# CHINA NAVIGATION'S EPHEMERAL *CHUNGKING* (1950) AND *CHANGCHOW* (1951)

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The last, largest and visually most impressive of the four new classes of passenger ships ordered by China Navigation Co. Ltd (CNCo) after World War II were *Chungking* and *Changchow*. Seen by some, particularly in Australia, as an enlarged *Changsha/Taiyuan* [see separate post], in appearance and internal content they were in fact closer to the smaller *Anking/Anshun* ordered six months before, being a development of the prewar emigrant 'A' class *Anking* (1925), *Anhui* (1925), *Antung* (1925, lost 1933) and *Anshun* (1930). *Anking/Anshun* and *Chungking/Changchow* did follow some layout innovations of the *Changsha/Taiyuan*, in turn designed six months earlier, notably the high forecastle and superstructure extended to the stern, but did not replicate the extensive First Class interior or the prominent rounded front plating of the superstructure.

The first of the pair, *Chungking*, was ordered in November 1947 from CNCo's affiliated yard, Scotts of Greenock, to cater to expected postwar growth in trade between South China, the Straits and Indonesia, where the company was moving into what had been the territory of the Dutch-flag Java-China-Japan Line (JCJL) and Koninklijke Paketvaart Maatschappij (KPM). After British shipping had been released from the control of the Ministry of Transport, in April 1946 CNCo had reopened its China-Straits line with the surviving *Anhui* and *Kweiyang* and the new freighter *Foochow*. Four months later CNCo extended from Singapore to Java, then still occupied by the British troops that had taken the Japanese surrender and been evacuating prisoners of war, while also blundering into armed conflict with the Indonesian Republic that had declared independence from the Dutch in August 1945 and opposed restoration of colonial rule.

From the commercial point of view, the extension made good sense. Now excluded by cabotage from China's coastal and river shipping, CNCo needed to become more of a regional operator. Through the relationship with Holts, their joint shareholding in Straits Steamship and the Mansfield agency, CNCo had a strong base in Singapore, while in Java, Holts' longstanding agents Maclaine, Watson & Co. were taken over to become Hong Kong-registered Swire & Maclaine Ltd. What remained of Dutch-flag shipping in the archipelago was still under control of the Netherlands Indies Shipping Organisation (NISO) until the end of 1946. Amidst all this early postwar chaos, Swire/CNCo had reasonable grounds

to regard prewar understandings as having lapsed. As Dutch-flag shipping faced boycotts in Singapore and was held up in Australian ports, in 1947 CNCo upgraded its service to fortnightly and from mid-1948 to three times a month from Singapore to Palembang (on inducement), Jakarta, Semarang and Surabaya through to Makassar and return via Singapore to Hong Kong, Shanghai and on some voyages to Japan. The regular 'F'-class freighters *Foochow*, *Fukien* and *Fengtien* were supplemented by fill-in sailings by other vessels from the China-Straits lines. Only the 'S'-class carried more than twelve passengers but a basis was thereby laid for the order of *Chungking* and *Changchow.*

CHINA NAVIGATION SHIPS BUILT EARLY POSTWAR BY SCOTTS OF GREENOCK, 1946-51

| Yard No. | Ship | Grt | Price £ | Order | Keel | Launch | Delivery |
|---|---|---|---|---|---|---|---|
| 638 | *Sinkiang* | 3029 | 238,451 | 28-9-44 | 16-5-45 | 22-2-46 | 31-7-46 |
| 641 | *Shansi* | 3152 | 275,773 | 4-12-44 | 18-12-45 | 28-8-46 | 25-2-47 |
| 645 | *Changsha* | 7412 | 820,748 | 30-9-46 | 10-12-47 | 2-11-48 | 3-5-49 |
| 646 | *Taiyuan* | 7472 | 779,648 | 22-10-46 | 2-3-48 | 12-5-49 | 4-11-49 |
| 647 | *Anking* | 6124 | 668,294 | 21-3-47 | 20-5-48 | 23-8-49 | 20-12-49 |
| 649 | *Chungking* | 9393 | 924,430 | 19-11-47 | 11-10-48 | 19-1-50 | 19-10-50 |
| 654 | *Changchow* | 9403 | 895,277 | 16-6-48 | 7-6-49 | 31-7-50 | 15-2-51 |

**Source**: Johnston Robb, 'Scotts of Greenock, 1820-1950', Vol. 2 (Ship List), University of Glasgow (1993).

In gross tonnage, *Chungking* would be 50% larger than *Anking*, ordered eight months previously for the South China-Straits line, and which, along with her Taikoo-built sister *Anshun*, would in turn be almost twice the tonnage of the prewar 'A' class. In June 1948 there followed an order for the sistership *Changchow*. The relative dimensions are as below:

| Ship | grt | dwt | length | breadth | 1st | 2nd | 3rd | portable | Total | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| Anking (I) | 3472 | 4619 | 336 | 49 | 8 | 28 | na | na | na | 13 |
| Anking (II) | 6124 | 4705 | 390 | 56.5 | 38 | --- | 116 | 1000 | 1154 | 16 |
| Changsha | 7412 | 6065 | 414 | 57 | 40 | 42 | 70 | 0 | 152 | 16 |
| Chungking | 9393 | 8910 | 450 | 62 | 48 | --- | 320 | 265 | 633 | 17 |

**Source**: Johnston Robb, 'Scotts of Greenock, 1820-1950', Vol. 2 (Ship List), University of Glasgow (1993), adjusted with detail from L. Dunn, 'Passenger Liners' (1961).

Accommodation for 48 First-class passengers in double berth cabins on the Upper and Promenade decks was rather less than the 82 for *Changsha*/*Taiyuan*. Their lounge, rather unusually located at the after end of the superstructure on the starboard side, was panelled in pear wood and, together with the card room on the port side, decorated with Chinese paintings— a bar with an ice-making machine and pantry was situated in between. A slightly larger veranda lounge was located directly above at the after end of the Boat deck with teak folding doors – presumably opened in hot weather and closed in cool weather - on three sides. Third-class cabins, the ships' raison-d'etre, were much more extensive than in *Changsha*/*Taiyuan* or *Anking/Anshun*, occupying the middle part of the ships' superstructure on the Upper Tween deck from the superstructure front to the stern (as far as the steering gear), and accommodating 320 passengers in 8- 10- and 20-berth cabins. The encompassed clear deck area

around No.5 hold was rated to take another 265 unberthed passengers, if necessary. On the Main deck extensive enclosed areas on either side of No.4 hold formed the third-class dining saloon with about 25 bench tables, which would have served as a social space between meals. The vessels were fitted with punkah-louvre ventilation that could be heated in cold weather. There were ten aluminium lifeboats fitted to Schat davits.

Like all the postwar Scotts-built ships, *Chungking* and *Changchow* were diesel-powered. Whereas *Anking* had 4-cylinder and *Changsha*/ *Taiyuan* 5-cylinder Scott-Doxford engines, for trial speeds of more than 16 knots, *Chungking* and *Changchow* had 6-cylinder opposed-piston, 4-stroke engines (670 x 2320mm) working at 6,500 bhp for a trial speed of 17.7 knots and a service speed of 15 knots.

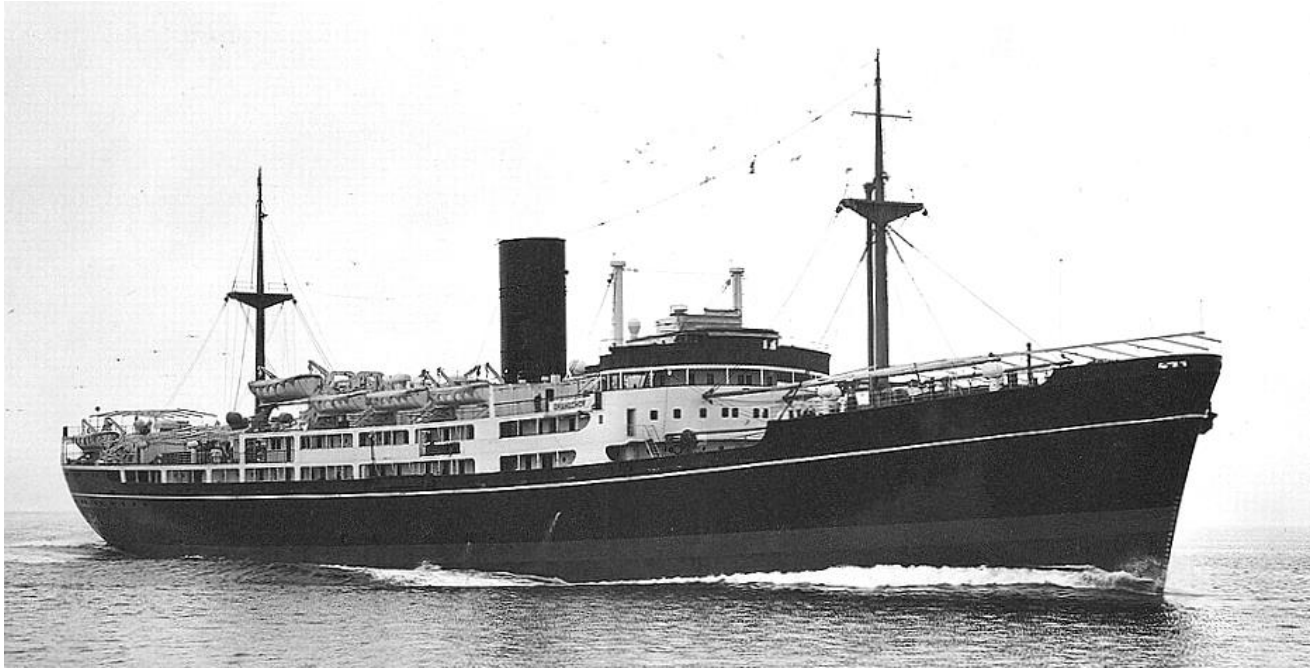
Deadweight was 8,900 tons, almost 50% more than then 6,070 tons of *Changsha*/*Taiyuan*. They looked like passenger liners but were therefore also big cargo carriers with No. 2 being a very large hold served by a 30-ton heavy-lift derrick lashed to the mast Winches were electric by Clarke Chapman. Two refrigerated chambers were located in No. 3 lower tween and two deeptanks for molasses discharging at 100 tph in No. 4 hold. Hatch covers were Macgregor patent steel.

