Marine Technology Special Collection, Newcastle University

Periodicals Histories: (only trade and industry technical magazines, research journals)

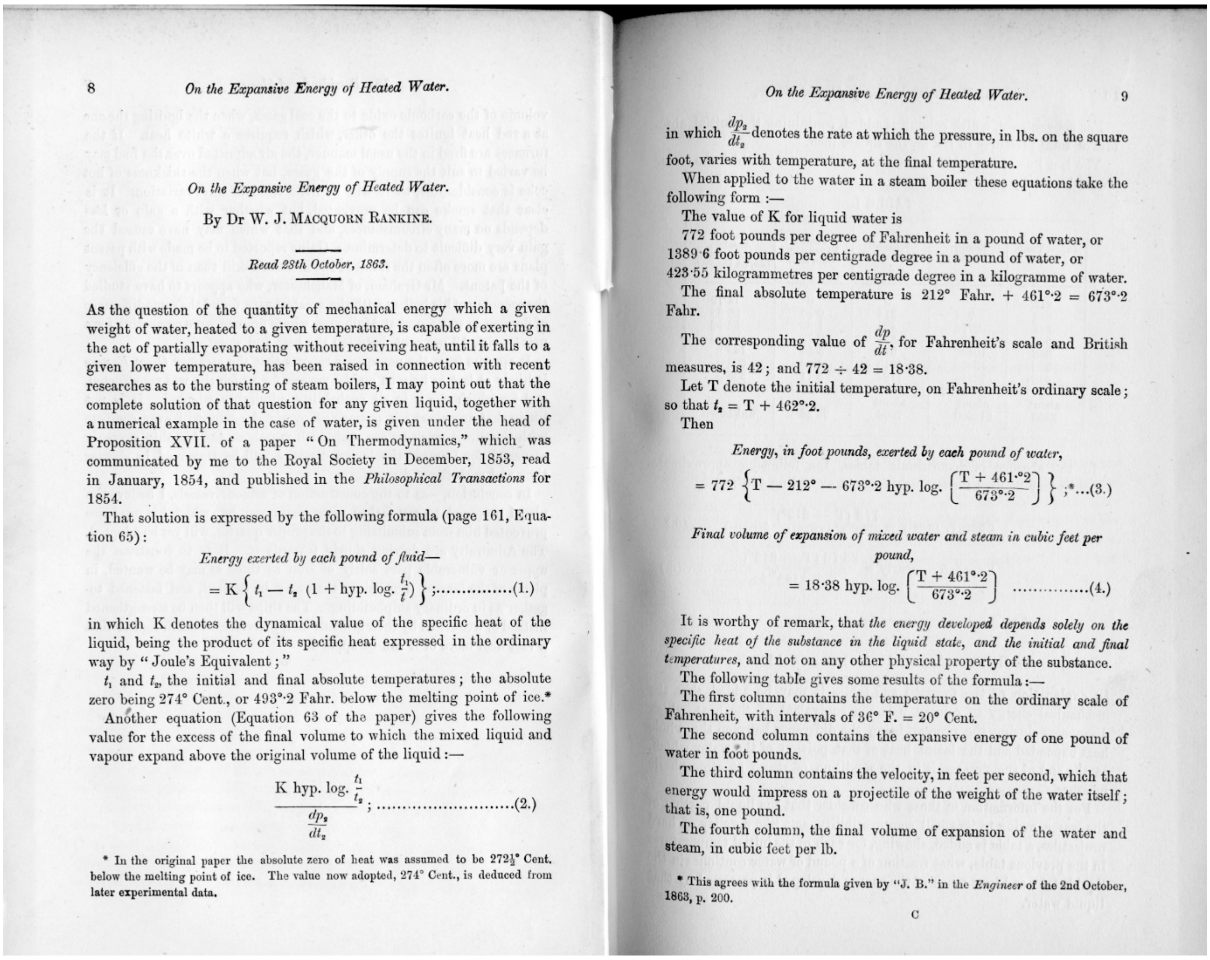
Listed in the same sequence as the Collection's holdings shown on the Collection's website for ***Search Collection*** then ***Periodicals***.

