1930.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED CONSTRUCTION OF

STEAMER FOR LIGHTHOUSE SERVICE.

By Authority:
H. J. GREEN, GOVERNMENT PRINTER, CANBERRA.

F.1256.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

(Seventh Committee.)

ANDREW WILLIAM LACEY, ESQ., M.P., CHAIRMAN.

Senate.	*House of Representatives.*
Senator John Braidwood Dooley.	Malcolm Duncan Cameron, Esq., M.P.
Senator Matthew Reid.	John Curtin, Esq., M.P.
Senator Burford Sampson.	Hon. Henry Gregory, M.P.
	Edward James Holloway, Esq., M.P.
	William John Long, Esq., M.P.

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VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES, No. 23.

Dated 27th March, 1930.

7. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—CONSTRUCTION OF STEAMER FOR LIGHTHOUSE SERVICE.—Mr. Lyons (Minister for Works and Railways) moved, pursuant to notice, That, in accordance with the provisions of the *Commonwealth Public Works Committee Act* 1913-1921, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for investigation and report, viz.:—Construction of Steamer for the Lighthouse Service.

Question—put and passed.

LIST OF WITNESSES.

STEAMER FOR LIGHTHOUSE SERVICE

REPORT.

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS, to which the House of Representatives referred for investigation and report the question of the construction of a steamer for lighthouse service has the honour to report as follows:—

INTRODUCTORY.

1. When the Commonwealth assumed control of Australian coastal lights in June, 1915, it was found necessary to make provision immediately for steamer attendance to the lighthouses. Accordingly, the *Lady Loch* (531 tons) was purchased from the Victorian Government for £9,062, and was engaged in attendance on the lights of Victoria and South Australia—Tasmania being added subsequently; the *Governor Musgrave* (266 tons) was purchased from the South Australian Government and transferred to Western Australia to attend to the lights of that State; and arrangements were made with the Queensland Government to use State vessels for attendance on the Queensland coastal lights. In 1916 the *Karuah* (600 tons) a twin-screw vessel, was purchased for £17,000, and was engaged principally on the construction of new lights.

2. In 1923 the *Governor Musgrave* was brought to Sydney for extensive repairs which were estimated to cost £19,000, but, on being opened up was found to be in such a bad condition as to be practically beyond repair. After boats and other moveable equipment had been taken out, the hull and machinery were sold to Cockatoo Dockyard as scrap for £100.

In the same year tenders were called for the construction of two new vessels for the lighthouse service, and the *Cape Leeuwin* and *Cape York* (1406 tons) were built at Cockatoo Island. The contract price was £233,124, but subsequently certain extras were stipulated which brought the cost of these vessels to approximately £120,000 each.

In 1924 the *Kyogle* (735 tons) was purchased from the North Coast Steam Navigation Company Limited of New South Wales, for £12,750. An amount of £3,477 was spent in repairs, &c., making the total cost £16,227.

3. It was originally intended that on the completion of the two new vessels, the *Cape York* should carry out the work on the Queensland coast with the assistance of the *Karuah*, and the *Cape Leeuwin* should attend to the Western Australian lights. However, in 1926, after the *Karuah* had narrowly escaped disaster when attempting to tow a light-ship which had broken adrift, she was reported to be too slow, and unsuitable for the work expected of her, and was sold for the sum of £700. It was then decided that the "Cape" boats should be retained for the Queensland service and the Kyogle left to look after Western Australia.

PRESENT PROPOSAL.

4. The proposal now under consideration is the construction of a new vessel for attendance on the lights on the coast line of Western Australia and North Australia to replace the *Kyogle* which is reported to be incapable of carrying out the work with economy and efficiency.

DESCRIPTION OF THE VESSEL PROPOSED.

5. The new vessel proposed is to be a single screw, oil-burning, steel steamer of about 1,400 tons, designed to have a cruising radius of 3,000 miles. It is to be 195 feet in length, 34 feet in breadth, with a depth of 17 feet. The cargo capacity is set down at 300 tons, the loaded draft 13 feet, with a sea speed of 10 knots. It is proposed to have accommodation for 20 passengers, and will carry a crew of 28.

6. In providing the accommodation, special consideration has been given to the comfort and well-being of the ship's complement and the passengers (lighthouse staffs and families) to be carried. The members of the crew are to be accommodated aft, under the poop. Two and three-berth cabins have been arranged for the deck hands on one side, and for the stokehold and engine-room hands on the other, with separate mess-rooms, lavatory accommodation, &c.

The engineer officers, petty officers, and members of the victualling staff are to be accommodated in the starboard alley-way, ample bath and lavatory accommodation being provided. The passengers are to be accommodated in the port alley-way in two-berth cabins—male passengers at the after end, and female passengers at the forward end—with adequate bath and lavatory accommodation; that for the women and children being specially designed to afford every comfort and privacy. The master, deck officers, and wireless operator are to be accommodated in self-contained cabins on the bridge deck, provision being also made for the official travelling on inspection duties, and for an office for general clerical work which can be also used as a sitting room. The saloon is situated on the main deck under the bridge, and is divided into two parts, one being for the use of passengers and one for the ship's officers, with a common pantry serving both sections. Seating accommodation and ventilation is amply provided for.

7. The space under the forecastle has been utilized for store rooms, paint locker, flasher room, &c. The forward hatch will stow about 200 tons of cargo and is so arranged as to enable construction material 30 feet in length to be handled. Provision has been made in the hold for a lock-up compartment for light-keepers' stores.

The forward hatch is to be served by two 12-ton derricks with two winches for working them. The forward deck and hatch will permit of buoys being landed on board for cleaning and painting purposes.

The after hold will stow about 100 tons of cargo, and is to be served by two 3-ton derricks and a suitable winch which can also be used for mooring the ship and hoisting boats. Towing facilities have been fitted on the poop deck.

That deck, and the small after deck, will provide ample recreation space for the crew, whilst the passengers and ship's officers will be adequately provided for in that respect by the forward and bridge decks.

8. The vessel is to be provided with two life-boats, each capable of accommodating thirty persons, and in addition one motor boat, two surf boats, and one small dinghy.

A refrigerating plant is to be installed, and a cooling chamber, properly insulated and divided for storage of meats, vegetables, &c., with a capacity of about twenty tons. The galley is situated at the after end of the alley-way and has been designed for convenience of working, being provided with oil-burning stove, baker's oven, dressers, &c. The scullery and a ready-use vegetable locker are in close proximity.

9. The vessel is to be fitted with wireless installation and an auto-alarm device, and with ample modern navigational appliances. Hospital accommodation is to be provided on the bridge deck, to which is to be attached a sanitary block, in accordance with the requirements of the Navigation Act.

10. The steamer will be of the double-bottom type, and ample provision has been made for fresh water for domestic use, and feed water and ballast tanks. It is to be built of steel to Lloyd's classification, and in accordance with the Board of Trade and Navigation Act requirements, the requisite number of bulkheads being fitted to comply with subdivisional requirements for a passenger vessel.

Electric light is to be installed throughout, with provision for a supplementary electric lighting system suitable for supplying the wireless set with electric current, and to provide restricted lighting in port and at anchor when the main dynamo is not in operation.

11. The ship is so designed as to be thoroughly stable in light condition, thereby obviating the necessity of carrying permanent ballast. It will differ from other steamships of similar size in that it is intended for lighthouse work and will be built to a special design. It will be suitably strengthened forward, because that part will be subjected to chafing by light-buoys brought alongside for examination and repair.

ESTIMATED COST.

12. The estimated cost of the proposed ship has been given as:—

Item.		Total. £
Hull—		
Woodwork, including wood decks, hold sparring, hatch covers, cabin partitions, furniture, wood derricks, skylights, deck-houses, &c.		17 245
Steel-work, including plates, bars, rivets for hull, bulkheads, decks, superstructure, casings, settings, &c.		32,805
Piping, including bilge and ballast sections, fresh and salt water and sanitary services, soil pipes and discharges, scuppers, and oil-fuel filling, air and sounding pipes, &c., ventilation, shelving, cupboards, troughs, and all wire work		4,600
Painting, Cementing, Tiling, including wire-brooming steelwork, cleaning out and cement washing tanks and other spaces		3,430
Rigging and Canvas work, including stays, shrouds, runners, lifts, guys, boat falls, purchases, awnings, covers, wind sails, &c.		535
Docking, Tests, Registration and sundry fees, freights, pilotage, tugs, &c.		1.685
Deck fittings, castings, forgings, brass and other metal work, deck, steam and exhaust pipes, steam heating and fitting of deck auxiliaries		6.875
Outfit, including anchors, cables, windlass, winches, refrigerating machinery, compasses and nautical instruments, galley equipment, steering gear, wire and hemp rope blocks, upholstery, flags and distress signals, lamps, stores, including beds and bedding, crockery and glassware, cutlery and silverware, deck and other stores and fire fighting appliances, and other finished purchases		9,885
Remaining miscellaneous items		4,490
Total Hull		81,550
Machinery—	£	
Main propelling machinery, including engines, boilers, shafting, propellor, &c.	16,835	
Auxiliary machinery	2,210	
Pipes, Valves, Fittings	4,715	
Spare gear, tools and furnishings	1,410	
Installation of all Machinery, and Trials	2,435	
Miscellaneous details	635	
Remainder	1,810	
Total Machinery		30,050
Electrical Equipment, including supply and installation of Wireless Telegraphy outfit		8,400
Grand Total		120,000

and the time fixed for completion about twelve months from the date of commencement.

COMMITTEE'S INVESTIGATIONS.

13. The Committee carefully scrutinized the plans submitted, took evidence from the Secretary, Marine Branch, the Acting Director of Navigation, the Director of Lighthouses, the Manager of Cockatoo Dockyard, a private naval architect, and from the mechanical engineering officers of the Department of Works; and generally sought to inform itself thoroughly on the subject under consideration.

Some disadvantage was felt that want of time and opportunity prevented an inspection being made of the existing lighthouse tender *Kyogle*, at present in Western Australian waters, and the Committee had to rely upon a description of the vessel and report as to her condition furnished by the various officials concerned.

Lighthouse Districts.

14. It was stated in evidence that for lighthouse administration purposes the Commonwealth is divided into four districts. No. 1 district comprises the coast-line of Western Australia and North Australia of an approximate length of 5,390 miles; No. 2 district comprises the coast-line of Queensland, including the Great Barrier Reef, with an approximate length of 3,000 miles; No. 3 district comprises the coast-line of New South Wales, Victoria and Tasmania, with an approximate length of 2,160 miles; and No. 4 district comprises the coast line of South Australia of an approximate length of 1,540 miles.

15. At the end of 1928 the Commonwealth lighthouse service was maintaining 210 aids to ocean navigation, consisting of 66 manned lights, 89 automatic lights, 2 light-ships, 7 light-buoys, 9 unlighted buoys, 31 beacons, and 6 fog signals. Of these, 33 aids were in the No. 1 district, 80 in No. 2, 56 in No. 3; and 41 in No. 4.

Vessels in Commission.

16. At the present time four steamers are in commission, attending to the lights, carrying stores to lighthouses and materials for effecting repairs, carrying construction gangs and construction material for new lights, conveying keepers and their families proceeding on leave, transferred from one station to another, or needing medical attention, &c. Two of these vessels, the *Cape York and Cape Leeuwin*, are stationed in No. 2 district (Queensland), the *Lady Loch*, with headquarters at Melbourne, attends to Victoria, Tasmania and South Australia; while a fourth, the *Kyogle*, with headquarters at Fremantle, deals with the coast line of Western Australia and North Australia.

During the year 1929, these vessels steamed a total distance of 61,520 miles, or an average per vessel of 15,380.

Outside Assistance.

17. In addition to the lighthouse ships, contracts have been arranged with the North Coast and South Coast Steamship Companies in New South Wales, and with the Coast Steamships Ltd., in South Australia, for steamer attendance to certain lights.

In Tasmania, fishing vessels are engaged to supplement attendance to certain lighthouses; and in Western Australia luggers are sometimes engaged, and coastal vessels utilized, to supplement the services of the *Kyogle*.

Description of the *Kyogle*.

18. The *Kyogle*, at present engaged in attending to lights on the Western Australian and North Australian coasts, is a coal-burning, twin screw, steel vessel of approximately 1,200 tons displacement. She was built on the Clyde to the order of the North Coast Steam Navigation Company of New South Wales in 1902, and, being designed for the Northern Rivers trade, is of light construction.

She was purchased for the lighthouse service in 1924 for the sum of £12,750, and an additional amount of £3,477 was spent in alterations and repairs, making her total cost £16,227. She is capable of a speed of 10 knots, but her economical speed is 7 knots. The cruising radius is 1,080 knots at 10 knots speed, and 1,480 knots at 7 knots speed.