*Chungking* was launched first on 19 January 1950 by Mrs R.G. McIndoe, *Changchow* on 31 July 1950 by Mrs D.M. Phillips.

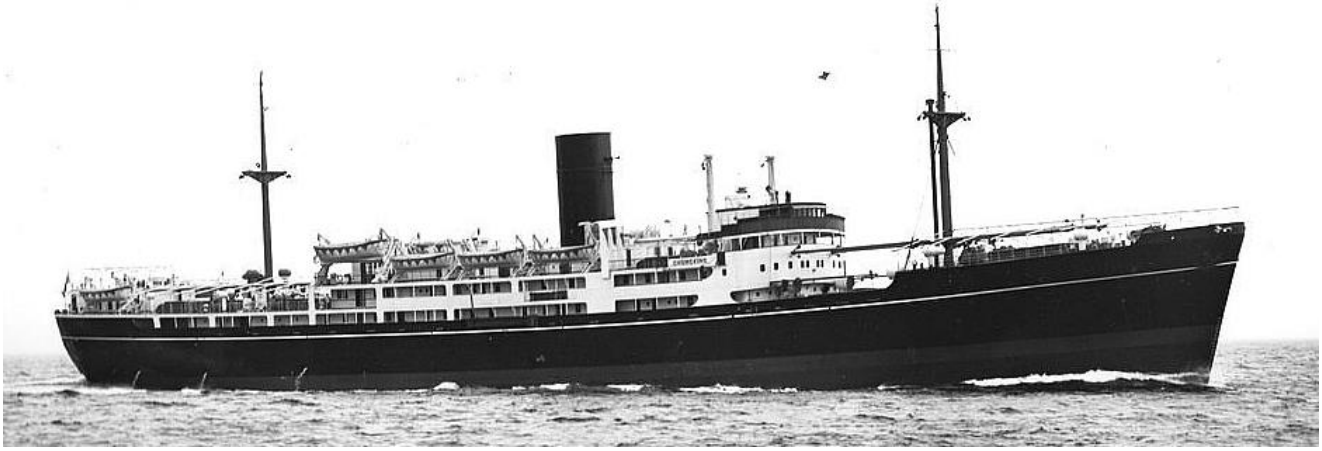
CHANGCHOW on launch into the Clyde, 31 July 1950, showing her sleek lines (Wikiswire).

Unfortunately, by mid-1950 as *Chungking* was nearing completion, the political situation had changed greatly to the disadvantage of the ambitious two-ship venture. In October 1949 Mao had proclaimed the People's Republic of China. Britain promptly recognized the new Communist government but South

China ports were blockaded by the Nationalists on Taiwan with American support, in consequence, of which *Anhui* struck a mine and sunk on the bar at Swatow in June 1950. Two months later *Tsinan* (1930) struck a mine in the Yangtse estuary and was badly damaged. At the other end of the route, the Dutch had recognized Indonesia's sovereignty at the end of 1949 but protected their economic interests, not least in shipping. As the KPM re-tonnaged and aggressively reclaimed its former sphere of operations, CNCo found its new line carrying only a third of the KPM's cargo to Singapore and almost none from Singapore. Facing war risks in Chinese ports and the prospect of stiff competition, CNCo wisely decided against introducing its two big new passenger-cargo ships and left the China-Indonesia line to be carried on primarily as a freight line.



CHANGCHOW on speed trials, February 1951, clearly derivative of CHANGSHA/TAIYUAN (Wikiswire).

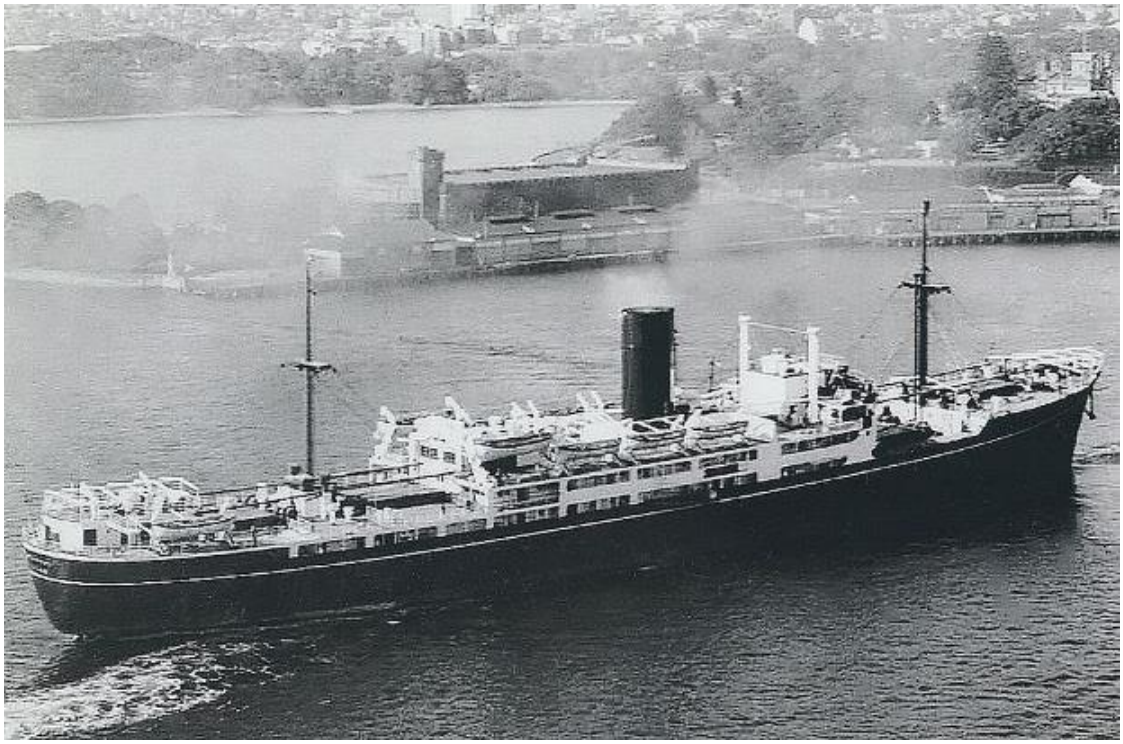


CHUNGKING on speed trials (The Motor Ship; shipsnostalgia.com)

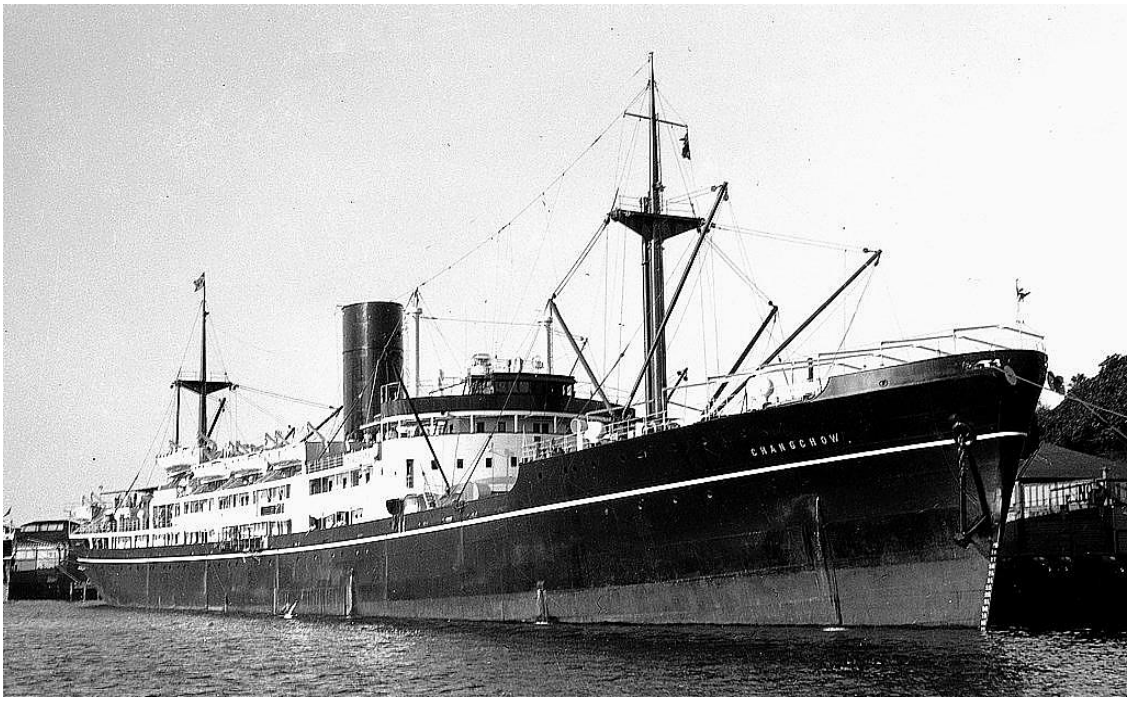
Meanwhile, in January 1948, just two months after CNCo had ordered *Chungking*, the newly formed Koninklijke Java-China Paketvaart Maatschappij (trading as Royal Interocean Lines, RIL), a merger of the KPM's deepsea lines with those of JCJL, had ordered the 8,630-grt liners *Tjiluwah* and *Tjiwangi* with a capacity for almost 2000 passengers for the South China-Hong Kong-Singapore-Java-Makassar route. Though taking over Dutch-flag rights in both the China-Straits and China-Indonesia trades with intermediate traffic between Indonesia and Singapore, RIL also overestimated the postwar traffic, especially for third-class passengers. Notwithstanding, *Tjiwangi* was introduced in March 1951 and *Tjiluwah* in January 1952 and did reasonably well through the 1950s. Had CNCo proceeded as planned, *Chungking* would have commenced service in December 1950 and *Changchow* in April 1951, respectively three and nine months ahead of the new RIL ships. This would almost certainly have triggered cut-throat competition and, because of the limited trade through Chinese ports and worsening instability in Indonesia, plus the Malayan Emergency, there would not have been enough business for all four ships. Instead, in February 1950 CNCo agreed with the KPM not to carry interisland cargo and in November 1950 CNCo signed a supplementary agreement to transship Indonesian cargo to/from China and Japan. CNCo was probably sensible to cut its losses and protect its other trades but would have been better not to have ordered such large ships in the first place.