Transactions of The Institution of Engineers & Shipbuilders in Scotland, v1=1857 - to date, IESS, Glasgow, Scotland. Was a leading regional professional engineering learned society in Scotland and is still active and now called **IESIS**. Transactions is a technical research journal and coverage is general engineering and shipbuilding in Scotland with some UK and international content. Refs: IESIS http://www.iesis.org members only. MTSC is not a member. , IESS on Wikipedia https://en.wikipedia.org/wiki/Institution_of_Engineers_and_Shipbuilders_in_Scotland

Example pages: **Trans IESS**, vol.vii[vol.7], 1863-64, pp.8-15 [*contents* page & pp8-9 only scanned]. *On the expansive energy of heated water*. By W. J. MacQuorn Rankine. A mathematical treatise on the thermodynamics of water in steam boilers. A subject of vital importance to the safety and operation steamships and other steam engines.

CONTENTS.

SEVENTH SESSION, 1863-64.



8 *On the Expansive Energy of Heated Water.*

On the Expansive Energy of Heated Water.

By Dr W. J. Macquorn Rankine.

Read 28th October, 1863.

As the question of the quantity of mechanical energy which a given weight of water, heated to a given temperature, is capable of exerting in the act of partially evaporating without receiving heat, until it falls to a given lower temperature, has been raised in connection with recent researches as to the bursting of steam boilers, I may point out that the complete solution of that question for any given liquid, together with a numerical example in the case of water, is given under the head of Proposition XVII. of a paper "On Thermodynamics," which was communicated by me to the Royal Society in December, 1853, read in January, 1854, and published in the *Philosophical Transactions* for 1854.

That solution is expressed by the following formula (page 161, Equation 65):

Energy exerted by each pound of fluid—

$$= \mathrm{K}\left\{ t_1 - t_2 \left(1 + \text{hyp. log. } \frac{t_1}{t}\right) \right\}; \ldots\ldots\ldots\ldots(1.)$$

in which K denotes the dynamical value of the specific heat of the liquid, being the product of its specific heat expressed in the ordinary way by "Joule's Equivalent;"

t_1 and t_2, the initial and final absolute temperatures; the absolute zero being 274° Cent., or 493°·2 Fahr. below the melting point of ice.*

Another equation (Equation 63 of the paper) gives the following value for the excess of the final volume to which the mixed liquid and vapour expand above the original volume of the liquid:—

$$\frac{\mathrm{K} \text{ hyp. log. } \frac{t_1}{t_2}}{\frac{dp_2}{dt_2}}; \ldots\ldots\ldots\ldots(2.)$$

* In the original paper the absolute zero of heat was assumed to be 272½° Cent. below the melting point of ice. The value now adopted, 274° Cent., is deduced from later experimental data.

On the Expansive Energy of Heated Water. 9

in which $\frac{dp_2}{dt_2}$ denotes the rate at which the pressure, in lbs. on the square foot, varies with temperature, at the final temperature.

When applied to the water in a steam boiler these equations take the following form:—

The value of K for liquid water is

772 foot pounds per degree of Fahrenheit in a pound of water, or
1389·6 foot pounds per centigrade degree in a pound of water, or
423·55 kilogrammetres per centigrade degree in a kilogramme of water.

The final absolute temperature is 212° Fahr. + 461°·2 = 673°·2 Fahr.

The corresponding value of $\frac{dp}{dt}$, for Fahrenheit's scale and British measures, is 42; and 772 ÷ 42 = 18·38.

Let T denote the initial temperature, on Fahrenheit's ordinary scale; so that $t_2 = \mathrm{T} + 462°{\cdot}2$.

Then

Energy, in foot pounds, exerted by each pound of water,

$$= 772 \left\{ \mathrm{T} - 212° - 673°{\cdot}2 \text{ hyp. log.} \left[\frac{\mathrm{T} + 461{\cdot}°2}{673°{\cdot}2}\right] \right\}; ^{*}\ldots(3.)$$

Final volume of expansion of mixed water and steam in cubic feet per pound,

$$= 18{\cdot}38 \text{ hyp. log.} \left[\frac{\mathrm{T} + 461°{\cdot}2}{673°{\cdot}2}\right] \ldots\ldots\ldots\ldots(4.)$$

It is worthy of remark, that *the energy developed depends solely on the specific heat of the substance in the liquid state, and the initial and final temperatures*, and not on any other physical property of the substance.