19. It is represented that these cruising radii are insufficient for requirements, as the length of the coast line to be attended to is 5,390 miles, so that a large amount of the cargo space has to be utilized for carrying extra coal, and, in addition, large quantities of coal have to be shipped to Darwin for the return trip at the high price of £6 4s. 7d. per ton plus handling charges—say a total of £6 10s. per ton.

Since the date of purchase the average cost of maintenance of the *Kyogle* has been £2,260 per annum, and, in view of the age of the vessel, it is represented that this sum is likely to increase yearly.

In addition, reports obtained indicated that the framing in the fore and aft peaks and the tank margins in the engine room and after hold are deteriorated, and will probably need replacement within the next two years. Some of the hull plates have also wasted on the wind-and-water line. It is stated that when repairs of this kind are undertaken on a lightly constructed vessel of the type of the *Kyogle*, it is not possible to foresee where replacements will end. Parts which are apparently good, and which may remain serviceable while undisturbed, will not stand cutting out and replacement of rivets.

The information obtained by the Committee in regard to this matter was somewhat contradictory and unsatisfactory. One witness stated that the *Kyogle* could be kept in a reasonably sea-worthy condition for five years by the expenditure of about £2,000 a year; another stated that by the expenditure of an average of £3,000 per annum she would have a useful life of ten years; while another witness, emphasizing the extent of the repairs and replacements that a searching investigation of the vessel might reveal, indicated that it is quite possible that the cost of making good defects so discovered would amount to anything up to £10,000 or £15,000, to be followed by an annual maintenance charge of £2,000 to £3,000.

Necessity for New Vessel.

20. It was apparent to the Committee that, apart from the inadvisability of spending an excessive sum on an old ship, the employment of a coal-burning vessel of limited steaming radius on a long coast line such as Western and North Australia, where the cost of replenishing bunkers was so high, is most uneconomical. As it is represented that fuel-oil can be obtained conveniently and at reasonable rates at Fremantle and Darwin, it is obvious that considerable saving would be effected by the employment of an oil-burning vessel. Inquiries were made as to the possibility of converting the *Kyogle* to oil burning, but the evidence obtained indicated that, although it was possible, it would be somewhat costly, and it was considered inadvisable to incur that expense on such an old vessel.

The Committee is satisfied from its investigations that, under existing circumstances, the lighthouse service on the Western Australian and North Australian coast cannot be economically maintained at the degree of efficiency desired with the *Kyogle*, and recommends that a new oil-burning steamer for such services be provided as early as practicable.

Estimated Cost.

21. From the evidence obtained the Committee is of opinion that the round figure estimate of £120,000 furnished for the construction of this vessel is high, and is satisfied that when the matter is considered in greater detail, a substantial reduction on such estimate may be expected. It was ascertained that a twin-screw vessel of approximately the same size, but with rather more elaborate fittings, is being built in Great Britain for the lighthouse service in New Zealand, and the contract price, delivered in Wellington, is £77,700. An estimate obtained from a naval architect in private practice placed the price of this proposed new vessel at £96,626, if built in Australia, or if built in Great Britain, £64,000, to which latter figure would have to be added the cost of bringing the ship to Australia—£5,000 to £6,000.

22. The fact that it may be possible to utilize auxiliary machinery and wireless installation from one or other of the Commonwealth vessels recently put out of commission may also help to reduce the cost of this proposed vessel.

While some members were satisfied that the vessel should be ordered direct from Cockatoo Island Dockyard, the opinion was expressed that, in view of the fact that the expenditure will be a charge against loan moneys, the amount should be kept to the lowest possible figure, and that this might be best brought about by calling tenders in Great Britain and Australia.

23. After some discussion it was eventually agreed that, as it was shown that at least three ship-building yards in Australia are capable of satisfactorily carrying out the work, tenders should be immediately called only in Australia for the construction of the vessel.

The decision arrived at by the Committee in connexion with this matter is shown by the following extract from its minutes of proceedings, namely:—

Mr. Gregory moved—That tenders be called in Great Britain and Australia for the construction of the vessel.
Seconded by Mr. Cameron (*pro-forma*).
The Committee divided on the motion.

Aye, 1.	Noes, 4.
Mr. Gregory.	Mr. Cameron.
	Mr. Curtin.
	Mr. Lacey.
	Mr. Long.

and so it passed in the negative.

Mr. Cameron moved that tenders be called in Australia for the construction of the vessel.
Seconded by Mr. Curtin.
Mr. Long moved as an amendment that the construction of the vessel be entrusted to Cockatoo Island Dockyard.
Seconded by Mr. Lacey.
The Committee divided on the amendment—

Ayes, 2.	Noes, 3.
Mr. Lacey.	Mr. Cameron.
Mr. Long.	Mr. Curtin.
	Mr. Gregory.

and so it passed in the negative.

The original motion was then put and carried unanimously.

Details of Steamer.

24. Some evidence was advanced as to the desirability of the proposed vessel being fitted with twin screws instead of with a single screw as suggested. It was pointed out that as a twin-screw vessel she would be more easily handled in the restricted positions in which she would be called upon to operate, while the extra screw would offer greater security in the event of accident. Twin-screw vessels are largely used in the United States lighthouse service, and such a vessel is favoured by the Director of Lighthouses, and the Manager of Cockatoo Dockyard.

The suggestion was also advanced that the installation of the Bauer Wach engine—the general principle of which is an ordinary reciprocating engine which uses its exhaust steam through a low pressure steam turbine that is connected to the main propellon shaft through helical gearing—might be expected to result in a fuel economy of 17 per cent. to 25 per cent.

The argument against such an engine was the difficulty of getting it repaired, and the fact that parts for repairs would have to be imported. On these and other details the Committee does not feel competent to express an opinion, but recommends that full consideration be given to them before tenders are invited.

Cost of Maintenance.

25. It was stated in evidence that the average annual maintenance cost of the *Kyogle* is approximately £2,000, and of the *Cape York* and *Cape Leeuwin*, £3,000. In the case of the last named vessels this appears high for new steamers, and is obviously due to mistakes in design or construction which had to be rectified. With the experience gained by the construction of the two "Cape" steamers, however, it should not be necessary to make any material alteration in the design of the new vessel, and it is hoped that the maintenance charges for the first few years of her life will be negligible.

The other charges of the new vessel—payment to crew, fuel, stores, victualling, &c.—are estimated to amount to approximately £18,000 per annum.

Disposal of the *Kyogle*.

26. With the new vessel in commission there will be no necessity to retain the *Kyogle* for service in No. 1 district. The suggestion was made that if sold for trade in the East, or for cargo carrying purposes on the Australian coast, she might be expected to realize £5,000 to £6,000. Other witnesses were not so optimistic, unless a very favorable opportunity for sale presented itself. The Committee made inquiries as to the possibility of utilizing the *Kyogle* on the Queensland coast in place of the *Cape Leeuwin*, which might be transferred to the west, but was informed that, although she might do useful work in that capacity, the difficulty again presented itself that she would be engaged in localities where coal was obtainable only at a high cost. The Director of Lighthouses, however, intimated that she might prove useful on the South Australian coast where the steaming distances were not so great, and relieve the *Lady Loch* which is at present over-worked.

27. The Committee is of opinion that the *Kyogle* has still some years of useful life, and recommends that before any action is taken to dispose of her, a special investigation should be made to ascertain whether she could be utilized with advantage elsewhere for lighthouse purposes.

CONCLUSION.

28. During the course of the inquiry the Committee was unfavorably impressed by the appearance of divided control which exists in respect of the lighthouse service, where the Director of Lighthouses, who is responsible for the proper maintenance of the lights, has no control over the light-keepers or the vessels attending lighthouses, and considers that the service would gain in efficiency if the practice followed in other parts of the world of having a single control were followed.

29. The Committee is also of opinion that, in the interests of economy and efficiency it might be found advisable to employ a competent consulting naval architect as liaison officer between the department and the contractors when the vessel is being constructed.

SUMMARY OF RECOMMENDATIONS.

30. Briefly summarized, the recommendations of the Committee are :—

A. W. LACEY,
Chairman.

Office of the Parliamentary Standing Committee on Public Works,
Parliament House, Canberra.
18th June, 1930.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

MONDAY, 5TH MAY, 1930.

Present:

Mr. LACEY, Chairman;

Senator Sampson	Mr. Holloway
Mr. M. Cameron	Mr. Long.
Mr. Gregory	

Lewis Findlay East, Secretary, Marine Branch, Department of Trade and Customs, sworn and examined.

1. *To the Chairman.*—I have been secretary to the marine branch since July, 1927, and for some years prior to that year I was Assistant Director of Navigation. The marine branch is responsible for the construction and maintenance of lighthouses and lightships, and the navigation branch deals with all matters affecting ships and shipping in relation to interstate and oversea trade. I am aware of the proposal to construct a new steamer for the lighthouse service on the Western Australian coast. The *Lighthouses Act* 1911 empowered the Commonwealth to acquire from the States, which at the time of the passing of the act controlled all lighting and marking of the coast, any lighthouse or marine mark the property of the State or of any authority of a State. It also empowered the Minister for Trade and Customs, in whom the administration of the act is vested, to erect or provide new lighthouses or marine marks, or to alter, add to, or remove lighthouses or marine marks the property of the Commonwealth. The actual administration of the act is, subject to the Minister and the Comptroller-General of Customs, in the hands of the marine branch of the Department of Trade and Customs. The branch is controlled by the secretary and consists of two sections, namely, the lighthouse section, under the direction of the Director of Lighthouses, which deals with the erection, alteration, and maintenance of lighthouses and marine marks, and the navigation section, under the Director of Navigation, dealing, under the powers conferred by the Navigation Act and other acts dealing with marine matters, with shipping and navigation in relation to interstate and oversea commerce. The navigation section also controls and is responsible for the running of the lighthouse steamers. The Australian coastline exceeds 12,000 nautical miles. There are only two countries in the world having coastlines greater than this. The United States of America (including Alaska) has a coastline distance of approximately 21,000 miles, and Russia (including Siberia) has a coastline which is probably even greater, but in respect of which definite figures are not available. The coastline of Great Britain and Ireland together is roughly 9,000 miles, and of the continent of Europe as a whole approximately 48,000 miles. For lighthouse administrative purposes the Commonwealth is divided into four districts. No. 1 District comprises the coastline of Western Australia and North Australia, with an approximate length of coastline of 5,390 miles. The head-quarters of this district is at Fremantle. No. 2 District comprises the coastline of Queensland, including the Great Barrier Reef. The approximate length is 3,000 miles. The head-quarters for the district is at Brisbane. No. 3 District comprises the coastlines of New South Wales, Victoria, and Tasmania, of an approximate length of 2,160 miles. This district is subdivided into three sub-districts, the head-quarters for the sub-districts being Sydney, Melbourne, and Hobart, respectively. The district head-quarters is at Melbourne. No. 4 District comprises the coastline of South Australia; approximate length of coastline, 1,540 miles; head-quarters, Port Adelaide. The Commonwealth is responsible for the provision and maintenance of ocean lights and marks. It has no concern with the lighting and marking of ports, this being attended to by State departments or local authorities functioning under State acts. At the end of 1928 the Commonwealth lighthouse service was maintaining 210 aids to ocean navigation, consisting of 66 manned lights, 89 automatic lights, 2 lightships, 7 lighted buoys, 9 unlighted buoys, 31 beacons, 6 fog signals. Of these, 33 aids were in No. 1 District, 80 in No. 2, 56 in No. 3, and 41 in No. 4. At the present time four steamers are in commission attending to the lights, &c., in the four lighthouse districts. Two of these vessels, the *Cape Leeuwin* and *Cape York*, are stationed in No. 2 District (Queensland), with head-quarters at Brisbane. Another, the *Lady Loch*, with Melbourne as head-quarters, attends to Victoria, Tasmania, and South Australia; while the fourth, the *Kyogle*, having head-quarters at Fremantle, deals with the coastline of Western Australia and North Australia. I submit a table which gives, in convenient form, data regarding these four vessels, and includes, for the purposes of comparison, corresponding particulars regarding the new steamer which it is proposed to build to replace the *Kyogle* in No. 1 District. Our steamer service it is considered, is run on a most economical basis. Taking as a basis of comparison the United States of America, with a coastline of 21,000 miles, as against the Australian coast line of 12,000 miles, the annual report of the Commissioner of Lighthouses for the United States of America for the year ended 30th June, 1929, shows that, apart from ten steamers used for lighthouse purposes on the navigable rivers and the Great Lakes, the United States of America lighthouse service had in commission during that year 46 sea-going tenders, of which 38 were steamers, and 8 motor vessels. Most of these vessels are of relatively small tonnage, as the department attends not only to ocean lights, but also to the lighting of the ports, &c. Seventeen of the tenders are, however, of a displacement of from 1,000 to 1,200 tons. The displacement of the *Lady Loch*, it may be mentioned for the purposes of comparison, is 830 tons, and of the *Kyogle* 1,200 tons. The distance steamed by the United States lighthouse tenders during the year 1928-29 was, on an average, 8,616 miles per tender. The four vessels of the Commonwealth lighthouse service covered during the calendar year 1929 a distance of 61,520 miles, equal to two and a half times round the world, or an average per vessel of 15,380 miles. For lighthouse administrative purposes the coast of the United States of America (with Alaska) is divided into no less than twelve districts, each with its head-quarters for steamer services. The length of coastline within a district is consequently considerably smaller than in Australia, being on an average about 1,750 miles, as against our average of 3,000 miles. On account of this greater distance to be covered, also because of the relatively fewer ports of supply on our coast as compared with the United States of America, greater cargo and fuel capacity, and consequently greater size is required in the case of our steamers than in those of the American service. The gross tonnages of our present steamers are:—*Cape Leeuwin* and *Cape York* (sister vessels), 1,406 tons; *Kyogle*, 735; and *Lady Loch*, 531. The proposed new steamer will be somewhere between 950 and 1,000 tons. A new steamer under construction for the New Zealand lighthouse service is of 1,163 tons. Evidence as to the requirements in No. 1 District in the way of passenger accommodation and cargo space (which, with the cruising range required, are the factors which determine the size of a vessel) will be given by the Director of Lighthouses (Mr. Wallach) and the