*Chungking*, the biggest ship CNCo had ever owned and costing £924,430, was therefore now without employment and her sistership *Changchow* (£895,277) was due for delivery in February 1951. Fortunately, there was some short-term relief. After the ships had been offered for charter, there was interest from the French government-owned Messageries Maritimes, which was seeking to strengthen the line from Marseilles via Panama to the French possessions of Tahiti, the New Hebrides (Vila) and New Caledonia (Noumea) through to Sydney, and was under increasing pressure on its Indochina route. Their 13k Noumea route passenger ship from prewar, the reconditioned 7706-grt *Sagittaire* (ex *Washington*, 1929, 37 first, 45 second, 38 third and 358 rationnaires) was undertaking three sailings each year assisted by the 13.5k 7068-grt *Ville d'Amiens* (1924) which could accommodate 31 in first and 58 in second. These were supplemented by other vessels such as *Sagittaire*'s sister *Oregon* which made a voyage in 1950 but was then diverted to Indochina where she loaded 800 war casualties. Two 12,700-grt purpose-built sisterships were on order from French yards but would not be delivered until late 1952 and early 1953. *Chungking* and *Changchow* were somewhat smaller but new passenger-cargo ships with an adequate first and third-class configuration and therefore almost ideal to be taken on interim two-year charters. The Third-class portable berths were obviously utilised because a report of *Chungking*'s maiden arrival in Sydney gave a figure of 525 passengers in that class. Officers, engineers and crew were CNCo under experienced master Graham Torrible, who previously had been Acting Marine Superintendent in Shanghai and in 1953, after the end of the charter, would become Marine Superintendent in Hong Kong. *Chungking* sailed from Marseilles just before Christmas 1950 and arrived at Sydney on 8 February 1951. *Changchow* followed from Marseilles in March and arrived at Sydney on 23 April. The two ships then maintained approximately a bi-monthly schedule with *Sagittaire* until *Calédonien* came into service at the beginning of October 1952 to replace *Chungking*, which took her last sailing from Sydney on 1 September, then in early May 1953 her sister *Tahitien* replaced

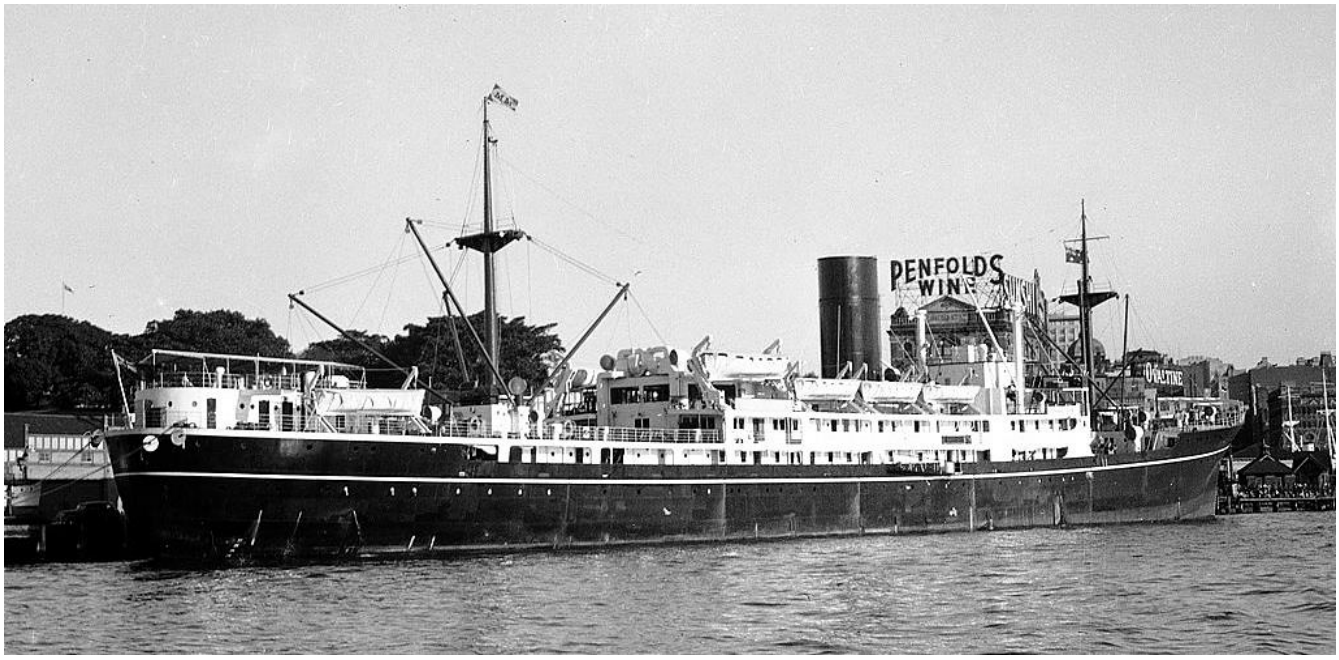
*Changchow*, whose scheduled departure from Marseilles in March did not proceed, so that her final departure from Sydney was on 5 January 1953.



CHANGCHOW arriving at Circular Quay, Sydney on Messageries Maritimes' charter (Chris Howell).




CHANGCHOW at Circular Quay, Sydney, 29 April 1951, on maiden voyage and MM charter. Upper and lower tween decks are divided by the white hull band (D. Finch/NAA).

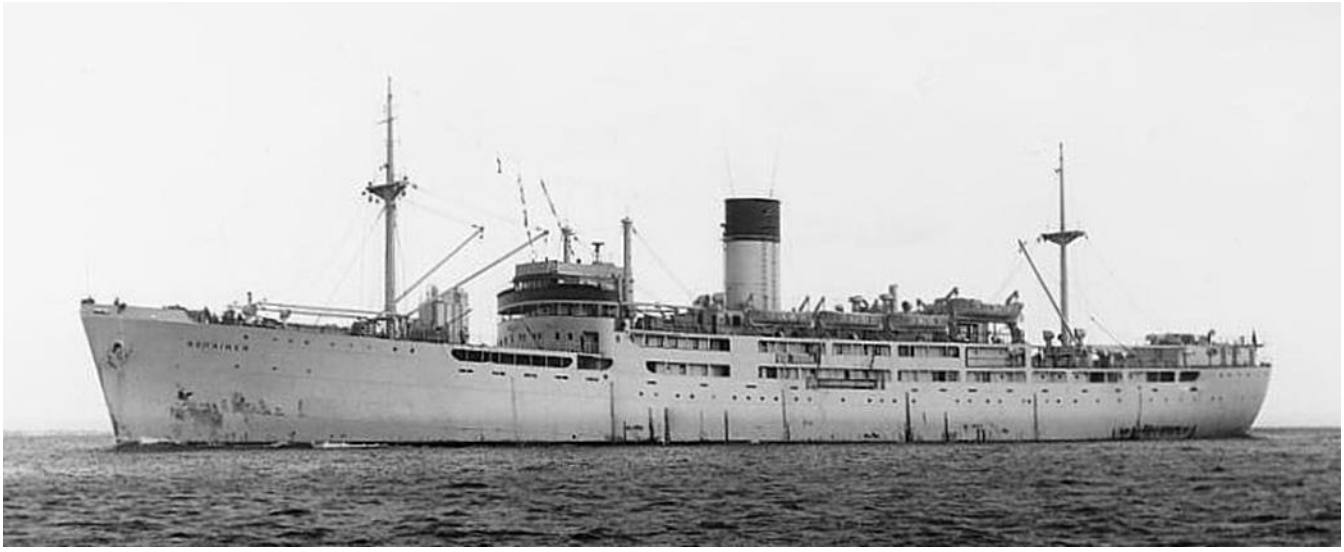



Stern view of CHANGCHOW at Circular Quay. China Navigation colours but Messageries houseflag flying at the mainmast (D. Finch/NAA).