The following table gives some results of the formula:—

The first column contains the temperature on the ordinary scale of Fahrenheit, with intervals of 36° F. = 20° Cent.

The second column contains the expansive energy of one pound of water in foot pounds.

The third column contains the velocity, in feet per second, which that energy would impress on a projectile of the weight of the water itself; that is, one pound.

The fourth column, the final volume of expansion of the water and steam, in cubic feet per lb.

* This agrees with the formula given by "J. B." in the *Engineer* of the 2nd October, 1863, p. 200.

C

International Journal of Maritime History, v1=1889 - to date, quarterly, International Maritime Economic History Association, now published by SAGE, England. A research journal with international coverage of the maritime dimensions of economic, social, cultural, and environmental history. Maritime historical themes, including shipping, shipbuilding, seafaring, ports, resorts and other coastal communities, sea-borne trade, fishing, environment and the culture of the sea. Refs: IJMH https://uk.sagepub.com/en-gb/eur/international-journal-of-maritime-history/journal202231 by subscription, MTSC does not subscribe.

Example pages: [under construction]

Transactions of the Institute of Marine Engineers, v1=1889 - to date, quarterly then bi-monthly, but continues 2002 as IMarEST (Institute of Marine Engineers, Scientists and Technologists), London, England. A leading UK national professional engineering learned society, as opposed to the once equally important UK regional societies. Now an international society. Coverage was mainly marine engineering but now much broader related topics including marine sciences and offshore engineering. Coverage was originally ma mainly UK but now international. Published "Transactions" which contained technical research papers and news of the society but also much later published monthly magazines, the first of which was ***Marine Engineers Review / MER*** 1971-2014. A trade and industry technical magazine with current news worldwide. Refs: IMarEST www.imarest.org members only, MSTC is not a member. IMarEST on Wikipedia https://en.wikipedia.org/wiki/Institute_of_Marine_Engineering,_Science_and_Technology

Example pages: **Trans I.Mar.E.,** vol.XLVII[47] part 1, 1935, pp.1-31 [only pp.1, 14 scanned]. *Some notes on heat transmission*. By E. F. Spanner. Detailed technical paper about marine boiler design. With illustrations, discussions, author's replies.

The
INSTITUTE of MARINE ENGINEERS
Founded 1889. Incorporated by Royal Charter, 1933.

Patron: HIS MAJESTY THE KING.

SESSION 1935. Vol. XLVII. Part 1.

President: JOHN H. SILLEY, ESQ., O.B.E.
President-Elect: MAURICE E. DENNY, ESQ., C.B.E.

Some Notes on Heat Transmission.

READ

By E. F. SPANNER, R.C.N.C.(ret.) (Member of Council).

On Tuesday, January 8th, 1935, at 6 p.m,

CHAIRMAN: Mr. J. HAMILTON GIBSON, O.B.E., M.Eng. (Chairman of Council).

Synopsis.

MODERN boiler design involves study of the subject of heat transmission to an ever increasing extent, the importance of gas velocities, tube sizes, and conditions of interaction between the moving fluids—gas and water—on either side of the separating diaphragm having been the subject of a great deal of research work during recent years. This paper surveys the main factors contributing to efficiency of heat transmission, and correlates these with the results of practical designs of different kinds. From this general survey arguments are developed indicating the directions in which progress is most likely to prove productive of better efficiencies. These ideas are then developed in their particular application to the science of waste heat recovery, especially in regard to their application to the case of thimble-tube boilers and water heaters. Outline arrangements illustrating various new designs of thimble-tubes and thimble-tube boilers are described, together with diagrammatic plans showing the manner in which the best results may be achieved. The paper concludes with references to the importance of correlated research on these questions to other types of boiler, and with diagrams indicating the extent to which economy can be effected by utilising waste heat even of a very low grade.

In preparing the following paper the author was prompted by the consideration that opportunity for exchange of experience and opinion upon the the subject of heat transmission—one of fundamental importance in many branches of engineering—would no doubt be welcome, since there have been many developments during the past few years in regard both to power generation and heat recovery which invite investigation and discussion.