Acting Director of Navigation (Captain Williams). Up to 1923, the attendance on the lights in Western Australia and North Australia was carried out by means of the SS. *Governor Musgrave*, a small iron steamer of 266 tons gross, taken over, when the Commonwealth assumed control of ocean lights, from the State of South Australia. The vessel when taken over in 1915 was old, even for an iron vessel (41 years), and even at her best would have been hardly suitable for the work required. In 1923 it became apparent that extensive repairs would be necessary in order to maintain the vessel in a seaworthy condition. She was brought to Sydney for the purpose, and an estimate was obtained from Cockatoo Dockyard of the cost of renewals and repairs sufficient to render the vessel suitable for a further ten years' use. The estimated cost was rather staggering, namely, over £19,000, but as it was essential that the lights should be maintained, approval was given for the work to be undertaken. However, when the vessel was further opened up with a view to the undertaking of the repair work, it was found that parts of the frame and hull plating which had not hitherto been examined were deteriorated to such an extent as to be practically beyond repair. The additional cost that would have been necessary to renew these parts rendered the proposal to repair the ship economically impossible. Some idea of her condition may be gathered from the fact that, after boats and other movable equipment had been taken out, the hull and machinery were disposed of to Cockatoo Dockyard, as scrap, for the sum of £100. In these circumstances it became imperatively necessary, when the *Governor Musgrave* was taken out of commission, to secure, as soon as possible, a substitute steamer for No. 1 District. Inquiries were made, and the only vessel available at all suitable for requirements was the SS. *Kyogle*, belonging to the North Coast Steam Navigation Company Limited, and built for the passenger and cargo trade between Sydney and the Northern River ports of New South Wales. The *Kyogle* was relatively old for a steel vessel (23 years), and of a shallow draught type, of lighter construction than usual, specially designed for the Northern Rivers trade, in which service the barbound entrances to the rivers precluded the use of vessels of normal draught. This particular limitation as to draught applied also, and still applies, to certain places on the north-west coast of Western Australia to which the lighthouse steamer must go, and where a draught of 13 feet is about the maximum permissible. As there was no time in which to build a new steamer for the service, and as the *Kyogle* was the only steamer at all suitable, the vessel was first chartered, and later, in March, 1924, bought by the Commonwealth, the price being £12,750. A sum of £1,738 was spent in overhaul and alterations in Cockatoo Dockyard, necessary to fit her for the special duties of a lighthouse tender on the Western Australian coast. The *Kyogle* is now 29 years old, and is fast approaching the end of her useful life. In mercantile practice the normal life of a steel steamer is taken at 25 years. The Imperial taxation authorities, it may be mentioned, approve of this, annual depreciation being allowed for taxation purposes at 4 per cent. of the capital cost, so that in practice a steamer is wholly written off the books at the end of the period mentioned. It is possible, however, by careful maintenance and, as time goes on, extensive renewals, to keep a vessel in commission for a longer period than this. Certain vessels on the coast, for example the SS. *Loongana* and the SS. *Oonah*, running between Melbourne and Tasmania, are now 26 years and 42 years old, respectively, but are still in fair seaworthy condition. The lighthouse steamer *Lady Loch* is also 44 years old, and the SS. *Edina*, trading between Melbourne and Geelong, no less than 76 years old. These two vessels are, however, built of wrought iron, a substance which is much less liable to corrosion in sea-water than steel, of which modern vessels are built. It is not regarded as good business, however, to run a vessel on the coast until she wears out and becomes unseaworthy, the general practice of ship-owners being, when a vessel is reaching the end of her life, but before she does so, to sell her to a foreign buyer, usually Chinese or Japanese, for use in the coasting trade of the country of the purchaser. Shipbuilding materials and dockyard labour are very much cheaper in these countries than in Australia, and so long as a vessel, when purchased here, is still in a seaworthy condition and capable of being taken overseas, she can be manned with a cheap labour crew, taken to her destination, docked on arrival, and necessary repairs and renewals made sufficient to give her a new lease of life, at probably less than one-third of the cost of a new vessel. The *Kyogle*, if sold now, would probably realize, in an Australian port, somewhere about half the amount (£12,750) paid for her in 1924. The deterioration in the structure of the *Kyogle* has now reached a stage at which, from statements made by the officer of the Works Department who supervised her overhaul in 1923, it is anticipated that fairly heavy renewals of hull plating and frames will shortly become necessary. It is practically impossible to estimate with any degree of accuracy just what these repairs would cost. In accordance with the general practice, the spaces between the frames in the lower parts are cemented over, and until this is removed, which so far has not been done, it cannot be ascertained just to what extent deterioration has taken place in the covered portions of the frames and platings. It frequently happens, also, that when repairs to a ship's frames and plating are put in hand the discovery is made, as was the case with the *Governor Musgrave*, that the renewals required are more extensive than was at first thought necessary, with a consequent increase in cost much above the preliminary estimate. Notwithstanding that when the *Kyogle* was bought in 1924 she was, before being taken to the West, given a thorough special overhaul in Cockatoo Dock, at a cost of £1,738; the cost of her annual overhauls in Western Australia during the past three years has amounted to £6,791, the figures for each year being as follows:—1926-27, £2,016; 1927-28, £3,181; and 1928-29, £1,594. In the last-mentioned year, it may be added, repairs were reduced to a bare minimum, the amount asked for in the Estimates having been severely "cut" by the Treasury. An officer of the Public Works Department, Mr. G. Hastie, who recently proceeded to Western Australia to supervise the annual overhaul of the *Kyogle*, was requested to investigate this aspect of the matter and to advise as to the probable cost of next year's overhaul and renewals, and of the probable increase in cost from year to year; also to give an opinion as to the probable useful life of the *Kyogle* for lighthouse or other purposes. The Director-General of Works has informed me that he prefers that Mr. Hastie's report, which he has received, shall be placed before the committee by himself rather than through the marine branch. Apart altogether from this question of general deterioration of the *Kyogle*, it may be stated that, from the point of view of fuel consumption, the vessel is entirely unsuited for work under the conditions obtaining in Western Australia and North Australia. Designed as she was for the short run of less than 350 miles between Sydney and northern New South Wales ports, she carries a very limited coal supply, having a bunker capacity of 108 tons only. To accentuate this disability she is something of a "coal-eater," her coal consumption at a normal cruising speed of 8 knots being 15 tons per day. Her bunkers consequently give a cruising radius of less than 1,400 miles. A consumption of 15 tons per day for a vessel of the size and speed of the *Kyogle* is excessive and extravagant. The SS. *Broadway*, of the Adelaide Steamship Company's fleet, is of approximately the same gross tonnage and

nominal horse-power as the *Kyogle*. Her speed is half a knot better (8½ knots as compared with a bare 8), but her coal consumption at cruising speed is only 8½ tons per day as against the *Kyogle's* 15. A cruising speed of 8 knots is too low for a satisfactory service for lighthouse purposes, and in a district subject in parts, as No. 1 District is, to cyclonic disturbances, is hardly safe. The normal cruising speed for a vessel in this district, it is considered, should be not less than 10 knots. The two "Cape" steamers have this speed and the *Lady Loch* 9 knots. As the coal supply of the *Kyogle* suffices for a voyage on a straight run of less than 1,400 miles, and as the steaming distance covered by the vessel on a trip from Fremantle to Cup Don in North Australia and return is roughly 5,700 miles, more than four times the distance provided for, it is necessary, when the vessel is proceeding to attend to lights in North Australia, to arrange not only for a quantity of coal to be carried in bags in her hold, but also for supplies of coal to be made available for her at Darwin and at the intermediate ports of Port Hedland and Carnarvon or Wyndham. No bunker coal is held at any of these intermediate ports. Consequently, arrangements must be made to forward by coasting steamer, ahead of the *Kyogle*, considerable quantities of bagged coal, to be landed on the jetties at these ports and there held until the *Kyogle* calls. This is a costly business, as to the original price of the bulk coal in Fremantle there must be added the cost of bagging, landing, coastwise freight and, at the intermediate ports, of labour necessary to place the bagged coal in the ship's bunkers Coal at Darwin is roughly £5 per ton, being subject to the heavy freight charges of bringing it from Newcastle or other eastern port. To this must be added also the cost of putting into bunkers. During 1929 the *Kyogle* steamed a distance of 15,276 miles, and consumed for all purposes 1,568 tons of coal. The cost of this amounted to £6,000, an average of £4 8s. per ton. Of the total amount of coal consumed 1,179 tons were used in propulsion, and the balance 389 tons, in maintaining steam at anchorages, for the winches in port, &c. A small proportion was used for cooking. The fuel bill of the *Kyogle* per 100 miles steamed, as compared with those of the other lighthouse steamers and of the proposed new steamer, is as follows:—

Kyogle—£33 17s. per 100 miles steamed.
Cape Leeuwin—£19 6s. per 100 miles steamed (including considerable towages).
Cape York—£16 per 100 miles steamed.
Lady Loch—£19 7s. per 100 miles steamed.
New steamer—£13 2s. per 100 miles steamed (estimated).

The new steamer is to be an oil burner. Supplies of oil fuel are obtainable at Fremantle, Darwin, and, if necessary, at Wyndham, at 75s., 66s., and (say) 90s. per ton respectively. The fuel consumption of the vessel will be it is estimated by Cockatoo Dockyard, 3½ tons per 100 miles' steaming. On this basis, and adding, say, 30 per cent. (roughly 1 ton per 100 miles) as representing fuel consumption while the vessel lies under banked fires at anchorages and for making steam for winches for cargo work while the vessel is in port, and assuming that two thirds of the necessary oil fuel is obtained at Fremantle and one-third at Darwin, the cost of covering the distance steamed by the *Kyogle* last year (15,276 miles) would be not more than £2,500, a direct saving in fuel costs of £4,400. On the estimate given by Cockatoo Dockyard, the fuel consumption of the proposed new steamer would be, when under way, about 8½ tons per day of 24 hours, as compared with, roughly, 10 tons averaged in normal years by the two Queensland steamers *Cape Leeuwin* and *Cape York*. The new steamer now under construction for the New Zealand lighthouse service, of 1,163 tons, is designed for a cruising speed of 11 knots, with an oil consumption of 11 tons per day. In July, 1927, following on the amalgamation of the lighthouse and navigation branches of the Department of Trade and Customs into a single unit known as the marine branch, the running of the lighthouse steamers was placed under the supervision of the Director of Navigation, and, under him, of the Deputy Directors in the States in which the vessels have their head-quarters. Early in the following year the Director of Navigation took in hand the preparation of a preliminary design of a steamer to be built to replace one of the two old vessels, the *Kyogle* or the *Lady Loch*. He obtained from the Deputy Directors, and through them from the masters of the lighthouse steamers, suggestions based on their experience in the running of the present vessels in regard to the special features requiring consideration in the designing of a vessel for maximum efficiency, with economy, in the work of attendance on lights. Working on these suggestions, and on material available in the central office, the Director prepared a sketch design of a steamer roughly of the size of the *Kyogle*. This sketch plan was again submitted to the Deputy Directors, and on the criticisms and further suggestions received, a second sketch plan was later prepared. At this stage it had become evident that the more pressing requirement was for a new vessel in Western Australia. By arrangements made in South Australia, partly in the way of the substitution of a land service to the four lights on Kangaroo Island, formerly attended to once a quarter by the *Lady Loch*, and partly by arrangement for contract vessels to attend to other lights, the work of the *Lady Loch* had been considerably reduced, and in view of the condition of her hull and machinery it was agreed that it should be possible to retain her in active service for another eight or ten years. Under these circumstances, special weight has more recently been given to the particular requirements of the service in Western Australia and North Australia. The principal alteration in the original plan has been in the direction of a slight increase in size, the proposal now under consideration being for a vessel of between 950 and 1,000 tons gross, or, roughly, one-third larger than the *Kyogle*. The chief considerations in providing for this increase in size have been, firstly, the necessity for a greater cruising range with increased speed, involving greater bunker and fresh water capacity; and secondly, because, as a steel vessel has a normal life of 25 years, it was necessary to look ahead and to give some consideration to probable developments in the way of the erection of new lights and consequently an increase in the amount of lighthouse materials, stores, &c., required to be carried. The Director of Lighthouses will give evidence in regard to this aspect of the matter. At this stage Ministerial approval was obtained to a preliminary discussion of the plans with experts of the Public Works Department and of Cockatoo Dockyard. A conference of these experts with the officers of the marine branch was held at the marine branch, Melbourne, towards the end of March last. The following took part in the discussion: Mr. Fleming, Senior Mechanical Engineer, Department of Works; Mr. Wilson, Assistant Manager, and Mr Morton, Chief Designing Engineer, Cockatoo Dockyard; Captain G. D. Williams, the Acting Director of Navigation, and myself. For part of the time, while engines and engine-room equipment were under discussion, Mr. Battle, Principal Engineer and Ship Surveyor of the Marine Branch, was also present. A sketch plan prepared by Cockatoo Dockyard, and now produced for the committee's inspection, is the result. Shortly stated, the plan provides for a vessel of about 990 tons gross and 1,380 tons displacement at a loaded draught of 13 feet. The vessel will be 195 feet long, 34 feet in breadth, and 16 ft. 9 in. in depth. She will have accommodation for 20 passengers (lightkeepers, lighthouse mechanics, and other officials) and a crew of 30, a total of 50 persons in all, and a cargo capacity of 300 tons dead weight. The vessel is designed for a