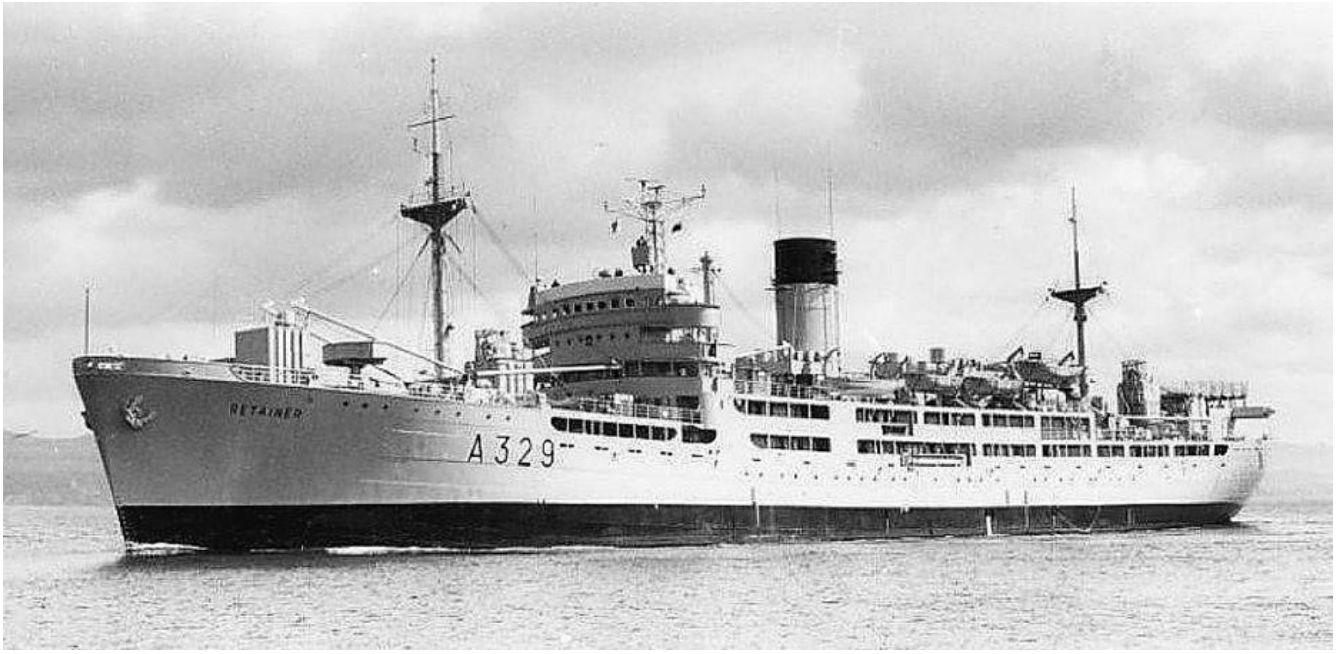
These charters gave CNCo breathing space to negotiate disposal of *Chungking* and *Changchow*. CNCo still had no line that could employ two such large passenger ships but, because of their double tweendecks, ample cabins and 17-knot speed, the Royal Navy saw their potential as storeships for the Far East fleet to replace similarly sized but less well configured and slower war-built ships. Accordingly, both ships were sold to The Admiralty in March 1952 with delivery at the end of their charters in November 1952 (Chungking, renamed *Retainer*) and March 1953 (*Changchow*, renamed *Resurgent*). Under these new names the vessels at first remained in commercial service under Ministry of Transport control. *Retainer* was operated by Buries Markes Ltd (Montship Lines) until delivered at Tyneside for conversion in July 1954. *Resurgent* made at least one more Australia voyage for Messageries in June 1953 from Marseilles and then from 1954 was managed by British India but also chartered to Buries Markes, and following withdrawal of *Sagittaire*, in June 1956 was taken up once more by Messageries, this time for twelve months, to make three more round voyages Marseilles-Noumea (no longer extending to Sydney) as a consort to *Calédonien* and *Tahitien*.

*Retainer* was the first to be converted to an Armament Stores Issuing Ship, the work being carried out by Vickers Armstrong at Hebburn-on-Tyne and taking just over six months from September 1954 to April 1955, after which she was placed on station at Portsmouth. From March 1957 to February 1958 she was then put through a more extensive refit, while *Resurgent* was taken in hand in August 1957 and was also alongside for eleven months, by which time the two ships were configured more or less the same and both very up-to-date, including electric cargo lifts for the holds and provision not only for ammunition and equipment stores but also for dry and fresh victualling stores with the necessary refrigeration. Comments on the shipsnostalgia website note that both ships rolled heavily. According to historicalrfa.org, in 1955 *Retainer* was fitted with 3,000 tons of temporary ballast and probably more

would have been needed after extra weight had been added topsides, but this may not have been enough when stores had been drawn down and the ship was riding higher, as some of the accompanying photos seem to show.



RFA RETAINER in early Admiralty guise, forecastle now extended to enclose No. 2 well, otherwise structurally unchanged except for the cargo lift at No. 2 (Rick Cox)



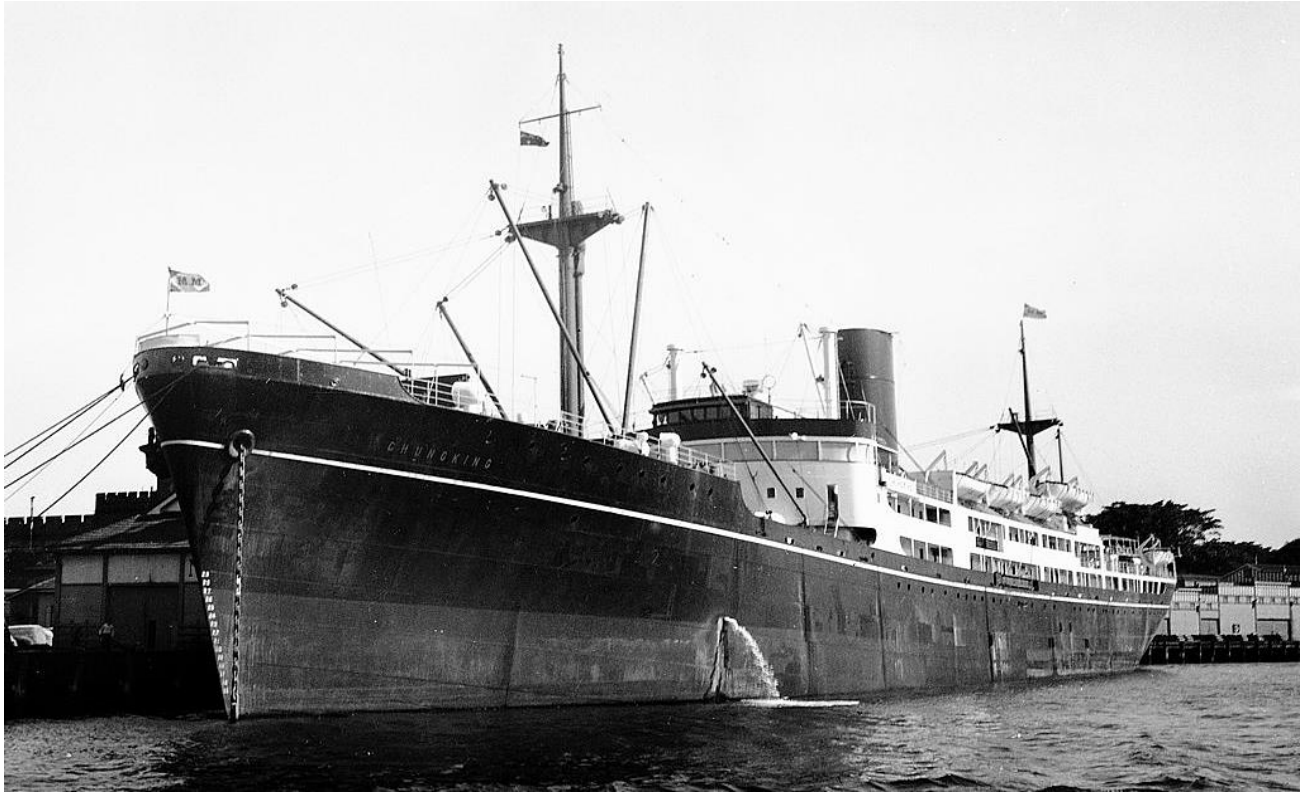

RFA RETAINER later appearance with higher navigating bridge, communications mast, cargo lifts, gun emplacements, helipad aft, etc. (rfanostalgia.org).

After Britain's withdrawal from East of Suez, through the 1970s the two Royal Fleet Auxiliaries were based in Home Waters and, apart from occasional engine issues – more so in the case of *Retainer* – they served reliably in the Atlantic and the Mediterranean with some more extensive fleet cruises.

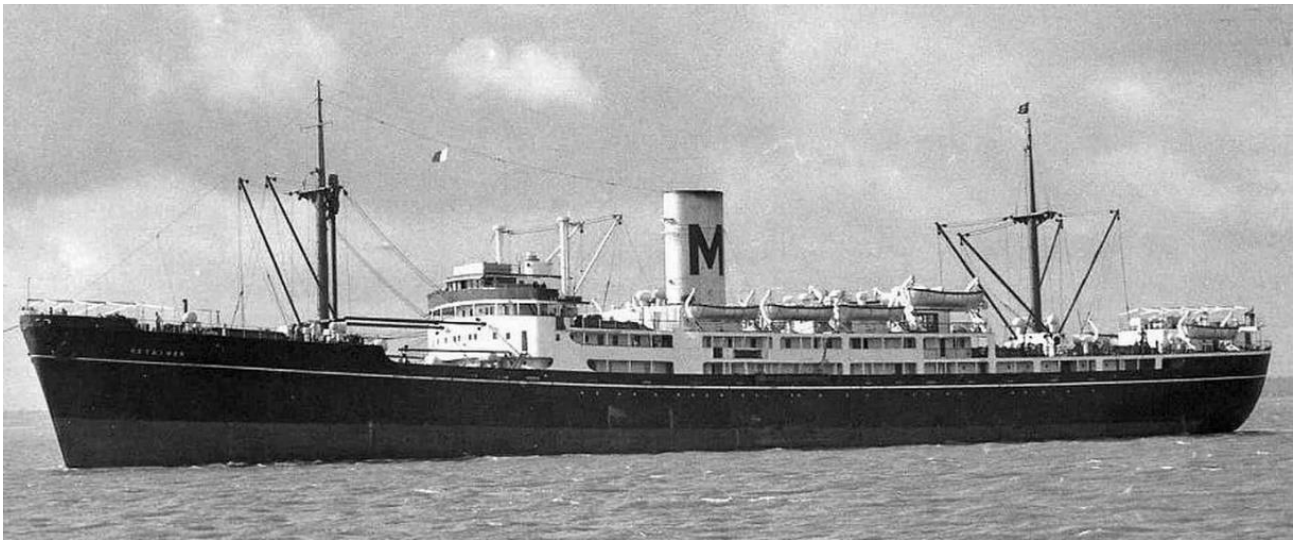
After commissioning of the new RFAs *Fort Grange* (later *Fort Rosalie*) in April 1978 and *Fort Austin* in June 1979, both built by Scotts as developments of the *Chunking*/*Retainer-Changchow*/*Resurgent* design, *Retainer* was laid up at Rosyth for disposal in April 1978, then *Resurgent* in December 1979. Full details of their naval service can be found at the Historical Royal Fleet Auxiliary (RFA) website.