Whether the problem concerns refrigeration, air conditioning, water heating, water cooling or steam generation, an essential feature of its solution is the exchange of heat between a gas and a liquid separated from one another by

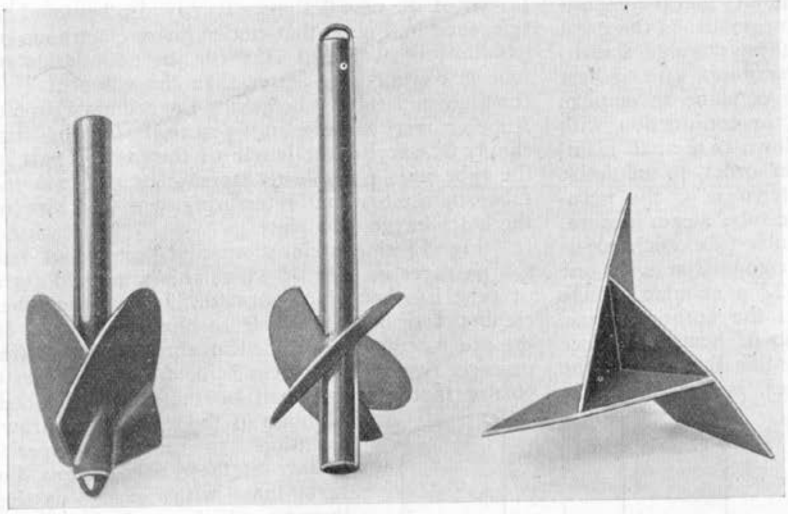


Fig. 14.—Illustrating different forms of spiral controller.

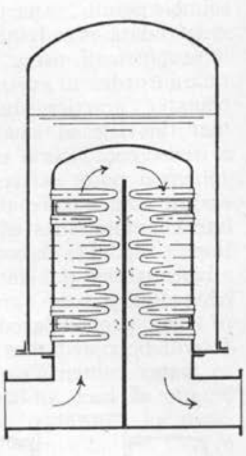


Fig. 15.—Diagram of a compact waste heat boiler for engines of small b.h.p.

designs for boilers and water-heaters for different conditions, from which it is possible to select a type to suit practically any service.

Fig. 15 shows diagrammatically, a small waste heat silencer boiler suitable for small engines up to say 4-500 b.h.p., the boiler taking hot gas at 650° F.

Fig. 16 shows, in outline, two downward flow, dry-bottom designs, suitable for silencing and combing heat from the exhausts from internal combustion engines taking hot gases at from 1,000° F. down to 450° F.

These dry-bottom designs are of particular interest. In the first place it should be remarked that in thimble-tube boilers there is no need to provide for water circulation up and down the height of the boiler. Wherever and however the feed is introduced, the spasmodic generation of steam in the individual tubes suffices to provide all the effort necessary to carry heat from the inner surface of the tubes into the main body of the water. It is anticipated, however, that in special cases it will be possible, by making special provision for circulation in the tubes near the bottom of the gas passage, to ensure a constant flow of water through the bottom tubes, and therefore a persistent exchange of heat at a relatively low mean temperature of exchange. In effect it is hoped to be able to obtain an increased efficiency in certain cases by making the lower part of the boiler its own feed water heater.

Fig. 17 shows vertical sections through two feed water heaters designed as such. Similar designs are also suitable for sewage heating plants, central heating installations, and the like. The flow of water is arranged either upward or downward according to the circumstances. These designs are commended to the attention of those interested in