cruising speed of 10 knots, and will carry sufficient oil fuel and fresh water to give her a cruising range of 3,000 miles. Evidence as to the details of the vessel, and touching more particularly on the Navigation Act requirements, crew and passenger accommodation, cruising speed and radius, fuel, limit of draught, propelling machinery, and general equipment of the vessel, will be given by the Acting Director of Navigation, Captain G. D. Williams. Although the proposed new vessel is, as mentioned, about one-third larger than the *Kyogle*, there will be no increase in crew or in wages. Three boiler attendants will handle the oil burners instead of the six firemen now employed in the *Kyogle* to fire her with coal. On account of the increase in size and horse-power, as compared with the *Kyogle*, it will be necessary to engage an engineer additional to the three now employed, one additional greaser, and a deck boy. The wages of these three will not, however, be more in the aggregate than that paid to the three firemen whose services will no longer be required, and who will be transferred to other positions. In the matter of wages and overtime, and of provisioning, the new ship will not be more costly to run than the *Kyogle*. In the matter of fuel she will, as explained above, be very much more economical. The increase in the size of the vessel will, however, carry with it a disadvantage that should be mentioned. There is no graving-dock anywhere in No. 1 District. The only facility for the docking of vessels of any size is a slipway at Fremantle. The maximum size of vessel that can be taken on the slip is 850 tons dead weight. This barely suffices for the *Kyogle*, and on occasion some difficulty is experienced in handling her on the slip. The Deputy Director advised some little time ago that, so far as could be ascertained, there was small prospect of docking facilities being improved at Fremantle for some time to come. Under these circumstances it will be necessary for the new steamer to be brought round to Melbourne or Sydney for annual overhaul in dry dock. Periodically, however, she will be placed "on the hard" at one of the northern-west ports and cleared of marine growth. On the north-west coast, it may be explained, the rise and fall of the tide is very great. A spring tide at Wyndham and Broome, for example, gives a rise of 22 feet from low-water mark. In Melbourne, it may be mentioned for purposes of comparison, the rise is only 7 feet. A vessel moored at the jetty at one of these places in left high and dry ("on the hard") when the tide goes out, and there is then no trouble whatever in cleaning her hull of marine growths, from the waterline down to the bilges, before the sea returns. On account of the cruising range provided, there would be no difficulty in bringing the ship to one of the eastern States for overhaul. The time involved, moreover, would not be much more than that now occupied by the overhaul of the *Kyogle* in the West. For, at any rate, the first eight or ten years very little in the way of repairs or renewals should be needed, and during that period, even after allowing for the cost of fuel consumption in bringing the vessel to an eastern State and her return to Fremantle, her overhaul bill should be less than the present cost of dealing with the *Kyogle*. I submit for information tables showing, for purposes of comparison, the cost over the past three completed financial years of the four lighthouse steamers, giving particulars under the headings of (*a*) payments to crew (wages, overtime, allowances, &c.), (*b*) fuel, (*c*) stores, (*d*) victualling, (*e*) repairs, alterations and overhauls, and (*f*) other expenses, together with an estimate of the cost, under the same heads, of running the proposed new steamer. I also submit a copy of the specifications (with sketch plan) of the new steamer under construction for the New Zealand lighthouse service. The tables above referred to are as follow:—

LIGHTHOUSE STEAMERS—COSTS OF RUNNING, MAINTENANCE, ETC.
(Three Financial Years.)

Ship.	Year.	Payments to Crew (Wages, Overtime, Allowances, &c.).	Fuel.	Deck and Engine-room stores.	Victualling.	Repairs, Alterations and Overhauls.	Other Expenses.	Total.	Remarks.
Lady Loch	1926-27	Included in "Other Exs."	..	..	..	1,138	16,775	17,913	
	1927-28	9,269	3,197	Included in "Other Exs."	..	2,881	2,623	17,970	Docking twice yearly
	1928-29	9,638	2,704	603	1,756	1,655	684	17,220	
Cape York	1926-27								
	1927-28	7,585	3,058	1,569	2,244	3,647	2,117	20,220	Laid up three months. Docking twice yearly
	1928-29	10,920	4,973	1,500	1,985	2,063	952	22,393	
	1929-30	10,720	4,207	603	1,740	3,900	723	21,893	Last four months estimated
Cape Leeuwin	1927-28	14,012	5,120	1,302	3,015	4,465	2,144	30,058	Other ship laid up three months
	1928-29	11,994	4,252	-1,283	2,274	2,870	1,136	22,918	
	1929-30	10,960	4,665	1,027	1,615	3,050	729	22,946	Last four months estimated. Includes cost of a trip to Willis Island (£600) for which credit was received. Docking twice yearly
Kyogle ..	1926-27	8,035	4,157	770	1,738	2,016	538	17,304	Two trips to Cape Don. Docking twice yearly
	1927-28	7,960	2,638	333	985	3,181	336	15,333	Laid up six months. One trip to Cape Don
	1928-29	8,865	6,899	654	2,115	1,694	1,034	21,161	Three trips to Cape Don
Estimate New Steamer..	..	Same as *Kyogle*.	2,500*	650	2,115	1,500	1,000	16,630 (approx.)	Docking once yearly in Melbourne

* Based on same service as given in 1928-29. † Includes fuel cost (£450) of bringing vessel to Melbourne and return.

LIGHTHOUSE STEAMERS—EXISTING AND PROPOSED.

	Cape Steamers.	*Kyogle*.	*Lady Loch*.	Proposed New Steamer.	New Zealand Steamer.
Length .. .. feet	225	180.1	182.7	195	210
Breadth .. .. feet	35	30.1	34.0	34	35
Depth .. .. feet	22.6	12	14.4	16.9	16.6
Loaded draught .. .. .. feet	14.8	11.8	11	13 (about)	13
Tonnage .. .. gross	1,406	736	531	990	1,163
Tonnage .. .. net	495	320	272	..	..
Displacement .. .. .. tons	2,141	1,200	830	1,380	..
Cargo capacity (deadweight) .. .. tons	400	220	100	300	440
Passengers	22	12	15	20	..
Crew	35	28	20	28	..
Total persons	57	40	44	48	..
Fuel capacity .. .. .. tons	150 (oil)	107 (coal)	98 (coal)	250 (oil)	193 (oil)
Fuel consumption per 100 miles .. .. tons	4.6	7.5	5.7	3.5	4.9
Miles steamed, 1928	C.L. 14,762	15,278	17,917	..	..
.. ..	C.Y. 13,564	..	..	..	..
Cruising range .. .. .. miles	3,260	1,425	1,720	3,000	2,000
Cruising speed .. .. .. knots	10	9	10	10	11
Cost of fuel per 100 miles of steaming	£18	£33 17s.	£19 7s.	£13 2s.	£18 7s. 6d.

Bunker coal at Fremantle costs £2 10s. per ton and bagged coal £3 12s. 9d. The freight on bagged coal from Fremantle—to Carnarvon is £1 7s. 6d.; to Port Hedland; £2 10s.; and to Wyndham, £3 8s.

The estimated cost of the new vessel is £120,000, and the estimated annual charges £16,630. The figure as to cost is only a rough estimate supplied to us by Cockatoo Island Dockyard authorities. If the work is authorised, the construction will occupy about twelve months. The vessel will serve all lighthouses and light beacons from Albany to Cape Don, about 50 miles beyond Port Darwin. The practice is to attend to the lighthouses and other marine marks on the way up the coast, and to send the steamer straight back to headquarters, unless the tides are unfavorable at certain places on the outward run, in which case the work is done on the way back. It is desirable that all lighthouses and light beacons should be attended to at least four times a year; but the *Kyogle* is unsuitable for work in all weather on the Western Australian coast, and, therefore, can do only three trips a year. It is not considered advisable to have the *Kyogle* in northern waters during the cyclone season. The annual maintenance cost in 1926-27 totalled £17,304; in 1927-28, £15,333; and last year, £21,161. During the first two years the vessel did only two trips annually to Cape Don and the northern lights, because she was laid up for some time on account of labour troubles. If authorization is obtained for the construction of the new steamer, we hope to be able to dispose of the *Kyogle*, which we regard as our worst asset. The *Lady Loch* is built of wrought iron, and will probably give good service for some years yet. The work which that vessel does on the Victorian and Tasmanian coast is supplemented by services rendered by a number of merchant steamers, under contract with the department. The *Kyogle* is costly to maintain in commission, and is too slow for the work. She is depreciating in value at such a rate that in the course of another six or eight years she will be practically worthless. We anticipate that if she is sold within a reasonable time, she should realize between £6,000 and £7,000. She is unsuitable for work on the Western Australian coast, and is too large for work in No. 3 district—Victoria and South Australia—with head-quarters at Melbourne. The *Cape Leeuwin* and *Cape York* were built for the department in 1925 at a cost of approximately £120,000 each. The Director-General of Works will be in a position to give the exact figures. Those vessels were designed for propulsion by oil fuel, but were immediately converted to coal burning, and in 1928 the change was again made to oil fuel. Their bunker capacity is not sufficient for the work in which they are engaged, so arrangements are being made to install additional oil bunkers to hold another 100 tons of oil fuel. They should then be quite satisfactory for the work. At present there is an oil barge stationed at Thursday Island. This belongs to the Navy Department, which intends shortly to withdraw it, so that it will be necessary to have additional oil bunkers in the two lighthouse steamers mentioned.

2. *To Senator Sampson.*—We can get oil supplies at Darwin, but the *Cape York* and *Cape Leeuwin* are not engaged on that portion of the coast. They have as much as they can do attending to all the beacons and lights along the Queensland coast.

3. *To the Chairman.*—Other alterations have been made to those vessels, but I would not describe them as expensive alterations. They were built for the service, but, as the result of additional experience, certain alterations were considered desirable to increase their efficiency. The specifications for the proposed new steamer have been examined by the Director of Navigation (Captain Davis), the Acting-Director of Navigation (Captain G. D. Williams), the Director of Lighthouses (Mr. Wallach), and the Deputy-Director of Navigation for Victoria (Captain Bolger), who for some time was in command of the *Lady Loch*, and has has had wide experience of lighthouse work. All these officials are agreed that a new steamer, constructed to the design and specifications provided, should be thoroughly satisfactory for the service intended. I cannot say definitely why the alterations were made to the *Cape York* and *Cape Leeuwin*. The Works Department carries out all repairs to our vessels, and that department has all the details.

4. *To Mr. Gregory.*—Whenever any work or alterations to our vessels are required, we requisition on the Works Department, which supplies an estimate of the cost. If this is approved by our Minister, and the Minister for Works, our responsibility is ended, and the work is put in hand by the Works Department.