RFA FORT ROSALIE (1978) built by Scotts drawing on experience with RESURGENT/RETAINER (USN).

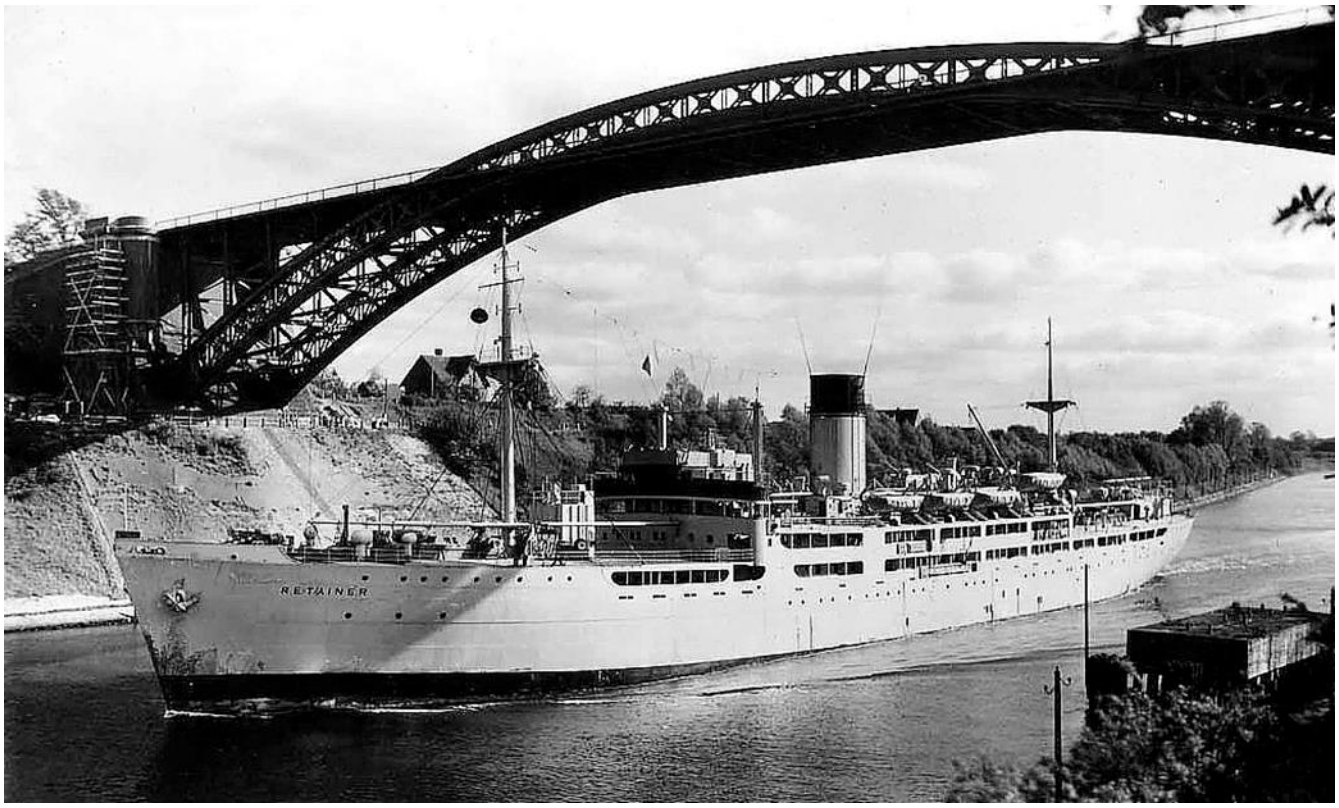
**CHUNGKING** (1950-53) 9393/50-11 (477.2 x 62.2, M6-cy Doxford/16 knots)
Built by Scotts' S.B. & Eng. Co. Ltd, Greenock (#649) for CNCo, London. 11/50 chartered to Cie des Messageries Maritimes, Paris for Marseilles-Tahiti-Noumea-Sydney line. 29/2/52 sold to The Admiralty (Buries Markes Ltd, London mgrs). 28/11/52 delivered at Liverpool to MOT and offered for charter, 12/52 r. RETAINER. c.23/9/54 arrived at Tyneside for conversion by Vickers Armstrong (Sbldrs) Ltd at Palmer's Hebburn yard to Armament Stores Issuing Ship (A329) for Home Fleet, 4/55 completed, based at Portsmouth. 3/57-8/57 refit at Palmer's adding extra cargo handling gear, lifts and new upper bridge wings. 2/58 refit by Vickers at Hebburn, then mainly Mediterranean and Atlantic. 4/78 laid up at Rosyth for disposal. 29/10/79 towed from Rosyth, 19/11/79 arrived at Barcelona for demolition by Desguaces Cataluna S.A., 20/2 work began.



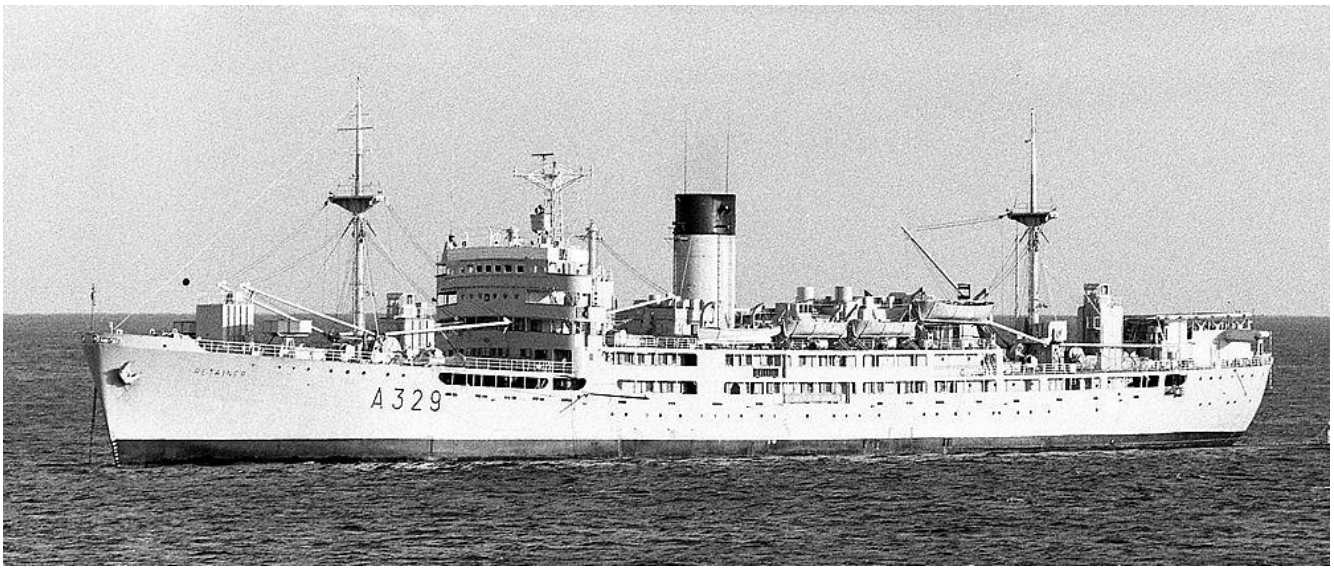

CHUNGKING at the end of Sydney's Circular Quay, 16 February 1951, on maiden voyage and MM charter. The third-class accommodation can be seen in the focsle (D. Finch/NAA).




RETAINER ex CHUNGKING late 1953 on Montship Lines charter (Wikiswire).




RETAINER in the Kiel Canal, 1955 (RFA Assoc. Photo archives).