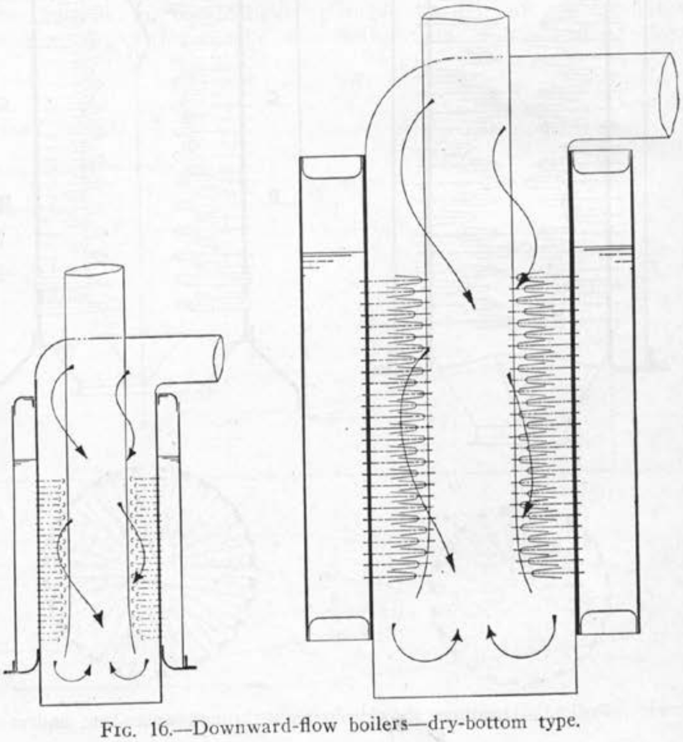


Fig. 16.—Downward-flow boilers—dry-bottom type.

Journal of Commerce and Shipping Telegraph**: **Annual review of shipping, shipbuilding, marine engineering, civil aviation and related topics. Includes ***New Construction in hand and on order merchant shipbuilding in British and overseas yards***, v1=1951 – tbc but including 1969, annual January, Charles Birchall, Liverpool, England. A UK-based annual trade and industry technical magazine giving a detailed review of all aspects of British and world shipping and ships of that year. Refs: none.

Example pages: [under construction]

Transactions. Liverpool Engineering Society, v1=1876 – ca.1969. Started at Liverpool University and based in Liverpool, Lancashire, England. Serving the North West and Merseyside. A UK regional professional engineering society. Subjects mainly engineering with some marine topics. Coverage was mainly NW England but also some UK national and international coverage.

Example pages: [under construction]

Lloyd's List Annual Review, start date?, end date? tbc but including 1951 – 1968, supplement to *Lloyd's List and Shipping Gazette*, London, England. A UK-based trade and industry magazine containing typically 2-page articles on all aspects of British and world shipping of that year. Refs: none.

Example pages: [under construction]

Lloyd's Register Staff Association Transactions, v1=?, but including v17=1936/37 – v38=1967/68, continues as, ***LR Technical Association Transactions,*** v39=1968/69 – v70?=1999/2000, end date?. Lloyd's Register of Shipping, London, England. A technical research journal by staff members for the company. Some of the papers are also republished in other technical journal such as ***Trans RINA***. Also ***LR Technical Reprints*** which seems to be similar and may be another change of title. Refs: none.

Example pages: [under construction]

Lloyd's Shipping Economist. [details under construction]

Example pages:

DRY BULK CARRIERS

Cement trades contract

The 1970s were a period of rapid growth for the cement trades as higher revenues prompted many oil producers to invest in major infrastructural projects. However, by 1984 a number of factors had combined to erode trade volumes.

In the period 1972-1979 world cement imports climbed from 29.5m. tonnes to 66.4m. tonnes according to Cembureau, the European Cement Association. The share of imports accounted for by Opec member states rose from around 18% of the world total in 1972 to 45% by 1977 with Saudi Arabia and Nigeria replacing the US and W. European countries, most notably the Netherlands, as the main import markets.

The suppliers benefiting most from the upsurge in import demand were from Spain, Japan, Greece, S. Korea and the EEC, especially France. Over the last ten years, however, N. W. European suppliers have tended to lose out to their low-cost competitors in the fight to retain their share of export markets, of which Saudi Arabia remains the most important.

Cement imports through the key Saudi ports of Jeddah and Dammam rose by 3.56m. tonnes, 49%, in the period 1980-1983 with the largest increase, of 2.9m. tonnes, occurring in 1983 (see table below). However, the January-November 1984 totals of 4.64m. tonnes and 4.32m. tonnes indicate an annual decline in imports through the two ports of around 10%. This trend is reinforced by the 12.4% fall in cement imports through Yanbu in 1984 to 1.49m. tonnes.