5. *To the Chairman.*—We have a contract with the Shell Oil Company for the supply of fuel oil to our steamers on the Queensland coast, and pay a flat rate of 75s. per ton at all places where the Shell Company has a depot. The price at the Darwin Naval Depot is 66s. per ton. This does not allow of any profit. I think the commercial price charged by the Shell Company is 80s., but we are able to do better than that on the understanding that we obtain all our oil from that company. I may add that there is no other oil depot in the north, so we have no choice. So far as can be foreseen, there is no probability of a shortage in oil fuel occurring; but if such a contingency should arise, it would be possible to convert the proposed new ship to coal burning. We requested the Cockatoo Island Dockyard people to make provision for conversion to oil or pulverized coal. The latter system is a more recent development in marine engineering, but it is

considered by my department that the use of pulverized coal will be fairly general within the next ten years or so. I doubt whether the plan submitted makes adequate provision for the use of pulverized coal. I understand that the Cockatoo Island Dockyard authorities took the view that it would cost considerably more to provide for the use of pulverized coal, so we modified our original plans somewhat to keep within the price mentioned, as we realized that the present is not the time to ask for a greater expenditure than is absolutely necessary. I have no personal knowledge of the lighthouse steamers in our service; but I am furnished with full reports concerning the working of all our ships. I have not been able, up to the present, to spare the time to visit any of our lighthouses, so, in dealing with all matters relating to them, I am guided by the reports of our responsible officers. I would not say that the *Kyogle* has definitely outlived her usefulness as a lighthouse steamer. We could carry on with that vessel for another six or eight years at a certain cost; but the ship is not suitable for our work, and if she were retained for many years longer, I doubt that she would have any value for sale purposes. The steamer has just been overhauled at Fremantle, and is certified as being seaworthy for another twelve months. At the end of that term further expenditure will have to be incurred on overhaul and maintenance.

6. *To Mr. Long.*—In the overhaul of a vessel of this description the practice is to make borings from the outside to test the thickness of the plates, and then to block and rivet the hole again. I have received the following report, dated 9th April, 1928, from Mr. R. M. W. Cunningham, the chief engineer, who has been employed on the vessel since we took it over:—

Regarding the condition of vessel, I wish to state that the fore section, which includes fore-peak tank and fore-hold, are in good condition. As you are aware, new reverse frames have been put in fore-hold, also new sister keelsons and part bilge keelson, which now brings this section up to standard condition. The part from stokehold bulkhead to engine-room is also in good condition. In regard to after section of vessel, I would like to state that from an outside view, it seems that this section is in good condition, but on the other hand, I would not like to state the condition of the vessel's hull, where cement work exists. I may state that the cement work in after-hold was not taken up, so as one could pass an opinion regarding hull at this particular place. For instance, on removing cement work in fore hold at skin of vessel, it was found on chipping, that several of the plates were very thin, which necessitated patches being put on, and the same thing may happen in after-hold, and, again, the after-peak is heavily cemented, and this being so, there is every likelihood of thin plates being discovered underneath the cement. In my opinion, this cement should have been removed to ascertain the condition of plating. Otherwise the vessel is good for another ten years, but will have to be well attended to, to keep her up to the mark. Regarding main engines, they are in good condition, but at the next overhaul will require to have new neck bushes for her piston rods supplied. Otherwise everything is in good condition. Regarding boiler, it is in good condition, but at a later date, it may be necessary to have her retubed. The reason for this is, that, in the event of oil fuel being installed, the heat from oil fuel will be of a greater intensity than that of coal, and there is a danger of the ends of tubes being burnt off sooner than what they would be under coal firing.

Apart from the condition of the boilers, the condition of the bottom of the hull is the main factor to be considered in determining the margin of safety. The *Kyogle* as I have stated, was built specially for the Northern Rivers trade in New South Wales, and when engaged in that work would necessarily suffer damage through scraping over the numerous sand bars at river entrances. I agree that it is not always possible to determine the condition of the hull from borings, because a plate might be sound enough in one part under the concrete, and 18 inches away be dangerously thin. The draught of the proposed new vessel will be a little greater than the *Kyogle*; but reports from the Deputy Director of Navigation in Western Australia, who has a personal knowledge of the work being done by the *Kyogle*, state a draught of 13 feet, which is 1 ft. 4 in. greater than the draught of the *Kyogle*, will be quite all right. The estimate of £120,000 covers all expenditure, apart from stores and oil fuel. Cockatoo Island Dockyard is the best equipped shipbuilding yard in the Commonwealth, but I would not say that the best-equipped yard would be the cheapest in the long run. We have requested that, as far as possible, all material for the vessel shall be of Australian manufacture. The manager of Cockatoo Island Dockyard will be able to state definitely what proportion will have to be imported. The cost of fuel per 100 miles of steaming is estimated at £13 2s. for the new vessel, as against £33 17s. in the case of the *Kyogle*. With oil fuel, there is no cost to be incurred for bunkering. All that is necessary is to couple up the pipes and allow the oil to flow into the bunkers, whereas in the case of a vessel burning coal, heavy handling charges have to be met, particularly in the far northern ports. Collie coal is not suitable for our requirements. The cost of fuel per 100 miles of steaming, in the case of the two Cape steamers, is £18. Those vessels have to do a lot of what is known as stand-by work, which increases their running costs considerably. The manager of Cockatoo Island Dockyard will be able to furnish information concerning the tests for tensile strength of the boiler plates, which, of course, would have to be up to Board of Trade standard. The safety factor will, I have no doubt, be carefully considered, and the precautions taken in the construction of the vessel will be in conformity with Lloyd's specifications, and meet the requirements of our Navigation Act surveyors. The figures dealing with the mileage of the *Kyogle* are based upon the actual distance covered. It is estimated that the fuel consumption of the proposed new steamer will be 8.6 tons per day.

7. *To Mr. Holloway.*—When I stated that it would be possible to continue running the *Kyogle* for another eight years, I was relying upon information in the report of Mr. Cunningham, and also on the verbal report of Mr. Hastie, the officer of the Works Department, who supervised the recent overhaul of the vessel. Speaking generally, it is not a commercially sound practice to continue working old vessels. Shipowners prefer to dispose of vessels which have reached the end of their economic life; but they do not get half their original cost. The price paid by our department for the *Kyogle* was less than half the original cost, and if she is sold in the near future, we should be able to recoup ourselves to the extent of about one half the price paid. If the construction of the new steamer is authorized, it will not be possible to eliminate expenditure on contracts with private steamship companies for the working of certain lights on the South Australian coast, unless we place the *Kyogle* in that service. I believe the Director of Lighthouses desires this to be done, but it would involve an additional expenditure of about £17,000 to £18,000 a year, the estimated cost of maintaining the new steamer in commission. If we had ample funds we should like to retain the *Kyogle*; but in view of the financial stringency, we think the vessel should be sold. The work in South Australia does not require a vessel of the size of the *Kyogle*. A steamer one half her size would be ample. The maintenance cost of a steamship increases from year to year. Although the proposed new vessel will be larger than the *Kyogle*, there will not be an increase in the engine-room crew, for, whilst we shall need an additional engineer, and three boiler attendants as well as a boy, we shall be able to dispense with six firemen on the *Kyogle*, and the saving in wages will be about £120 for the first year. In any case, because the steamer will be bigger than the *Kyogle*, we should have to employ an additional engineer to comply with the requirements of the Navigation Act.

We consider that, in the interests of safety, and for the greater efficiency of the service, we should have a steamer of the type described. We obtain our coal supplies from the three companies represented in Western Australia. Although we invite tenders their prices are all the same, so we give a contract to each company in turn. The Adelaide Steamship Company, which is one of the contractors, naturally expects to make its profit on the coal sold to us. The several companies say that they are not one body, and that while they have an arrangement as to price, they compete with one another for the trade. Our experience is that the quotations never vary.

8. *To Mr. M. Cameron.*—The estimated cost of running, maintenance, &c., of the proposed new steamer, £10,630, includes everything except interest on capital cost. It is not the practice of government departments to include interest charges in estimates. The *Lady Loch* and the *Governor Musgrave* were taken over by the Commonwealth Government when it assumed control of lighthouse services. We have not made inquiries recently in Great Britain to see if we can purchase a steamer in that market for this class of work; some years ago inquiries were made. Mr. Wallach will be able to tell you with what result. I understand that new vessels of the same tonnage are available in Great Britain, and on the continent, at a price below the estimated cost of construction at Cockatoo Island Dockyard, but such ships are usually built for cheap running and would not be suitable for lighthouse service on the Australian coast. The expenditure on alterations, and the cost of bringing them out to Australia, would make their purchase unsatisfactory from our point of view. I base this opinion upon reports in shipping newspapers such as *Fairplay* which we receive. The majority of ships for sale in Great Britain have been built for cargo carrying. The steamer we require must have accommodation for about twenty passengers, because we utilize our lighthouse vessels for the purpose of moving our light-keepers and their families from place to place. Except when undergoing overhaul, our steamers are in constant commission. The service is maintained in the most economical manner possible. We do not send our ships out to attend to one particular light and leave others without attention. The itinerary is carefully arranged with a view to economy in cost. The Commonwealth Oil Refining Company has no depot in Queensland, so we obtain all our supplies of fuel oil for the Cape steamers from the Shell Company. Some of the other companies have petrol depots in Queensland, but no depot for the supply of oil fuel. A cruising speed of ten knots is sufficient. Every additional knot required in a vessel of that size would increase the running cost very materially. If we stipulated for a cruising speed of 13 knots for this vessel, probably the consumption of oil fuel would be doubled. The lights at Cape Condie and Cape Borda are attended to under land contracts. Motor vehicles can negotiate the road from Kingscote without any trouble. I doubt whether the contract price (£366) would have been less than it is if the road had been attended to. The local authorities endeavoured to induce us to contribute towards the construction of that road. If we had acceded to their request we would be expected to keep in repair the roads to Cape Borda, Cape Cowdie, Cape Willoughby and St. Albans, and then doubtless we would be requested to do the same in other parts of the Commonwealth.

9. *To Senator Sampson.*—Apart from the fact that the *Kyogle* is nearing the end of her economic life, the vessel is unsuitable, and is expensive to run. Her passenger accommodation is ample for requirements; and, although the vessel is old, it is comfortable.

10. *To Mr. Gregory.*—We base our figures on the steaming costs of the *Kyogle* on the monthly returns. In 1927-28 the vessel was laid up for six months on account of labour troubles, and made only one trip to Cape Don. In that year the coal consumption was 2,538 tons. In 1928-29 it amounted to 6,890 tons, but in that year she made three trips to Cape Don. The two Cape steamers were so designed as to be convertible from coal to oil fuel, the idea being that if they were working in localities where oil was not available, they could readily be converted to the use of coal. These vessels were built in 1925 at Cockatoo Island Dockyard. In that year it was possible to get oil fuel in Queensland at Brisbane only, so, for a couple of years, they were running on coal, which was put in the bunkers at Brisbane. Later, the navy stationed an oil barge at Thursday Island, and the Cape steamers were converted to oil fuel. When the oil barge is removed, the present bunkers will be inadequate, so it is proposed to increase the bunkering capacity of each vessel by 100 tons next year. These two steamers cost about £120,000 each, plus alterations and additions made subsequently. The estimated cost of the new New Zealand lighthouse steamer, which is being built in Great Britain is £77,700. The proposed new steamer will have accommodation for a crew of 30 as against 28 on the *Kyogle*; but it will be a larger vessel, and, under the Navigation Act regulations, we should have to provide for a fourth engineer, and put on a boy. The cost of fuel per 100 miles of steaming in the case of the *Lady Loch*, is £19 7s., compared with £18 for the two "Cape" steamers. This discrepancy is capable of explanation. The "Cape" steamers have to do a great deal of standby and towage work in the maintenance of lights, buoys, and other marine marks. This adds appreciably to the steaming costs. The *Lady Loch* has a great deal of straight-run work between Melbourne and Adelaide, and, therefore, shows a lower average cost per 100 miles of steaming. When we purchased the *Kyogle*, there were no oil fuel steamers of a suitable size available. We gave consideration to the possibility of converting the *Kyogle* to oil fuel, but came to the conclusion that, in view of the age of the ship, it would not be a commercial proposition. The department was well aware of the cost of coal at different ports on the Western Australian coast, and in North Australia when the *Kyogle* was purchased, but at the time it was not possible to make a better arrangement. We had to get a steamer for that work. The "Cape" vessels were probably the first oil fuel ships to be constructed in Australia. Ships with internal combustion engines of the Diesel type are not suitable for lighthouse work. Our vessels have to manœuvre in narrow waters and alongside light buoys, and proceed at low engine speeds. Diesel engines are not so easy of manipulation.

11. *To the Chairman.*—At the request of the Treasurer, we submitted a report relating to the state of our lighthouse steamer services, and were authorized to discuss with Cockatoo Island Dockyard authorities a proposal to construct a new steamer. As the result of our negotiations, the dockyard furnished us with plans and specifications for the proposed new vessel. We intend to discuss technical matters in greater detail with officials from the dockyard at an early date. We could keep the *Kyogle* in commission for some years yet, and I do not think the cost would exceed £3,000 or £4,000 a year, but I should not like to certify that the vessel always will be seaworthy. In the case of all old ships, there are hidden dangers which Mr. Long mentioned this morning, that cannot be provided against.

12. *To Mr. Cameron.*—We have used Collie coal in an emergency, but it has not the same steaming value as Newcastle coal.