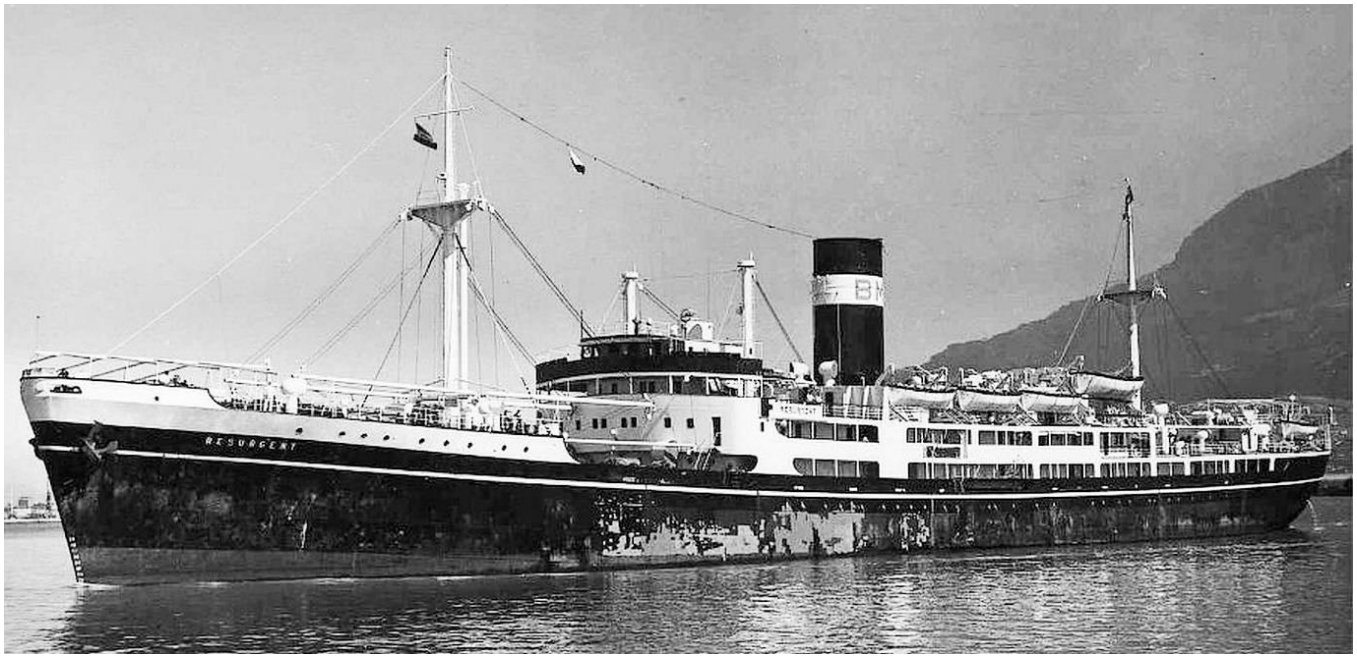



RETAINER (A329) anchored off Marsaxlokk, Malta, 25 October 1970 (Dr. George Wilson).

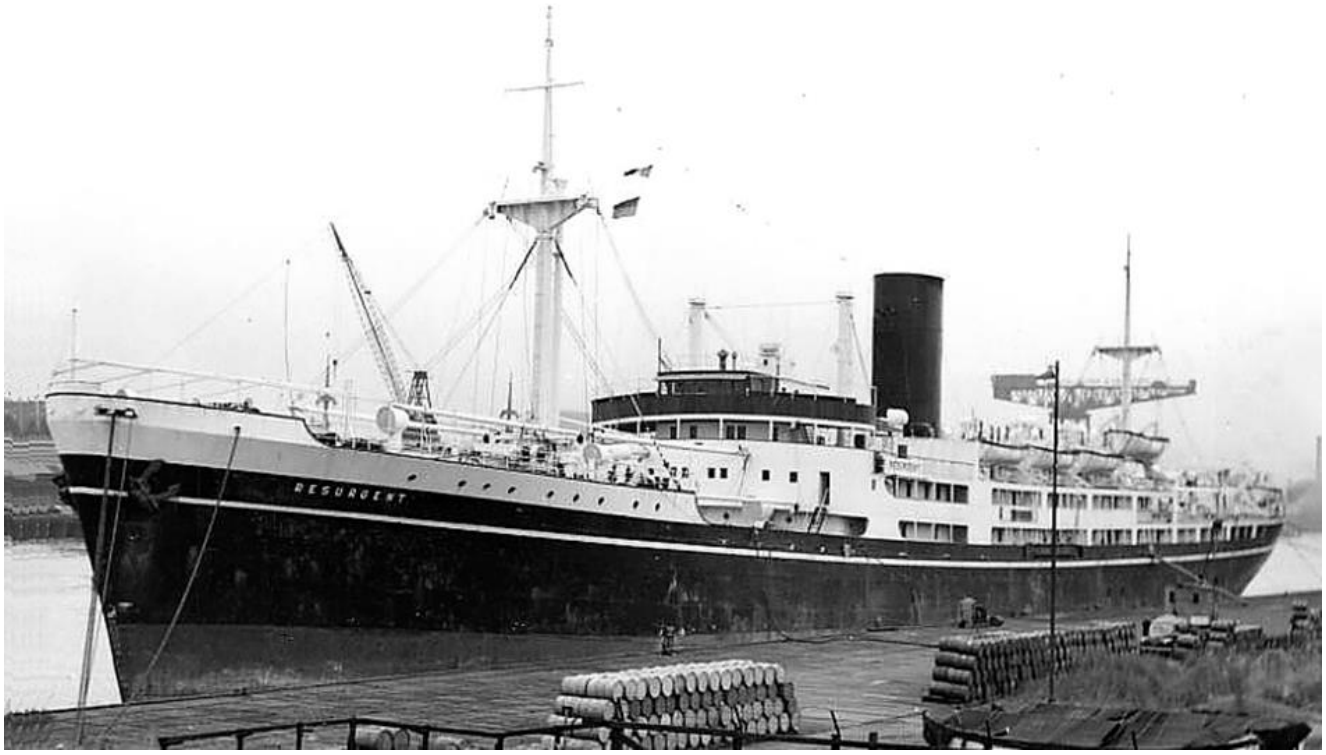
RETAINER departing Vancouver believed to be early-1978 (Mr.DOT/Shipspotting).

**CHANGCHOW** (1951-53) 9403/51-2 (477.2 x 62.2, M6-cy Doxford/16 knots)
Built by Scotts' S.B. & Eng. Co. Ltd, Greenock (#654) for CNCo, London. 2/51 chartered to Cie des Messageries Maritimes, Paris for Marseilles-Tahiti-Noumea-Sydney line. 3/52 sold to The Admiralty (British India S.N. Co. Ltd, London mgrs) and on delivery 3/53 r. RESURGENT. 2/54 offered for charter by MOT. 1955-57 British India S.N. Co. Ltd mgrs. 6/56-7/57 Messageries charter for Marseilles-Noumea line. 7/57 reverted to The Admiralty. 8/57-8/58 converted by Vickers Armstrong (Sbldrs) Ltd at Palmer's Hebburn yard, Tyne to Armament Stores Issuing Ship (A280) for Far Eastern fleet, 9/10/58 sailed Plymouth for Far East. From 1972 mainly Mediterranean and Atlantic. 12/79 laid up at Rosyth for disposal. 3/81 sold for £189,000 to brokers Davies & Newman Ltd, London on behalf of Asturamerican Shipping Co. Inc., Panama, then resold to breakers Desguaces Vige S.A. 5/5/81 towed from Rosyth by tug *Suzanne M*, 13/5 arrived at Avilez for lightening, 15/5 at Gijon for demolition at San Esteban de Pavia, 27/5 work began [see also www.historicalrfa.org/rfa-resurgent].

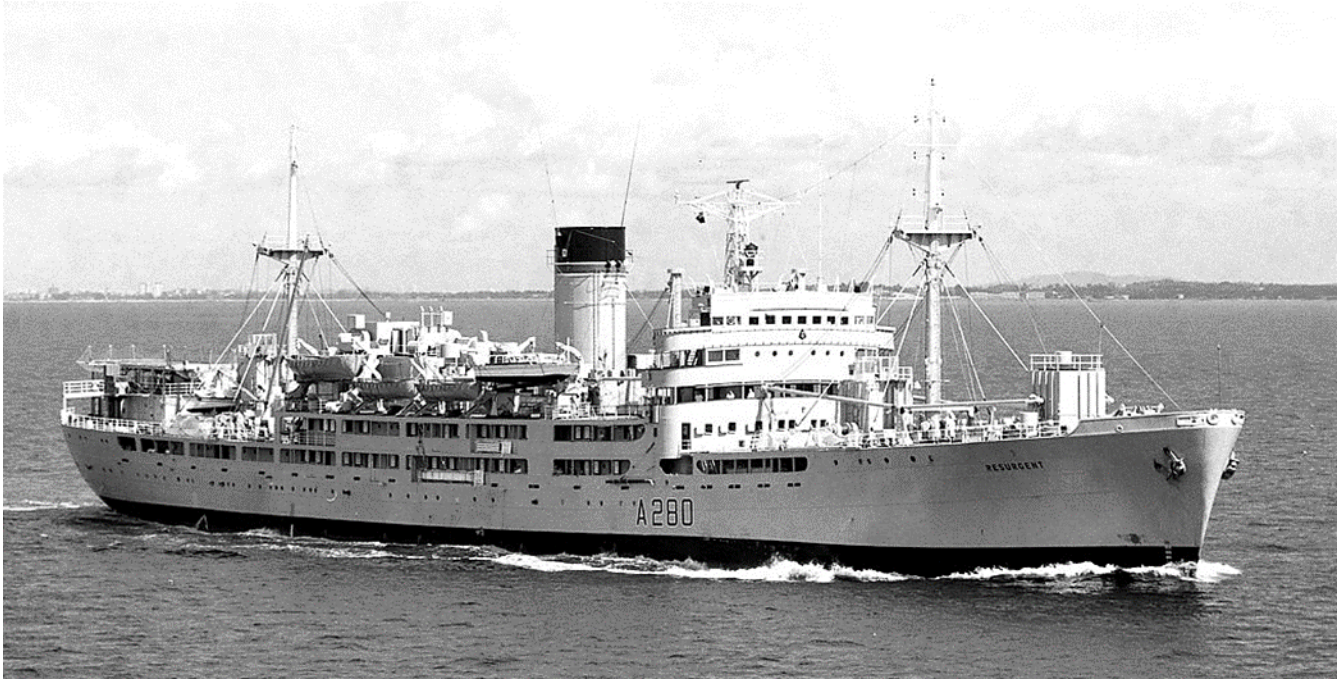
CHANGCHOW arriving Sydney, probably on the June 1953 voyage (Rick Cox).



