leads the way

OVER 4.500 INSTALLATIONS

DECCA RADAR LIMITED

LONDON

ENGLAND



### The Sestrel-MOORE YACHT COMPASS

April 1956



A Revolutionary Advance in Yacht Compass Design Clear perspex bowl. Compass card can be read in the vertical position as well as from above. "Circum" single ring magnet gives extreme steadiness in heavy weather. Design allows compass to be mounted on eye level and magnified card image is clearly visible up to ten feet. Two patterns of bracket fitting are available, the pillar pattern "A" for fitting to the coach roof or the bulkhead pattern "B." (Specify type when ordering).

"Sestrel" Bearing Sight for use with Sestrel-Moore Compass. £3 15s.

#### HENRY BROWNE & SON, LTD.

Sales Dept. & Service Depot:

71 LEADENHALL STREET, LONDON, E.C.3
Telephones: Sales-AVEnue 6060. Service-AVEnue 2156

Head Office: BARKING, ESSEX

### NOTWITHSTANDING

modern scientific attainment there are

RISKS at Sea and in the Air and notably on terra-firma.

The obvious and appropriate Company for the insurance of the property and liabilities of all professional and amateur Navigators is the Navigators and General.

Founded in 1921 under the chairmanship of the late Admiral Sir John Franklin Parry, K.C.B., we specialize in the insurance requirements of all who are or were connected with the sea. We have added interest in their insurance problems in that the majority of our executive staff served, at one time, in the Royal or Merchant Navy. We offer impeccable security and are renowned for prompt and generous settlement of claims.

Classes of business transacted include:

Fire, Accident, Marine Personal Effects (Ashore, Afloat and Airborne) Navigator's Indemnity (Sea and Air)

Consult your Broker or write for particulars:

# THE NAVIGATORS AND GENERAL INSURANCE CO. LTD.

15/16 CULLUM ST., LONDON, E.C.3.

Phone: MANsion 2121 Grams: Avigatinsu Fen London

SHAKESPEARE STREET

WATFORD, HERTS.

Tel. 7241. Grams, "Sidbrownix, Watford"

On the high seas ... (and in narrow waters) Brown Gyro Equipment is renowned for dependability—merchant fleets of the world, from liners to oil tankers, rely on these navigational aids.

Coming into harbour ... (and in open waters) nothing helps good seamanship better than Subsig Echo Sounding Equipment—accurate to the last foot of clearance, and available in recording or indicator models.

S. G. BROWN LTD.

(Incorporating The Submarine Signal Co., London, Ltd.)



# QV20-P18

ANODE currents as high as 18 amps and voltages up to 20 kV are among the characteristically high ratings of the QV20-P18—a hard valve designed specifically for pulse modulation.

Good electrical performance and a thoroughly rugged mechanical construction combine to make the QV20-P18 the most advanced British valve in its class,

It is an exact equivalent of the American 4PR60A and can be used as a plug-in replacement for the types 5D21 (CV2814) and 715C (CV598). The Services' type number for the QV20-P18 is CV2752.

# For Pulse Modulation

 		Max. Ratings	Typical Opera- tion
Heater voltage	26 V		
Heater current	2·25 A		
D.C. anode voltage	(kV)	20	20
D.C. grid voltage	(kV)	<b>— I</b> ∙0	0∙6
Peak positive grid voltage	(V)	300	100
Peak anode current	(A)	. 18	18
Peak positive anode voltage	(kV)	25	25
Average anode dissipation	(W)	60	_
Pulse power input	(kW)	-	320
Pulse power output	(kW)	-	305
Anode output voltage	(kV)	_	19
			•

Data and Operating Recommendations for the QV20-P18 will be gladly supplied on request.

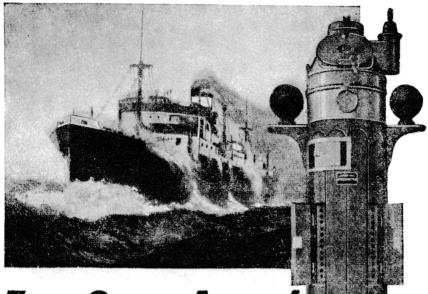
# Mullard

MULLARD LIMITED

COMMUNICATIONS AND INDUSTRIAL

VALVE DEPARTMENT · CENTURY HOUSE

SHAFTESBURY AVENUE · LONDON · W.C.2



FULL SPEED AHEAD!