13. *To Mr. Long.*—It is possible, by careful maintenance and renewals, to keep the *Kyogle* in commission for some years yet. No passenger vessel on the Australian coast other than the *Oonah*, *Loongana*, and our own *Lady Loch* is older than she.

The witness withdrew.

Captain George Davies Williams, Acting Director of Navigation, sworn and examined.

14. *To the Chairman.*—I have been occupying my present position since June last. I am aware of the proposal to construct a new lighthouse steamer for the Western Australian service. I have had no personal experience of that class of vessel. Towards the beginning of last March, in accordance with instructions received, sketch plan and tentative specifications were prepared by the marine branch for a new lighthouse steamer to replace the *Kyogle* in No. 1 district, and, when such plans and specifications had reached a stage which enabled them to be discussed with the parties concerned, a conference was held towards the end of March at the office of the secretary, marine branch, and at which the Works Department, Cockatoo Dockyard and the marine branch were represented. The sketch plan and preliminary specifications were discussed, and an agreement with relation to the general arrangement of the vessel was arrived at, though there was some difference of opinion as to type of propelling machinery to be installed in the vessel. The engineer and ship surveyor-in-chief, Mr. Battle, strongly recommended engines of the triple-expansion reciprocating type in conjunction with a high-speed, low-pressure turbine operating on the main shafting, it being contended that such system would result, in a conservative estimate, of 20 per cent. economy in fuel consumption, with at least equal efficiency, as compared with the ordinary reciprocating type of engine. In that connexion, however, it was held that the installation of such system would involve extensive importation, and the proposal was abandoned in favour of machinery that could be manufactured in Australia and similar to that installed in the lighthouse steamers *Cape York* and *Cape Leeuwin*. Following on the conference, a general arrangement plan of the new vessel was prepared at Cockatoo, and was received at the marine branch a few days ago. Dealing first with the accommodation provided in the proposed new vessel, reference to the plan will show that the utmost consideration has been given, consistent with space available, to the comfort and well-being of the ship's complement and passengers (lighthouse staffs and families) to be carried. The members of the crew are accommodated aft under the poop, and, in order to provide a greater degree of comfort and privacy, the old system of one large sleeping berth has been abandoned, and separate three and two-berth cabins have been arranged for the deck hands on one side and for the stokehold and engine-room hands on the other, also separate mess-rooms, washplaces and lavatory accommodation, all self-contained. The spaces allotted for crew accommodation are in accordance with, and, in some instances, in excess of, the requirements of the Navigation Act. The engineer officers, petty officers, and members of the victualling staff are accommodated in the starboard alleyway, ample bath and lavatory accommodation being provided. The passengers are accommodated in the port alleyway in two-berth cabins, male passengers after end and female passengers forward end, together with adequate bath and lavatory accommodation, the accommodation for the women and children being specially designed to afford every comfort and privacy. The master, deck officers and wireless operator are accommodated in self-contained cabins on the bridge deck in close proximity to the bridge, accommodation being also provided for the official travelling on inspection duties, and an office for general clerical work, which can also be used as a sitting room. The saloon is situate on the main deck under the bridge, and is divided into two parts, one being for the use of passengers and one for the ship's officers, with a common pantry serving both sections. Separate entrances are also provided, and the passenger section is intended for use also as a sitting and recreation room for passengers. Seating accommodation and ventilation is amply provided for. Direct entrance from the officers' quarters above by means of a ladder is also provided, and the steward's store is conveniently placed. The above comprises the living accommodation on board the vessel. The space under the forecastle has been utilized for storerooms, paint locker, flasher room, &c. The forward deck and hatch will permit buoys to be landed on board for cleaning and painting purposes. In that connexion it may be mentioned that the deck space forward is considered somewhat inadequate for the proper handling of buoys, and representations will be made to have that important matter adjusted. The forward hold will stow about 200 tons of cargo, and is so arranged as to enable construction material 30 feet in length to be handled. Provision has been made in the hold for a lock-up compartment for lightkeepers' stores. The forward hatch is served with two 12-ton derricks, thus providing adequate safety margin for weights to be lifted. Two winches are installed for working the forward derricks. The after deck provides sufficient space for working the after hatch. The after hold will stow about 100 tons of cargo, and is served by two 3-ton derricks and a suitable winch, which can also be used for mooring ship, and boat hoisting purposes. Towing facilities have been fitted on the poop deck. That deck and the small after deck provide ample recreation space for the crew, whilst the passengers and ship's officers are adequately provided for in that respect by the forward and bridge decks. The number of crew to be carried is as follows:—Master, 1; deck officers, 3; engineer officers, 4; wireless operator, 1; boatswain, 1; A.B.'s, 6; O.S., 1; deck boy, 1; greasers, 2; boiler attendants, 3; chief steward, 1; assistant stewards, 2; chief cook, 1; assistant cook, 1; total, 28. Accommodation is provided for two additional stokehold hands, in case the vessel will, at some future time, use coal for fuel, in which case the total complement would be 30. Provision is made for the following number of passengers:—Officials, 2; mechanics, 2; lightkeepers, 8; women, 8; total, 20. The vessel is provided with two lifeboats, each capable of accommodating 30 persons, and, in addition, one motor boat, two surf boats, and one small motor dinghy. Much inconvenience and discomfort has been felt in the *Kyogle* through the absence of refrigerating facilities, livestock having to be carried for the supply of fresh meat. The new vessel will be provided with refrigerating plant and a cooling chamber, properly insulated and divided for storage of meat, vegetables, &c., with a capacity of about 20 tons. The galley is situate at the after end of the alleyway, and has been designed for convenience of working, being fitted with oil-burning stove, baker's oven, dressers, &c. The scullery is in close proximity, and a ready-use vegetable locker is also provided. The vessel will be fitted with wireless installation, and auto-alarm device, and also with ample modern navigational appliances. Hospital accommodation is provided on the bridge deck, to which is attached a sanitary block, in accordance with the requirements of the Navigation Act. The vessel is designed to give a cruising economical speed of 10 knots, with a reserve of about 1 knot for emergency. She will be oil-burning, but so designed as to be convertible to coal-burning should the occasion arise, the possibility of the development of pulverized fuel being kept in mind. She will have two boilers. A radius of action of 3,000 miles is provided for, and the oil

bunker space is such as to enable vessel to operate from her base at Fremantle to the extreme northern limit of her district, i.e., Cape Don, distant 1,930 miles from Fremantle, and return, if necessary, without refuelling. It is estimated by the builders that oil consumption, when under way, will be about 8½ tons per day. There is ample provision for oil bunker space, a good margin being allowed for unforeseen circumstances. Owing to depth of water in localities the vessel will be operating in, the mean loaded draft must not exceed 13 feet, and the vessel has been designed accordingly. The steamer will be of the double-bottom type, and ample provision has been made for fresh water for domestic use and feed water, also ballast tanks, special provision having been made, apart from supply for ship's use, for about 5,000 gallons of fresh water for lighthouse supply, with independent pumping system. The vessel will be built of steel to Lloyd's classification, and in accordance with the Board of Trade and Navigation Act requirements, the requisite number of bulkheads being fitted to comply with sub-divisional requirements for a passenger vessel. Electric light will be installed throughout, and provision has also been made for supplementary electric lighting system suitable for supplying the wireless set with electric current, and to provide restricted lighting in port, and at anchor when the main dynamo is not in operation. The vessel will be single screw solid propeller of manganese bronze. She is so designed as to be thoroughly stable in light condition, thereby obviating the necessity of carrying permanent ballast. The following particulars are submitted in connexion with the proposed new vessel and the *Kyogle*:—

—	New Vessel.	*Kyogle*.
Length	195 feet	180
Breadth	34 „	30
Depth	17 „	12
Approximate gross tonnage ..	1,000 tons	735
Cargo capacity	300 „	220
Loaded draught	13 feet	11 ft. 8 ins.
Sea speed	10 knots	8
Ship's complement ..	28	28
Passengers	20	16

The proposed new vessel will differ from any other steamship of a similar size in that it is intended for lighthouse work, and will be built to a special design. She will be considerably strengthened forward, because that part of the ship will be subject to chafing by lightbuoys brought alongside for examination and repair. Every passenger vessel of her size has a certain amount of cargo space. The proposed new vessel will have special towage facilities forward and aft, and will also be fitted with rollers forward to heave up the buoy moorings. Our Navigation Act regulations provide that each seaman shall have 136 cubic feet of air space. In this respect British or American vessels do not comply with out regulations. The mess room and sleeping accommodation on this vessel will be similar to that provided on ordinary trading and passenger ships, and is greater than the accommodation usually provided on British ships of the same size. The personnel of the crew will be the same in number as on the *Kyogle*, but in place of six firemen, there will be three boiler attendants and a boy, as well as the fourth engineer. I have no personal knowledge of the condition of the *Kyogle*. Speaking as a practical seaman, I should say that she is approaching the end of her economic life. The vessel is 29 years old, and was built to what is known as a restricted classification; that is to say, she was intended for the sole purpose of trading between Sydney and the northern river ports of New South Wales, where the depth of water on the bars would not permit of a vessel like the *Kyogle* being laid down to the full draft which her form and size warranted. The *Kyogle* is not a full seantling ship. In navigating the bars, vessels of that description frequently scrape over the sandy bottom, so thinning their plates. I have no personal knowledge of lighthouse steamers, because lights on the New South Wales coast are attended to by land service, except one or two, which are attended to by contract steamer. The *Kyogle* could be maintained in a seaworthy condition for another four or five years provided an increasing amount were spent for maintenance and repairs. One cannot speak with certainty on this point. As a vessel gets older, more stripping of the plates is required to ensure that the parts covered by cement are up to standard strength, and there is always a probability that when cement is removed, unforseen expenditure will have to be incurred to replace plates that have deteriorated to a greater extent than was anticipated. From now onwards we can fully expect that the cost of maintaining the *Kyogle* in a seaworthy condition will be in excess of charges incurred hitherto. We should bear in mind that the *Kyogle* is nearing the end of her economic life, and if she is retained for many years longer, she will have lost her disposal value It would be impossible to sell the ship without a certificate of seaworthiness from the Navigation Department. After about 25 years' service, the value of a steel vessel depreciates very rapidly. I should say that the selling value of the *Kyogle* to-day is about £6,000 or £7,000. As far as I am aware, there is no vessel suitable for lighthouse work available, and for sale in Australia. If a ship were purchased she would have to be in good order, and the cost of conversion to render her suitable for our services, would make it an economically unsound purchase. I agree that the proposed new vessel should be designed for the use of oil fuel or coal, though I doubt that she would ever be converted from oil to coal. Pulverized coal may be used in her furnaces, and this has been borne in mind in the preparation of the sketch plans. The actual work of conversion may cost a fair amount, but no additional expenditure would be incurred in making available the space for pulverized coal. Two additional firemen would have to be employed if the vessel were converted from fuel oil to pulverized coal. I am aware that additional expense was incurred in making alterations to the *Cape York* and *Cape Leeuwin*. Additional bunker space had to be provided in those ships to enable them to operate over the full length of the Queensland coast without being dependent upon problematical oil supplies in northern waters. I am not fully conversant with all details of the alterations, but I understand that the original propellers were found to be too small. It is obvious that mistakes in design and construction had to be rectified. With our experience of the two Cape steamers, it should not be necessary to make any alterations in the design of the proposed new vessel, and the maintenance charges for the first few years of her life should be negligible.

15. *To Mr. Cameron.*—Mr. Battle, the engineer and ship surveyor in chief, was referring to the whole system of propelling machinery when he was advocating the adoption of engines of the triple expansion reciprocating type, which he believes will result in an economy of 20 per cent. in fuel consumption; but it must be borne in mind that extensive importations of machinery will then be necessary. I cannot state what would be the percentage of importations, but Mr. Payne, manager of the Cockatoo Island Dockyard, will be able to say. This is a purely engineering problem. I am the officer principally concerned with the general arrangement of the proposed new ship. The layout is my responsibility, and the plan submitted to the committee has been drawn from a rough sketch plan prepared by me. The system recommended by Mr. Battle, known as the Bauer Wach triple expansion engine,

associated with a low-pressure turbine, has been in operation for only about three years. I am advised by Cockatoo Island Dockyard officials that it will have to be tried for about six years to find out the truth or otherwise of the claims made. The engineer and ship surveyor in chief is quite emphatic as to the percentage of fuel economy which its adoption would mean, but his advice was not adopted for the reasons given. The technical details of the system will be explained by Mr. Payne. In rejecting the recommendation to install the Bauer Wach system, we were also influenced by the fact that the proposed new vessel would be operating in remote parts of Australia where no dockyard facilities would be available in the event of any mishap to the machinery. The system is so complicated that we must be careful about adopting it. Ample provision is made in the new vessel for the installation of a refrigerating plant. In other circumstances this space would be available for cargo. The draught of the vessel has been limited to 13 feet, to enable her to operate at all our marine lights and marks. Because the ship will be subjected to rough use, the specifications provide for additional strengthening in certain parts. The wear and tear will be greater than in a vessel engaged in ordinary work.