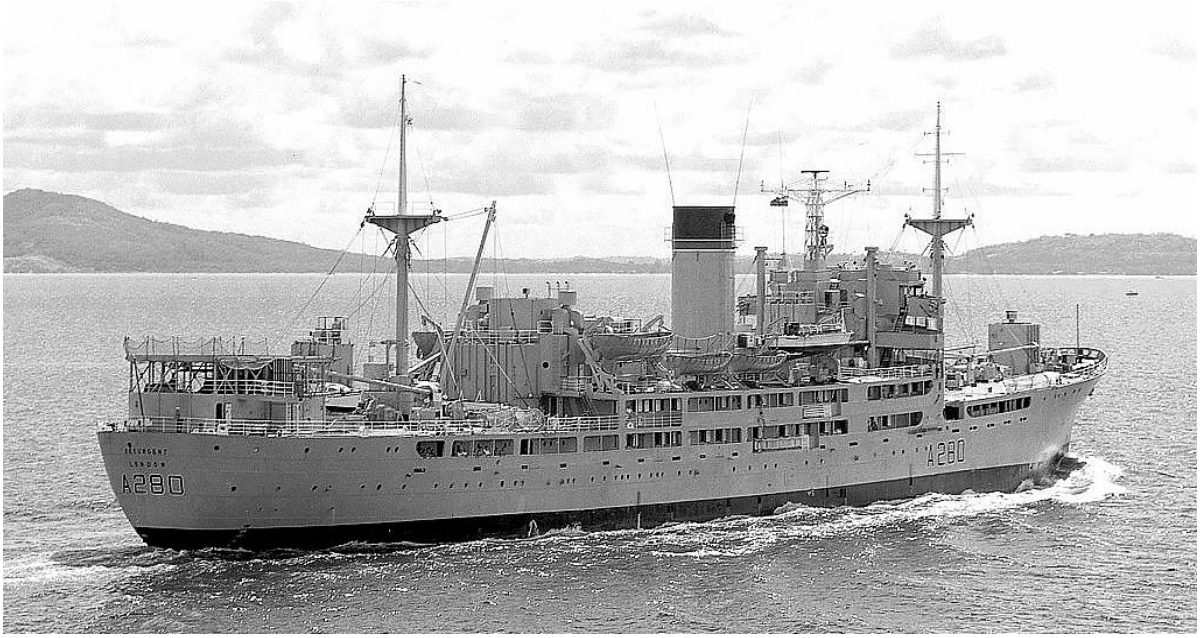

RESURGENT at Cape Town in Buries, Markes & Co. colours, probably 1957 (WSPL and Wikiswire).




RESURGENT evidently Tyneside prior to conversion, Buries, Markes funnel painted out, showing in effect, final Messageries colours with white focsle and masts (clydeships.co.uk)




RESURGENT (A280) passing Johore Shoal Buoy eastbound from Sembawang naval base, 29 May 1969, towards the end of her service East of Suez (Dr George Wilson).




RESURGENT off Johore Shoal Buoy, 29 May 1969.
Red band on the funnel indicates explosive cargo (Dr George Wilson).


RFA RESURGENT leaving Durban in 1970s in naval grey (Trevor Jones).

**Sources**

Johnston Robb, 'Scotts of Greenock, 1820-1950', Vol. 2 (Ship List), University of Glasgow (1993); *The Motor Ship* (Feb. 1951, pp. 346-48) (by courtesy Iain Steverson); Capt. Graham Torrible, Yangtze Reminiscences (Swire Group, 1990); KPM files in the Algemeene Rijksarchief; *Daily Commercial News and Shipping List* (Sydney), *Pacific Islands Monthly*, *Straits Times*, *Taikoo Gazette*, W.A. Schell registers,

Nautical Association of Australia (NAA) photo archive; wikiswire.com; www.messageries-aritimes.org/changchow.htm; www.historicalrfa.org/rfa-resurgent, www.historicalrfa.org/rfa-retainer.

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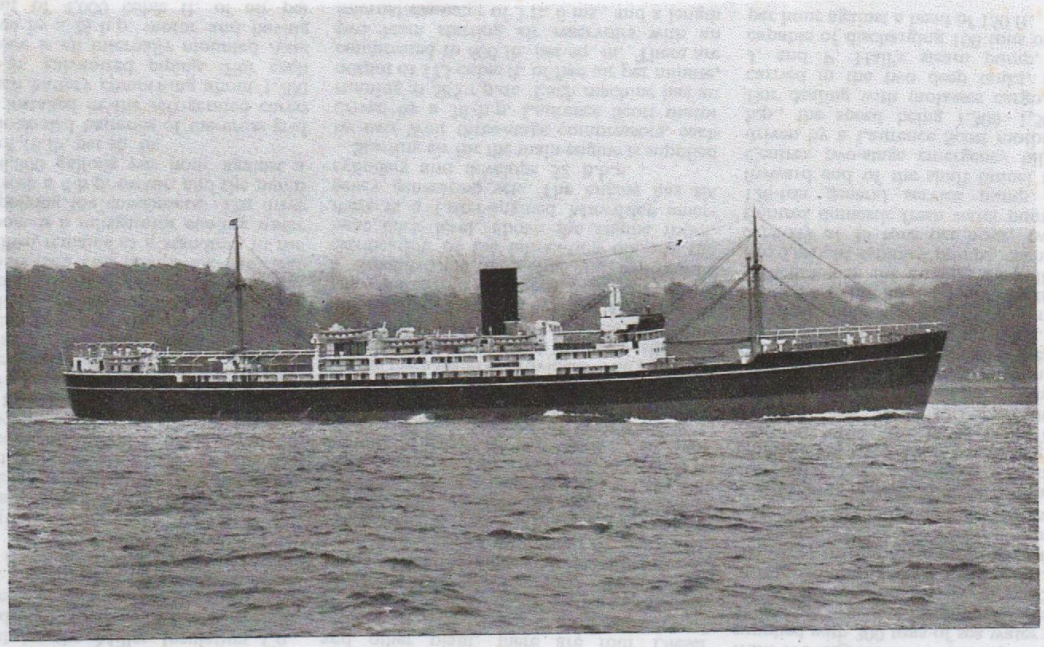

The M.S. "Chungking," built for the China Navigation Co's Far Eastern Services

# THE PASSENGER AND CARGO M.S. "CHUNGKING"

## Scott-Doxford Six-cylinder 6,500 b.h.p. Engine in a 9,000-ton Vessel for the China Navigation Co.

SOME time ago the China Navigation Co. Ltd. ordered from Scotts' Shipbuilding and Engineering Co. Ltd. two passenger and cargo liners for their Far Eastern services. The first of these two vessels has been completed, and one of the points of interest is that they are each propelled by a six-cylinder Scott-Doxford opposed-piston engine of 6,500 b.h.p. In addition to accommodation for first- and third-class passengers, a certain amount of refrigerated space is provided for cargo.

The following are the main details:—

| | |
|---|---|
| Length overall .. | 477 ft. 1½ ins. |
| Length b.p. .. | 450 ft. |
| Breadth, moulded | 62 ft. |
| Depth to upper deck .. .. | 35 ft. |
| Gross register .. | 9,398 tons |
| Net register .. | 5,332 tons |
| Deadweight capacity .. .. | 8,910 tons |
| Loaded draught.. | 25 ft. |
| General cargo .. | 425,746 cubic ft. (bale) |
| Refrigerated cargo | 10,200 cubic ft. |
| Machinery .. | 6,500 b.h.p. |
| Revolutions .. | 115 per min. |
| Service speed .. | 15 knots |

Accommodation is provided on the promenade and upper decks for 48 first-class passengers in double-berth cabins. The third-class accommodation is on the main deck and 8-, 10- and 20-berth cabins are provided to accommodate 320 persons, while in addition provision is made for the transport of 265 passengers in No. 5 upper tween deck. The general arrangement of the accommodation will be noted from the accompanying plans. The vessel has three complete decks, a forecastle deck, a combined promenade and poop deck, and a boat deck. Cargo is carried in five holds, and there is a deep tank aft of the engine room, forward being a cross-bunker tank. In the double bottom provision is made for the carriage of fuel, ballast, and fresh water.

### First-class Accommodation

The shipbuilders carried out all work in connection with the first-class public rooms, which were designed by A. McInnes Gardner and Partners. The dining saloon seats 44 persons, and is the full width of the vessel. In this apartment the panelling is of Scotch elm. A main staircase at the after end of this part of the accommodation gives access to a card room on the port side and a lounge on the starboard side of the promenade deck. In the card room the upholstered furniture is covered with hide dyed turquoise green and tropic-proofed. The lounge is panelled in pear wood, and both of these rooms are decorated with Chinese paintings. Special attention has been given to the finish of the accommodation, and the door handles and other decorative metal work are in satin silver. Between the lounge and the card room is a serving bar and pantry equipped with refrigerators, an ice maker, and electric water heaters.

A veranda lounge is arranged at the after end of the boat deck. It is fitted with teak folding doors on three sides, giving a clear view on both sides of the ship, as well as aft. The floor coverings throughout the first class public rooms, and in the veranda lounge are of Korkoid. On the promenade deck are three two-berth cabins, each having a private bathroom, while six of the 21 two-berth cabins on the upper deck have private showers. All the cabins are finished in light oak with cot beds, dressing-tables, three-quarter length mirrors, washbasins, and fitted wardrobes.