NAVIGATIONAL INSTRUMENTS

The "HEZZANITH" Patent MARK VII

#### PROJECTOR BINNACLE AND COMPASS

By means of a series of optical elements an enlarged erect image of a portion of the card covering an arc of 40° in length is produced on a ground glass screen which is viewed in an adjustable plane mirror.

All stray light is effectively screened, and there is a completely unobstructed view of the card from above, permitting the normal use of an azimuth instrument by day or night.

Send for our special Projector Binnacle Leaflet (N1.56).

### **HEATH & COMPANY**

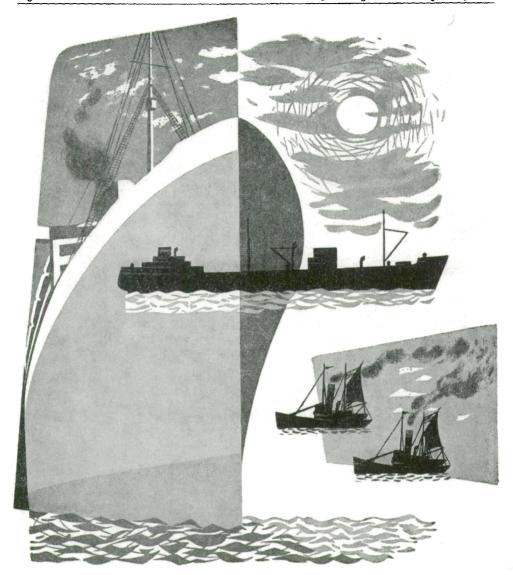
(Incorporated with W. F. Stanley & Co. Ltd.)

NEW ELTHAM

LONDON, S.E.9

Phone: ELTHAM 3836

Cables: "Polaris, Souphone, London"



# from the largest to the smallest

Ships of every size rely on the Decca Navigator to provide them with continuous position information. This navigational service is a safeguard of the greatest value and an important factor in time and fuel economy.

# THE DECCA NAVIGATOR

THE DECCA NAVIGATOR COMPANY LIMITED, 1-3 BRIXTON ROAD, LONDON S.W.S

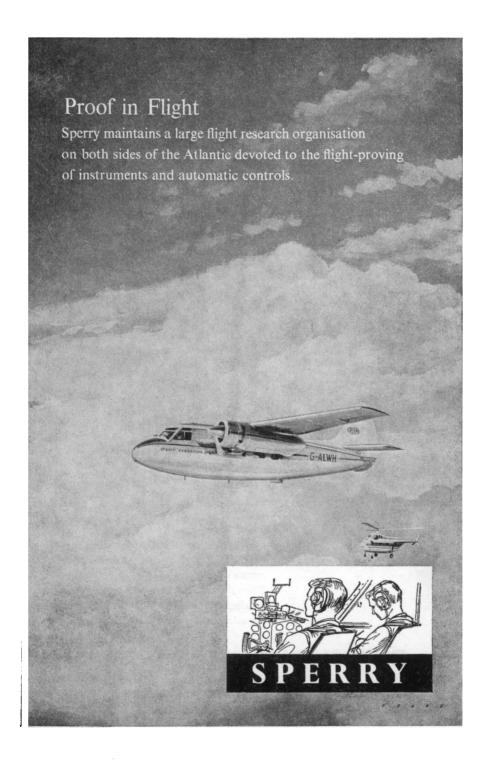


### THE BRITISH THOMSON-HOUSTON

COMPANY LIMITED . RUGBY . ENGLAND

Member of the AEI group of companies

A4885



# Marconi Airfield Control Radar



Marconi Ground Radar is used by 18 Air Forces.



system needs no time to settle down.

Lifeline of Communication

# MARCONI

Planning & Installation of Military & Civil Radar Systems

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD., CHBLMSFORD. ESSEX

# Institute Meetings: May 1956—January 1957

Wednesday, 16 May 1956 at 5 p.m.

BALLOONING

C. H. GIBBS-SMITH, D. N. HARRISON, C. S. DURST

Wednesday, 20 June at 5 p.m.

THE TRANS-ANTARCTIC EXPEDITION
GEORGE LOWE

Tuesday, 16 October at 3 p.m.

ANNUAL GENERAL MEETING

Wednesday, 24 October at 2.15 p.m.

CADET LECTURE

Friday, 16 November at 5.15 p.m.

THE FUTURE OF TURBO-PROP OPERATIONS
OVER THE NORTH ATLANTIC

J. E. D. WILLIAMS

Friday, 14 December at 5.15 p.m.

PORT OPERATION IN FOG

L. S. LE PAGE

Friday, 18 January 1957 at 5.15 p.m.