16. *To Mr. Gregory.*—I am a master mariner and have only a superficial knowledge of engineering. The specifications for the proposed new vessel came to hand from the Cockatoo Island Dockyard this afternoon, and I shall furnish the committee with a copy. We laid down certain requirements and the specifications have been prepared along the lines indicated by us. The fuel consumption is estimated at 8.5 tons per day. I anticipate that the new vessel will use less fuel than the Cape vessels because she will be a smaller ship, being 1,000 tons gross against 1,400 tons in the case of the *Cape Leeuwin* and *Cape York*. The vessel will attend all lights from Albany to Cape Don. Lights on the southern coast are attended to by land service. Speaking as a practical seaman, and keeping in mind the class of work which this vessel will be required to do, I would recommend the installation of the ordinary type of engines, rather than triple-expansion engines in conjunction with a high-speed low-pressure turbine. We must eliminate every element of risk in our services to lighthouses. I understand, however, that triple-expansion engines of the reciprocating type fitted with low-pressure turbines are being used in Great Britain and in the United States of America; but because of the particular work which this ship will have to do I should prefer the ordinary method of propulsion to be employed. I have no idea what a vessel of a similar size would cost in Great Britain. We have not made inquiries. We have made arrangements for the separate mess-rooms for the stokehold and engine crew, and for the seamen. Because of the dust and oil which the engine-room crew bring into the mess-room, the seamen like to keep to themselves. This arrangement will not mean the employment of more stewards because the men take it in turns to wait on the table. This arrangement for separate mess-rooms will not mean extra expense in construction; it will only mean added comfort for the crew, and it also improves the general layout of the ship.

17. *To Mr. Long.*—I do not pose as an engineering expert. All I claim is that I have as much engineering knowledge as any man in my position would pick up in the course of his career, and I submit that I am in a position to give expert knowledge as to the suitability and seaworthiness of any ship. Although the *Kyogle* is 29 years old, and has exceeded the allotted span for the life of a ship by four years, she has been well cared for and is perfectly safe. We have just issued a certificate of seaworthiness for another twelve months. These certificates are issued by our department annually. If the *Kyogle* is disposed of, certain equipment in that vessel could be placed in the new ship and reduce her cost to some extent. The proposed new steamer will be equipped with two 12-ton derricks forward and two 3-ton derricks aft, to lift lifebuoys and to take in stores. Some buoys may have on them 6 or 7 tons of marine growth. In the sketch plan which I supplied to the Cockatoo Island Dockyard people, there was ample room for the handling of buoys; but the plan now before the committee shows a restricted space not quite in accordance with my ideas, so I shall take up this matter with the dockyard people at our next conference. In the design and working of a ship, the safety of those employed on her must be the paramount consideration. The *Kyogle* is known as a coal-eater, because of her high cost per 100 miles of steaming.

18. *To the Chairman.*—The vessel has been designed to take the sea in all weathers and to carry out efficiently the duties which she will be called upon to perform. Special regard is being paid to the accommodation for the lighthouse-keepers and their families who have to travel in the vessel when on leave, or when being transferred from one lighthouse to another. Consideration has also to be given to the comfort of the officers and crew. I contend that the *Kyogle*, being built of steel and restricted in her scantlings, for the purpose of trading to northern rivers ports in New South Wales, is now obsolete and should be replaced by a modern steamer for lighthouse work. The use of iron in steamship construction was abandoned many years ago in favour of steel which is lighter. It was found that a ship built of iron submerged herself to such an extent that there was less room for cargo.

19. *To Mr. Cameron.*—The actual condition of the *Kyogle* could only be determined by the removal of the cement, which covers the bottom of the ship in some parts. I have no personal knowledge of the vessel. In fact I have never seen her, because I am stationed in New South Wales and the *Kyogle* is operating on the Western Australian coast; but it is well-known that when a vessel is 25 year old, she is no longer commercially profitable.

20. *To Senator Sampson.*—The *Kyogle* is not an economical ship to run. A modern vessel for lighthouse work in Western Australia is necessary.

21. *To Mr. M. Cameron.*—Without first-hand knowledge of the state of the ship, I cannot say if there is urgent need for a new lighthouse steamer, but speaking as a practical seaman, I am convinced that the time has arrived to replace her. If the committee wishes to get outside opinion, I suggest that an engineering superintendant of one of the private shipping companies be called, and I name Mr. Waugh, of the Huddart, Parker Company. He will be in a position to state what is the practice of private companies with regard to vessels 25 years old.

22. *To Mr. Holloway.*—The *Kyogle* has just been overhauled. Maintenance costs increase with the age of all vessels. In the repair of oversea ships that have been damaged, it is sometimes the custom to build a cement patch over the damaged part and to block it securely until the vessel can be docked overseas, where labour costs are lower. Ship-owners do not care to disturb the cement, and this is not done if it can be avoided. Mr. Hastie went to Western Australia some time ago to superintend the overhaul of the *Kyogle*, and he informed me that he was concerned about the state of the ship and the amount of money available to effect repairs.

The witness withdrew.

(Taken at Melbourne.)

TUESDAY, 6TH MAY, 1930.

Present:

Mr. GREGORY (in the Chair);

Senator Sampson	Mr. Holloway
Mr. M. Cameron	Mr. Long.

Bernhard Wallach, Director of Lighthouses, and Engineer-in-Chief of Lighthouse Services, sworn and examined.

23. *To Mr. Gregory.*—I have been in the Lighthouse Service since its inception in 1912, and in my present position since 1926. In 1912 Captain C. R. W. Brewis, R.N., was engaged by the Commonwealth Government to report on the existing lighting and make recommendations for improvements in the lighting of the coast of Australia. In his reports he divided, for administrative purposes, the coastline of Australia into four districts namely: Cape Northumberland, South Australia, to North West Cape, Western Australia—an approximate distance of 2,900 miles of coast, with a steamer based at Albany as head-quarters; from North West Cape to Cape Wessel—distance of about 3,300 miles, with a steamer based at Port Darwin; from Thursday Island to Cape Moreton—approximately 1,500 miles, with a steamer to be stationed at Townsville; and from Point Lookout to Cape Northumberland, including Tasmania, with a steamer to be stationed in Melbourne—with an approximate distance of 2,200 miles. These proposals were to necessitate the construction or purchase of four vessels for the maintenance of the coastal lights which would be transferred to the Commonwealth. The type of vessel proposed by Captain Brewis, was 200 feet in length, with 36 feet beam, and an extreme draught not to exceed 12 feet; the vessel to be fitted with twin screws, and capable of steaming 15 knots if required, with an ordinary speed of 12 knots. Accommodation was to be provided for lighthouse employees consisting of 10 men, 30 women and children, and four visiting officials; the vessel to be capable of carrying 250 tons of coal or oil fuel, and 30 tons of fresh water with hold accommodation for 300 tons. In accordance with this specification the Department of the Navy designed vessels which, owing to various circumstances, were not constructed. When the Commonwealth assumed control of the coastal lights in June, 1915, it was found necessary to make provision immediately for steamer attendance to the lighthouses, and the *Lady Loch* was purchased from the Victorian Government for the sum of £9,062; the *Governor Musgrave* was purchased from the South Australian Government for the sum of £5,800. The *Governor Musgrave* was transferred to Western Australia to attend to the Western Australian lights, and the *Lady Loch* was engaged in the attendance of the lights in Victoria and South Australia, Tasmania being subsequently added. Arrangements were made with the Queensland Government to use State vessels for the attendance to the Queensland coastal lights. In 1916 the SS. *Karuah* (130 feet length, 27 feet breadth and draught 8 feet 6 inches), a twin screw vessel, was purchased for £17,000 and engaged principally on construction of new lights, until she was sold. The *Karuah* was disposed of in June, 1926, as the vessel was too small and slow to cope with the work required. In 1923 tenders were called for the construction of two new vessels for the lighthouse service, and the tender of Cockatoo Dockyard was accepted as being the lowest. These vessels, the *Cape Leeuwin* and *Cape York*, are now in service, and are stationed in Queensland. In addition to the two "Cape" vessels located in Queensland, it has been found necessary to station the launch *Rooganah* at Thursday Island to make stores trips to Goode Island light and Booby Island light, and run emergency trips as required. In 1923 the *Governor Musgrave* was condemned at Cockatoo Dockyard, and the SS. *Kyogle* was purchased in 1924 at a cost of £13,750 for service in Western Australia. It will thus be seen that four vessels are in commission for the lighthouse service, namely the *Lady Loch*, the *Cape Leeuwin*, the *Cape York*, and the *Kyogle*". Under the existing organization the boundaries of the districts are different from those proposed by Captain Brewis, the present boundaries being: No. 1 district, Western Australia and North Australia; No. 2 district, Queensland; No. 3 district, New South Wales, Victoria and Tasmania; No. 4 district, South Australia. Since the date of Captain Brewis' report, when four lighthouse vessels were recommended for the whole of Australia, it has been found necessary to maintain the two Cape vessels in Queensland to cope with the work, the *Lady Loch* attending to South Australia, Victoria and Tasmania, and the *Kyogle* attending to Western Australia and North Australia. In addition to these vessels, contracts have been arranged with the North Coast and South Coast Companies in New South Wales for steamer attendance to Solitary Island light and Montagu Island light; and with the Coast Steamships Limited, in South Australia, for attendance to Neptune Island light, Althorpe Island light, and St. Francis Island light. In Tasmania fishing vessels are also engaged to supplement attendance to certain lighthouses. In Western Australia luggers are engaged and coastal vessels are utilized from time to time as required to supplement the services of the *Kyogle*.

The attendance required for lighthouses consists mainly of carrying necessary supplies for the light, repair and maintenance material, lightkeepers' stores, transfer of lightkeepers, their wives and families when on recreation leave and on transfer to another station, and the carrying of construction gangs and construction material for new lights. At lights constructed on reefs and outlying positions, it is generally necessary for the vessel to stand by while construction is in progress. The vessels are also required to carry supplies for automatic lights, the crew of the vessel being employed in scraping and painting the structures, also the lifting, placing, and checking of position of lightships and buoys, the maintenance of beacons and other marine marks. The vessels are required, if available, to run emergency trips in the case of illness or accident at a lighthouse station. They might also be required to render assistance, if available, in the event of any marine casualty occurring in the district. As a general rule it has been found possible in all districts, except Western Australia and North Australia, to maintain a quarterly service to all manned lights. This period has been reduced to a monthly service in most cases by engaging other vessels or arranging overland attendance. Every endeavour is made to arrange for lightkeepers' food supplies to be replenished monthly, but in Western Australia, with the limited steamer attendance available, this has not been altogether possible. The attendances to automatic lights is conducted quarterly in all States, except Western Australia and North Australia. In Western Australia and North Australia, referred to as No. 1 District, the vessel makes only three trips per annum to lights north of North West Cape, and consequently automatic apparatus is left for a period of six months, during the cyclone season. During this season it is considered the lights should be maintained at their maximum efficiency, and I am of opinion that a period of six months without attendance it far too long. It is on record that some of the lights have been reported out in Western Australia by passing vessels, but on examination it has been found that the light was only obscured by dirty lantern panes. In my opinion the minimum attendance necessary in Western Australia is four trips per annum to all lighthouses, supplemented