This decline in Saudi import demand is due, first, to the expansion of the domestic cement industry. Capacity now exceeds 10m. tonnes/year and annual production is expected to reach 15m. tonnes/year by the late 1980s. This compares with an output level of only 1.8m. tonnes in 1979. The second major factor is lower oil revenues which have dampened domestic demand growth.

Bagged cement cargoes through Jeddah and Dammam have virtually ceased — a reflection of the continuing shift towards bulk shipments in the cement trade, with the accompanying economies of scale, as ports invest in bulk loading and discharge facilities. The employment of floating transfer terminals at major Saudi ports has made the discharge of cement from bulk carriers faster and more efficient. Once on the terminals the cement can be bagged before delivery ashore in barges or lightering craft. Bulk shipments are not confined to specialised cement carriers — the 10,000 dwt plus dedicated fleet numbers only 31 vessels. The majority of vessels employed in the trade are conventional dry bulk carriers up to Panamax size, but mainly in the 10-40,000 dwt size range.

An examination of the sources of Saudi Arabia's cement imports by means of the port statistics reveals a rise in the Far East share of this market since 1980 — up from 32% to 44% — largely at the expense of S. European suppliers whose share has dropped from 55% in 1980 to 45% last year. The 2% fall in 1984 was compounded by the effect of lower Saudi import demand on S. European sales.

For example, figures from Hispacement SA, the Spanish cement manufacturing group (which accounted for 60% of total Spanish exports in 1983) show a 40% reduction in sales to Saudi Arabia in 1984. However, the decline in exports was not confined to the Saudi market. Volumes to Egypt and Algeria were also down significantly, reversing the 1983 trend when Hispacement sales in the Mediterranean rose sharply. Exports to Nigeria fell too, following the 18% decrease in Hispacement's W. Africa trade in 1983. The austere economic policies adopted by the Nigerian government effectively curbed cement demand.

HISPACEMENT EXPORTS BY DESTINATION
('000 tonnes)

	1983 (% share)	*1984 (% share)*
Saudi Arabia	3,660 (46)	2,184 (39)
Egypt	2,095 (27)	1,695 (30)
Algeria	547 (7)	80 (1.5)
Nigeria	514 (6)	315 (6)
Kuwait	219 (3)	75 (1.5)
US	217 (3)	613 (11)
Pakistan	45 (1)	174 (3)
Others	583 (7)	465 (8)
Total	7,880 (100)	5,601 (100)

SOURCE: Hispacement SA.

The one significant growth area for Hispacement exports last year was the US, where import demand has been boosted by a construction boom. However, the positive effect of higher US cement imports on shipping demand may well be checked by increased imports from Canada and Mexico.

Japanese cement exporters also suffered last year with first half sales totalling 5.54m. tonnes compared with the 1983 annual total of 14.18m. tonnes.

While the Middle East is the most important outlet for Japanese cement exports, accounting for 58% of the total, around one third goes to markets in the Far East — the main destinations being Singapore, Hong Kong, Malaysia and China. However, as in the Middle East, the growth of domestic cement industries is limiting the region's import demand growth, as well as contributing to the growth in thermal coal shipments to the Far East. Moreover, the increasing export potential of the cement industry in S. Korea and Taiwan has intensified competition in the Far East (and the Middle East) markets, although preparations for the 1988 Olympics in Seoul, by raising domestic cement demand, will restrict S. Korea's export capacity in the short term.

SAUDI ARABIA CEMENT IMPORTS THROUGH JEDDAH AND DAMMAM
(m.tonnes)

	1980		*1981*		*1982*		*1983*		*1984*	
From	*Jeddah*	*Dammam*	*Jeddah*	*Dammam*	*Jeddah*	*Dammam*	*Jeddah*	*Dammam*	*Jeddah*	*Dammam*
S. Europe	2.95	1.06	3.18	0.41	4.05	0.32	4.56	0.53	3.14	0.91
N. Europe	0.67	0.18	0.43	0.12	0.08	0.02	0.25	0.01	0.91	0.01
US/Canada	0.08	—	0.10	—	0.21	—	0.08	—	—	—
Far East	0.14	2.21	0.10	2.87	0.11	3.15	0.76	4.66	0.57	3.38
Others	—	—	—	0.03	0.01	—	—	—	0.02	0.02
Total	3.84	3.45	3.81	3.43	4.46	3.49	5.65	5.20	4.64	4.32

SOURCE: Kingdom of Saudi Arabia Ports Authority.