HELICOPTER NAVIGATION

P. A. HEARNE (BRITISH EUROPEAN AIRWAYS)

#### HARRIES COURSE AND BEARING INDICATOR

(Patents applied for)

AN ENTIRELY NEW METHOD FOR ALL CHARTWORK

Any course may be laid and the true course read immediately without moving the instrument from the course line, i.e. no 'crabbing' to a compass rose or meridian is necessary.

All other functions of the Field's or roller rules are also performed with complete accuracy, simply and swiftly.

See January issue of this Journal (page 65).

All enquiries to:

FAIRWOOD SHIPPING & TRADING CO. LTD., 20/24 PEMBROKE BUILDINGS, SWANSEA

## Old book—NEW LOOK

# THE ART OF ASTRONOMICAL NAVIGATION

by S. M. BURTON

being the modernized version of the old favourite

A MANUAL OF MODERN NAVIGATION

BROWN, SON & FERGUSON, Ltd. 52-58, DARNLEY STREET, GLASGOW, S.I

Price 18/6

# THE MATHEMATICAL PRACTITIONERS OF TUDOR AND STUART ENGLAND

#### E. G. R. TAYLOR

In his Foreword to this book, the Astronomer Royal writes: 'Professor Taylor has given a fascinating account of these mathematical practitioners and of the development of ideas, methods and instruments from Tudor times to early in the eighteenth century, which forms a valuable contribution to a little-known epoch in the history of navigation and surveying.'

'The Institute of Navigation is to be congratulated on having sponsored this valuable book.' Journal of the Royal Naval Scientific Service.

'An important contribution to the history of scientific progress in England, and in particular to the history of navigation.' The Geographical Journal.

'Members of the Institute of Navigation have reason to congratulate themselves upon their happy choice of an author.' Journal of the Franklin Institute (U.S.A.).

'This is a most important and interesting book.' The Nautical Magazine.

#### CAMBRIDGE UNIVERSITY PRESS

for the Institute of Navigation

Demy 8vo. 442 pages, illustrated. Price 55s. net (45s. to Members).

#### THE USE OF RADAR AT SEA

'Whatever happens the book will remain a milestone on the road of radar in its relation to shipping.' "Hansa (Hamburg).

'It should find a place in the chart-room bookcase of every radar-fitted vessel and in the private reference library of every navigator.' Journal of the Honourable Company of Master Mariners.

'The wording is so clear and simple that it gives the reader confidence.' International Hydrographic Bulletin.

'One of the finest books on the subject.' Navigation (Los Angeles).

'There can be no doubt that a copy placed on board any radar-fitted ship would pay dividends.' Shipping World.

'An excellent handbook for the navigator.' Navigation (Paris).

'Undoubtedly as a textbook the work stands alone.' Merchant Navy Journal.

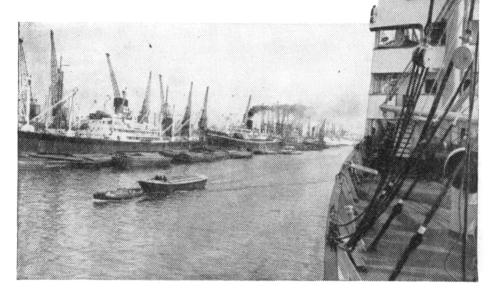
#### **HOLLIS & CARTER**

for the Institute of Navigation

Royal 8vo. 270 pages, illustrated. Price 30s. net.

# Every ship in this picture relies on KELVIN HUGHES

Taken from the foredeck of the British India Company's "Chilka", this picture shows a typical scene in the Royal Albert Dock, London. Like the "Chilka" herself, every ship shown has Kelvin Hughes equipment on board. Radar, Echo Sounders, Pneumercator Gauges, Stress and Stability Indicators . . . these are some of the Kelvin Hughes Instruments to be found among this representative gathering of deepsea vessels. More than half these ships use the Kelvin Hughes Chart Correction Service, and they all rely on Kelvin Hughes Compasses, Sextants, Chart Instruments, etc., to assist in maintaining high standards of navigational efficiency.



The ships, left to right, are:

- \* S.S. Suffolk (Federal Line)
- \* S.S. Miahar (Brocklebank Line)
- \* S.S. Pinjarra (P. & O. Steamship Co.)
- \* S.S. City of Hull (Ellerman Line)
- \* S.S. Kenya (British India Steamship Co.)
- \* S.S. Martand (Brocklebank Line)
- \* S.S. Indian Importer (India Steamship Co.) \* S.S. Jamaica Producer (Jamaican Line)