For service the "silent call" system has been adopted. In addition to the passenger accommodation, the officers' cabins are on the promenade deck, together with a separate dining saloon and smoke room at the forward end. The whole of the passengers' and crew's accommodation is ventilated and heated on the Thermotank system, and as the ship is intended for tropical service, a relatively high rate of air changes is maintained, the delivery being by punkah louvres.

The galley equipment in the ship is partly electric and partly steam. Throughout the accommodation there is a broadcast and public address system. Included in the navigation equipment is a Seascan radar and a Brown gyro compass with bearing and steering repeaters, and an automatic course recorder. Siemens wireless and a direction finder are installed.

A Kelvin and Hughes echo sounder is provided, together with a Trident electriclog and a Loudaphone system

communication between the wheelhouse and the main control positions, including the boat stations. Loud hailers are fitted in the wings of the bridge.

Hastie electro-hydraulic steering gear is installed, and there are two pumps, each driven by a 40 h.p. electric motor. The pumps supply four hydraulic rams acting on a double-arm steel tiller. The gear is controlled by the usual telemotor system operated from the bridge, and local mechanical control is provided in the steering compartment and from a pedestal on the poop. Chadburns electric telegraphs are fitted on the bridge, and in the engine room. An Emerson Walker electric anchor windlass is provided for handling 2 7/16 in. Tayco stud link cable, and is operated by a watertight motor mounted on the bedplate. On the foremast is a 30-ton derrick, the remainder being capable of lifting 10 tons, seven tons, five tons, and two tons, serving five cargo hatches. All the winches are of the Clarke Chapman electric type.

### Aluminium Lifeboats

It is of interest to note that there are 10 aluminium alloy McLean lifeboats, mounted, with certain exceptions, on Schat davits.

A fire sprinkler system is provided in the officers' and first-class passengers' accommodation, and for the cargo and other enclosed spaces there is a Pyrene smoke detection and $CO_2$ gas distributing system. Foamite fire extinguishers are installed throughout the ship. As the vessel trades regularly in Far Eastern waters, all the vital parts of the ship, including the engine room, bridge, and officers' accommodation are protected against piracy.

The refrigerating machinery comprises two J. and E. Hall's 6½-ins. by 5-ins. twin-cylinder freon machines running at 450 r.p.m., and driven by means of belts from 25 h.p. motors. The two refrigerated cargo chambers are in No. 3 lower tween deck, and are designed for temperatures down to 10 degrees F. The insulation has been carried out by the Miller Insulation Co. Ltd. In addition to the main refrigerating plant there are various Hallmark cabinets and freon compressors for the provision chambers, the latter having direct expansion on the sides and overhead, with thermostatic control.

The main refrigerating equipment includes a separate evaporator room with two submerged coil-type evaporators, each having approximately 1,000 ft. of 1¼-ins. bore piping, giving 396 sq. ft. of effective surface. There are three brine pumps with the motors located in the refrigerating machinery room, the pump spindles passing through the insulated bulkhead. Each pump is coupled to a 3 h.p. electric motor and delivers 4,500 gallons of brine hourly, the pressure being 25 lb. per sq. in. For the full refrigeration load two pumps are sufficient and the third remains as a standby. In the engine room is a refrigerator cooling water pump supplying the condensers. The drive is taken from a 4 h.p. motor, and the pump delivers 6,000 gallons per hour against a pressure of 18 lb. per sq. in.

Two air-cooled batteries of the cross-grid type are installed in the refrigerated cargo space, each battery comprising about 1,700 ft. of 1½-in. galvanized piping. For each cooler there is an internally mounted Axia fan, driven by a 2½ h.p. motor and having an output of 4,000 cubic ft. of air per minute. The refrigerating plant operates automatically according to the brine temperature in the evaporators, by means of thermostats. The brine circuits are arranged on the two-temperature system, and a steam heater is provided for defrosting. The equipment includes a set of Elliott electrical distant-reading thermometers.

### Machinery

Three lever-driven scavenging air pumps are provided for the main engine, which has six cylinders 670 mm. in diameter, the combined stroke of the opposed pistons being 2,320 mm. The pumps are driven from the crossheads of the three after lower piston rods. A separate Michell thrust block is bolted to the engine bedplate and to the tank top. At the forward end of the crankshaft there is a flywheel incorporating a Doxford-Bibby detuner. For the fresh and salt water cooling systems, as well as the lubricating oil, Aspinall visual and aural alarms are provided, and operate when the pressure has fallen below a predetermined figure. Eight Michell bearings are fitted in the shaft tunnel. A four-bladed bronze propeller, having a diameter of 16 ft. 6 ins. is provided. A B.R. Vickers lubricating system, including a pump and a special oil tank, supplies the stern tube.

A Cochran composite boiler is arranged at the forward end of the engine room, and takes the exhaust gas from the main engine, supplying 3,650 lb. of steam per hour. The working pressure is 100 lb. per sq. in., and the steam output 5,200 lb. per hour when burning oil fuel. A Laidlaw Drew oil-firing equipment is provided, comprising two low-pressure oil burners supplied by an electrically-driven fan running at 2,900 r.p.m. The internal diameter of the main engine exhaust pipe is 2 ft. 5 ins., and a sluice valve can be operated to close off the boiler and divert the gas through a Burgess silencer located in the funnel.

In view of the comprehensive electric installation, including winches, pumps, fans, and other plant, there are four Diesel generating sets, having a total capacity of 700 kW. The engines are of the six-cylinder Mirrlees four-stroke type, coupled to Brush dynamos supplying current at 220 volts, and running at a speed of 550 r.p.m. Fresh water is used for cooling the cylinder jackets, and is supplied by a Drysdale Upright pump, running at 1,250-1,750 r.p.m., and driven by a 5½ h.p.-6 h.p. motor. There are two coolers for the auxiliary circulating system, each fitted with thermostatic control. For the supply of sea water to the coolers a pump similar to that for the fresh water is provided. The auxiliary engines exhaust through Burgess silencers as well as through spark arresters located in the funnel. Two engines are arranged to port and two to starboard, each pair having a Stream Line filter for the continuous clarification of the lubricating oil. At the boat deck level, above the engine room, there is a Lister-engined Mawdsley emergency generating set. The engine has six cylinders and develops 52 b.h.p.

Starting air for the main engine is supplied by two Weir three-stage compressors, each driven by a 78 h.p. Laurence Scott motor running at 585 r.p.m. Each machine has an output of 175 cubic ft. of free air per minute, compressed to 600 lb. per sq. in. There are two main starting air reservoirs with an internal diameter of 3 ft. 6 ins., and a length of 17 ft. 4 ins., each having a capacity of 150 cubic ft. An auxiliary air reservoir is charged from the main reservoirs through a reducing valve, and supplies compressed air to two Tyfon whistles. Air connections are taken from this reservoir to the fuel transfer pump and the auxiliary boiler feed pump for emergency operation, and for blowing through the Stream Line filters, as well as for removing dust from the auxiliary generators. For the supply of lubricating oil to the main engine there are two Vertoil pumps driven by 15-20 h.p. Allen motors running at 950-1,330 r.p.m. One pump is sufficient for normal service, the output being 70 tons per hour and the pressure 40 lb. per sq. in. Oil is drawn from the drain tank below the engine, the capacity being 1,400 gallons. The depth of oil can be ascertained from a K.D.G. gauge. There are two Auto-Klean strainers, one for each pump, and the oil is discharged to either one or both of a pair of interconnected coolers, each half being capable of dealing with 50 tons of oil, which, after leaving the coolers, passes through a Philips magnetic filter.

For purifying the lubricating oil a De Laval centrifugal separator with a capacity of 300 gallons per hour is installed. The drive is supplied by a 2½ h.p. motor, and the oil is continuously bled from the main engine system, purified, and returned to the drain tank. The oil in this tank can be pumped up to a 1,400-gallon cleaning tank fitted with a heating coil, where it is clarified and led back through the separator.

In accordance with the standard Doxford practice, fresh water is used for cooling the main engine pistons and jackets. There are two Drysdale Upright pumps, one of which is a standby. Each pump is driven by a 40-64 h.p. Allen motor running at 1,300-1,600 r.p.m. The capacity is 350 tons per hour against a pressure of 45 lb. per sq. in. It is of interest to note that each of these pumps has a steam ejector for initial priming. The fresh water cooler has a capacity of 300 tons per hour, reducing the temperature from 150 degrees F. to 135 degrees F. when supplied with 300 tons of sea water per hour at an inlet temperature of 90 degrees F. An Upright pump driven by a 35-45 h.p. motor running at 1,200-1,500 r.p.m. supplies sea water for the main lubricating and fresh water coolers, the Diesel generator oil and water coolers, and the air compressors.

A Centrex ballast pump with a capacity of 400 tons an hour is installed, and this can be employed as a sea water circulating pump, if required. Two De Laval centrifugal fuel purifiers are provided, each having a capacity of four tons per hour. The drive is taken from a 3½ h.p. motor having a speed of 1,450 r.p.m., and a steam heater with thermostatic control is provided. Dobbie McInnes indicators are fitted for showing the depth of fuel in the double bottom tanks.

Included in the auxiliary installation are two Upright sanitary pumps, each having a capacity of 35 tons per hour, two 20-ton Centrex domestic fresh water pumps, and a 120-ton general service pump. At the forward end of the shaft tunnel there is a Centrex two-stage emergency bilge pump driven by a Laurence Scott motor of 18-22 h.p., the speed being 1,300 - 1,500 r.p.m. For dealing with molasses cargo, which is carried in the two deep tanks, there is a J. and P. Hall's steam pump, which is capable of discharging 100 tons of molasses per hour against a head of 150 ft.