DRY BULK CARRIERS

SUPPLY AND DEMAND

(as compiled at end December 1984)

OCTOBER 1984	10,000 to 39,999 dwt	40,000 to 79,999 dwt	80,000 dwt plus	Total	6 months annual change
	million dwt				
CURRENT MARKET					
SUPPLY					
— Bulkers	90.5	61.2	33.9	185.6	
— Combis	0.2	3.5	30.1	33.8	
— (active in dry)	(83%)	(48%)	(80%)	(75%)	
— Total	90.7	64.7	64.0	219.4	plus 7%
DEMAND (supply-surplus)	71.7	46.9	50.7	169.3	plus 9%
SURPLUS					
— Slow steaming					
Bulkers	13.4	14.2	5.2	32.8	
Combis (see SUPPLY)	—	0.8	4.5	5.3	
— Laid up					
Bulkers	2.9	1.8	0.4	5.1	
Combis (50%)	—	0.2	1.3	1.5	
— Other idle					
Bulkers	2.7	0.7	1.2	4.6	
Combis (50%)	—	0.1	0.8	0.9	
— Total	19.0	17.8	13.3	50.1	minus 2%
SURPLUS TO DEMAND	plus 26%	plus 38%	plus 26%	plus 30%	
ADDITIONS in previous 12 months	6.0	5.3	1.1	12.4	
DELETIONS in previous 12 months	1.9	1.1	0.5	3.5	

FUTURE MARKET (orders as at end September 1984)

	10,000 to 39,999 dwt	40,000 to 79,999 dwt	80,000 dwt plus	Total
ORDER BOOK				
— 1984 Bulkers	2.5	1.9	1.0	5.4
Combis (50%)	—	0.2	0.1	0.3
— 1985 Bulkers	6.9	4.6	3.3	14.8
Combis (50%)	0.1	0.3	0.1	0.5
— 1986 Bulkers	1.5	1.9	1.7	5.1
Combis (50%)	—	—	0.4	0.4
— 1987 Bulkers	0.1	0.1	0.1	0.3
Combis (50%)	—	—	0.3	0.3
— Total	11.1	9.0	7.0	27.1
FUTURE SUPPLY end 1987				
— No scrapping	101.8	73.7	71.0	246.5
— Less scrapping at above level	95.8	70.2	69.4	235.4

EXPORTS — sailings/month

		10,000 to 39,999 dwt	40,000 to 79,999 dwt	80,000 dwt plus	Total	6 months annual change
Brazil	Bulkers	0.7	1.6	1.5	3.8	
(iron ore)	Combis (100%)	—	—	3.9	3.9	plus 17%
W. Australia	Bulkers	0.4	0.7	4.1	5.2	
(iron ore)	Combis (100%)	—	—	1.8	1.8	plus 27%
Liberia	Bulkers	—	0.5	0.6	1.1	
(iron ore)	Combis (100%)	—	—	0.2	0.2	plus 14%
S. Africa	Bulkers	—	0.1	—	0.1	
(iron ore)	Combis (100%)	—	—	0.1	0.1	plus 39%
Venezuela	Bulkers	—	0.3	—	0.3	
(iron ore)	Combis (100%)	—	0.1	0.2	0.3	plus 29%
India	Bulkers	1.4	0.8	0.5	2.7	
(iron ore)	Combis (100%)	—	0.1	0.9	1.0	plus 7%
Hampton Roads	Bulkers	0.4	1.3	0.9	2.6	
(coal)	Combis (100%)	—	0.4	0.5	0.9	plus 3%
E. Australia	Bulkers	1.0	2.3	3.6	6.9	
(coal)	Combis (100%)	—	—	0.1	0.1	plus 33%
S. Africa	Bulkers	0.8	0.9	1.8	3.5	
(coal)	Combis (100%)	—	—	0.7	0.7	plus 24%
Poland	Bulkers	1.3	0.8	0.2	2.3	
(coal)	Combis (100%)	—	—	0.1	0.1	plus 12%
US Gulf	Bulkers	4.7	5.8	0.9	11.4	
(grain)	Combis (50%)	—	0.5	0.7	1.2	minus 3%
River Plate	Bulkers	0.4	1.7	—	2.1	
(grain)	Combis (100%)	—	—	—	—	plus 8%
Australia	Bulkers	1.0	0.3	—	1.3	
(grain)	Combis (100%)	—	—	—	—	plus 90%
Morocco	Bulkers	1.2	0.4	—	1.6	
(phosphates)	Combis (100%)	—	—	—	—	plus 5%
Canada East Coast	Bulkers	2.6	2.0	1.1	5.7	
(general)	Combis (50%)	—	—	0.5	0.5	minus 11%
Canada West Coast	Bulkers	2.7	2.3	1.1	6.1	
(general)	Combis (100%)	—	—	0.2	0.2	plus 19%

IMPORTS — sailings/month

		10,000 to 39,999 dwt	40,000 to 79,999 dwt	80,000 dwt plus	Total	6 months annual change
W. Europe — North	Bulkers	7.3	7.9	4.4	19.6	
	Combis (50%)	—	0.6	2.4	3.0	
— South	Bulkers	5.4	4.1	1.3	10.8	
	Combis (50%)	—	0.7	1.8	2.5	
— Total	Bulkers	12.7	12.0	5.7	30.4	
	Combis (50%)	—	1.3	4.2	5.5	plus 10%
Japan	Bulkers	8.9	6.7	9.1	24.7	
	Combis (50%)	—	—	2.3	2.3	plus 10%
Baltic Russia	Bulkers	0.7	0.8	—	1.5	
	Combis (50%)	—	—	—	—	plus 53%
Black Sea	Bulkers	2.3	2.3	—	4.6	
	Combis (50%)	—	0.1	—	0.1	plus 15%
China	Bulkers	2.1	0.5	0.1	2.7	
	Combis (50%)	—	—	0.1	0.1	plus 11%

RATES AND PRICES

(average for month)

	30,000 dwt USGC-Japan (grain)	55,000 dwt HR-Japan (coal)	120,000 dwt Brazil-NWE (iron ore)
SINGLE VOYAGE			
	$/ton of cargo		
1984 — Oct.	18.0	13.0	5.4
Nov.	18.5	13.5	5.8
Dec.	18.0	12.8	5.6
TIME CHARTER (1 year)			
	$/day		
1984 — Oct.	3,650	5,200	8,000
Nov.	3,850	5,600	8,000
Dec.	3,800	5,500	7,900
	$/ton of cargo (voy equiv.)		
1984 — Oct.	22.3	19.8	7.9
Nov.	22.9	20.4	7.9
Dec.	22.6	20.1	7.9

	30,000 dwt	70,000 dwt	120,000 dwt
NEWBUILDINGS — BULKERS			
	$ million		
Japan 1984 — Oct.	13.0	16.0	27.5
Nov.	13.0	16.0	27.5
Dec.	13.0	16.0	27.5
	$/dwt		
Japan 1984 — Oct.	433	229	229
Nov.	433	229	229
Dec.	433	229	229
SECOND-HAND — BULKERS			
	$ million		
5-year-old 1984 — Oct.	6.5	8.5	13.2
Nov.	6.5	8.5	13.2
Dec.	6.2	8.0	13.2
	$/dwt		
5-year-old 1984 — Oct.	217	121	110
Nov.	217	121	110
Dec.	207	114	110
DEMOLITION — BULKERS			
	$ million		
Taiwan 1984 — Oct.	0.69	1.7	2.5
Nov.	0.69	1.7	2.5
Dec.	0.69	1.7	2.5
	$/ldt		
Taiwan 1984 — Oct.	117	116	113
Nov.	117	116	113
Dec.	117	116	113

	70,000 dwt	140,000 dwt
NEWBUILDINGS — COMBIS		
	$ million	
Japan 1984 — Oct.	26.0	33.5
Nov.	26.0	33.5
Dec.	26.0	33.5
	$/dwt	
Japan 1984 — Oct.	371	239
Nov.	371	239
Dec.	371	239

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