by outside steamer or overland services, so that all manned lights shall receive food supplies every month. A considerable amount of construction work will have to be carried out in the future, particularly on the North West Coast of Australia. At the present time the Orient Company is agitating for additional lighting facilities between Cape Leeuwin and Albany, but funds are not available for this work. When construction work is commenced in No. 1 District it will be necessary to provide an additional steamer, as most of the positions on which lights are proposed are so exposed that it will be necessary for a steamer to stand by practically all the time. Many requests have been received, both from the Government of Western Australia and from individual masters on the Western Australian Coast, for additional aids to navigation, chiefly on the North West Coast of Western Australia. Apart from the question of funds, it would not be possible to undertake any heavy construction work in Western Australia with the present steamer attendance available. I might mention in passing that between Cape Leveque and Point Charles, near Darwin—a distance of approximately 630 miles—no lights or other aids to navigation have been provided by this service. This distance is approximately equivalent to the length of coastline in Victoria, on which eleven aids to navigation are maintained by the Commonwealth. As illustrating this point, I attach a table, which will show the number of miles of shipping track per light in 1915 and as at 30th June, 1929. In the preliminary lighting of the coast of Western Australia and North Australia approximately sixteen additional lights are required to those at present in operation. At the average rate of construction maintained in the past, these lights could be constructed in approximately eight years, provided the necessary steamer attendance and funds are available. I consider that in addition to the two *Cape* boats, two vessels of the type now proposed are necessary, together with two slightly smaller vessels, in order to meet the minimum requirements of the service. One vessel would be fully engaged in properly attending to the work at present required in No. 1 District without allowing for future developments. The six vessels referred to would be stationed one at Port Darwin, one at Fremantle, one at Port Adelaide, one at Melbourne, and two in Queensland. The importance of having the vessels distributed around the coast in such a way that they are capable of dealing with emergencies such as illness or accident to lightkeepers, lights going out, buoys or lightships getting out of position, &c., cannot be over-emphasized. At the present time, if any of the buoys in Clarence Strait (north of Darwin) become extinguished or out of position, we have to leave them in that condition until such time as the *Kyogle* next visits them, which, as pointed out above, may involve a period of six months. In tropical waters it is not economical to leave floating marks out on a station longer than a period of about eight months, and it is therefore necessary to arrange for changing the two lightships and the buoys approximately three times every two years. This involves considerable steamer work, and is one of the reasons why it has been found necessary to employ the two *Cape* vessels in Queensland waters. In regard to the type of vessel required, it should be pointed out, in the first place, that owing to the heavy work this vessel has to perform in the open sea, she should be of the heaviest construction and be provided with heavy lifting gear. In my opinion these should all be in excess of the Lloyd's ordinary requirement, and the ship should be built to Lloyd's special survey. I consider that it should be provided with twin screws, as this will facilitate handling and avoid damage when coming alongside buoys, &c. Good space should be provided on the fore deck for the handling of buoys and chains, &c. The trial speed should be approximately 12 knots so that a cruising speed of not less than 10 knots can be fully maintained. Captain Brewis, in his specification, stipulated for a maximum speed of 15 knots, so that my figures should be regarded as the minimum. This vessel will be required to run approximately 2,200 miles between Fremantle and Darwin, the terminal ports at which oil fuel is obtainable. Allowing a margin for bad weather and standing-by time it is considered that provision should be made for bunker oil to the extent of 150 tons. Between Fremantle and Darwin there are at present sixteen lights which would be attended to without replenishing fuel. The stores, such as kerosene, repair material, lightkeepers' stores, and automatic light material would amount to approximately 190 tons per trip. The amount of construction material required to be carried for small lights such as have now been installed at Legendre Island and Sandy Cay would be about 180 tons, but for the larger lights this would be about 450 tons. By providing for a space of 300 tons in the hold, it is considered that the minimum only has been allowed for. The transfer of the large buoys from Darwin to Clarence Strait and from Darwin to Medusa Bank (approach to Wyndham) can be accomplished only after the ship has discharged all her material, and it is not necessary therefore to increase the hold capacity on this account. At the same time I would point out that a ship of this size is fully taxed to handle and accommodate heavy buoys and moorings such as this service has to maintain on the northern coast. In outlining the general requirements of a vessel suitable for No. 1 District, in discussing a plan submitted I supplied the following information to the secretary:—

(*a*) Suitable, separate accommodation cabins and saloon for lightkeepers, about seventeen persons.

(*b*) Suitable accommodation for lighthouse officials, comprising three separate cabins, office, and flasher room.

(*c*) Minimum carrying capacity 200 tons on vessel for use in No. 3 District, and 300 tons for No. 1 District.

(*d*) Steaming radius not less than 3,000 miles for No. 1 District.

(*e*) Storage capacity of 5,000 gallons fresh water for sole use of construction parties in No. 1 District vessel, with separate fresh water and pipes for delivery over side.

(*f*) Deck space forward to handle buoys and chains. Derricks to lift 12 tons.

(*g*) Main saloon preferably under bridge. Deck officers' accommodation on deck abaft bridge.

(*h*) Lavatories for officers and passengers to be placed in one unit on each side of ship instead of in various places as shown on plan.

(*i*) Vessel to be provided with twin screws and forced draught for oil burning.

(*j*) Vessel to be of heavy construction and provided with facilities for towing.

(*k*) Windlass to be extra heavy type, suitable for breaking out and lifting heavy moorings.

(*l*) Direction finding station to be installed.

(*m*) Economical speed about 10 knots with power to increase speed in case of emergency.

I produce a copy of my letter to the secretary, dated 3rd July, 1928—

NEW LIGHTHOUSE TENDER.

The Secretary,
Marine Branch,

With reference to your minute of 31st April, 1928, I forward herewith reports on the proposed new lighthouse vessel by the engineer and district engineer, and offer the following suggestions:—

In designing a vessel for this service two main factors have to be taken into consideration—

(*a*) The number of lights, &c., is increasing each year.
(*b*) The long distances to be covered.

Taking the useful life of a ship of this class as 25 years, and assuming that the past average number of lights is constructed each year, at the end of 25 years 100 new lights will have been added. In view of the introduction of auto matic lights, very few new manned lights will be established. There will, therefore be practically no increase in the number of light-keepers in the service. On the other hand the number of mechanics will be increased and the amount of material to be carried for these lights will be practically double that at present. Should the Commonwealth establish D/F stations at some of the lighthouses this will necessitate the erection of buildings and the carrings of additional stores and maintenance material.

In designing a ship for lighthouse attendance, provision must be made for the future.

In most of the large lighthouse services of the world much better steamer attendance is provided than has been supplied to the Commonwealth Lighthouse Service. The practice in these services is to employ many small vessels on short runs, thus ensuring that a vessel is always in readiness at important centres. With only four or five lighthouse tenders to serve the whole of the coast of Australia and Tasmania it becomes necessary to employ vessels with large steaming radius and a fair speed to cover the long distances in a reasonable time.

It will be seen, therefore, that the type of vessel required for Australia differs from that adopted by the larger lighthouse services of the world.

Other essential features required for Australian conditions are improved accommodation for light-keepers, their wives and children. Light-keepers on leave may travel from Cape Don to Fremantle, a distance of approximately 2,500 miles.

It is recommended that the accommodation for the wives of light-keepers should be the standard two-berth cabins with settee for extra berth if required. It is highly desirable that separate accommodation be provided for light-keepers and a separate saloon provided for their use. Many of the keepers' wives are seen sick most of the time they are on the ship, and their children are not, therefore, under control. The only safe place for the children, when not under the care of their mother, is in the saloon.

"In regard to the official accommodation for officers of the Lighthouse Service, at least three cabins are required, and better accommodation provided than is shown on the plan. An office should also be provided for use of lighthouse officers.

A room is required to store mechanics' tools and apparatus as it is not desirable that these should be placed in the hold.

No accommodation should be below the main deck, and, generally, the vessel should comply with the requirements of the Navigation Act.

Two derricks, each capable of lifting 12 tons, are required.

Twin screws are recommended, and the vessel should be of heavier construction than is usual to allow for coming alongside buoys, &c., and for the heavy wear and tear due to frequent anchorages in deep water and lifting heavy moorings.

It will be seen that the above requirements cannot be obtained with a length of 180 feet. In my opinion it would be a mistake to limit the size of the vessel to suit the docking accommodation at present available at Fremantle.

The necessity for increased docking facilities at Fremantle is generally recognized, and it is safe to assume that better dock facilities will be available in the near future.

The general requirements may be summarized as follows:—

(*a*) Suitable separate accommodation cabins and saloon for light keepers, about 17 persons;
(*b*) Suitable accommodation for lighthouse officials, comprising three separate cabins, office, and flasher room;
(*c*) Minimum carrying capacity 200 tons on vessel for use in No 3 District and 300 tons for No. 1 District;
(*d*) Steaming radius not less than 3,000 miles for No. 1 District;
(*e*) Storage capacity 5,000 gallons fresh water for sole use of construction parties in No. 1 District vessel, with separate fresh water pump and pipes for delivery over side;
(*f*) Deck space forward to handle buoys and chains. Derricks to lift 12 tons;
(*g*) Main saloon preferably under bridge. Deck officers' accommodation on deck abaft bridge.
(*h*) Lavatories for officers and passengers to be placed in one unit on each side of ship instead of in various places as shown on plan.
(*i*) Vessel to be provided with twin screws and forced draught for oil burning.
(*j*) Vessel to be of heavy construction and provided with facilities for towing.
(*k*) Windlass to be extra heavy type, suitable for breaking out and lifting heavy moorings.
(*l*) D/F station to be installed.
(*m*) Economical speed about 10 knots, with power to increase speed in case of emergency.

(Sgd.) B. WALLACH,
Director of Lighthouses.

3rd July, 1928.

With reference to the general type of vessel required, if a forecastle is provided then more room is required on the well deck for handling buoys and chains. It is considered that the flush deck forward is more suitable.

COASTLINE.—NUMBER OF MILES PER COASTAL LIGHT.

District.	State.	Coastline Miles. (approximate.)	1915.		1929.	
			Number of Lights.	Miles of Coastline per light.	Number of Lights.	Miles of Coastline per light.
No. 1	Western Australia	4,350	19	230	24	181
	North Australia	1,040	2	520	9	116
No. 2	Queensland Outer Track	3,000	23	130	41	73
No. 3	New South Wales	700	19	37	19	37
	Victoria	650	11	62	11	62
	Tasmania	*780	*10	†78	‡15	52
No. 4	South Australia	§1,540	121	§73	§26	59
	Total Coastline	12,090	105	115	145	83

* Exclusive of Islands in Bass Strait. † Exclusive of Kangaroo Island. ‡ Exclusive of lights in Bass Strait. § Exclusive of lights on Kangaroo Island.

Lam responsible for the location and erection of lighthouses and for the maintenance of equipment, as well as for the efficiency of all land lights, but I do not control the running of lighthouse steamers. Originally the control of these steamers was under the Director of Lighthouses, but with the amalgamation of the marine branch and the navigation branch, the running of lighthouse steamers passed to the control of the Director of Navigation, who arranges the itinerary of the several vessels in the service. I have visited practically every Commonwealth lighthouse in Australia. As compared with Great Britain and the United States of America, we have not nearly so many lights or marine marks to attend to. I am in regular communication with the Commissioner for Lighthouses at Washington, who keeps me supplied with information concerning the service in the United States of America, and we get from Trinity House, London, similar information about lighthouse services in Great Britain. I have a copy of a publication issued by the Department of Commerce in the United States of America giving full particulars of lighthouse services performed, and also an illustration of one of their lighthouse tenders. Generally speaking, the draught of our vessels is lighter than those of the United States of America. This arrangement enables us to attend to all light buoys and marine marks on our coast. I am satisfied that the design of the proposed new steamer is suitable for service on the Western Australian coast. A new vessel has been urgently required in that service for many years because the *Kyogle* can do only three trips a year instead of four, which we regard as necessary for the efficient maintenance of the service. We do not allow the vessel to go north of North-west Cape from the middle of December to the end of April, which is regarded as the cyclone season. If anything happens to automatic lights during that period, we can do nothing unless we can engage

a lugger at Broome or at Port Hedland to take a mechanic out to attend to it. Our chief difficulty is the birds, which lime all the lantern panes and the whole structure in an incredibly short space of time. We have been carrying on with the *Kyogle* since 1925, but we have only been scratching along. We have not been able to start new construction on the Western Australian coast. We cannot do this class of work with the existing steamer service. If a light goes out at any point along the coast the master of a vessel in the vicinity may be able to take certain precautions, but if any of our lighthouse-keepers or members of their family become sick, we have no means of transporting them to hospital if the *Kyogle* is down at Fremantle. It may be possible to get them overland, but the most satisfactory method is to send a steamer up north to bring them away. The majority of our lighthouses are not close to any settlement. Cape Leveque is over 100 miles from Broome. It might be possible to get a sick person from that lighthouse overland into Broome. The *Kyogle* was the best vessel offering when the department decided to purchase a steamer. The *Governor Musgrave*, working on the Western Australian coast, had been condemned by Mr. McGowan, Lloyd's surveyor, and it was on his recommendation that we purchased the *Kyogle*. The *Cape Leeuwin* was constructed with a view to working that portion of our lighthouse services, but developments in Queensland obliged us to utilize both the "Cape" steamers in Queensland waters. The lightship at Breaksea Spit, on the Queensland coast, north of Bundaberg, broke adrift on several occasions, and the *Karuah*, which was attending to lights along that coast, was unable to tow it. The lightship nearly put the *Karuah* on the rocks. Our intention originally was to work the Queensland coast with the *Karuah* and the *Cape York*; but the failure of the former rendered it necessary to station both the "Cape" steamers on the Queensland coast. If the construction of the proposed new steamer is authorized I suggest that the *Kyogle* be stationed at Port Adelaide to relieve the *Lady Loch* of some portion of its work. The *Lady Loch* is overworked. The arrangement which I suggest would cut out about 4,800 miles of steaming by the *Lady Loch* each year between Melbourne and Adelaide. I have a personal knowledge of all lighthouse vessels. The *Lady Loch* was built in 1882, and is still doing useful work for the department. I believe the *Kyogle* could render useful service in South Australia, but her retention would entail an additional expenditure of between £17,000 and £20,000 a year, the estimated cost of running the new steamer. The design for the new vessel makes provision for a single screw only. I was not consulted in regard to that matter. The engineer-surveyor recommended a single-screw steamer and the Bauer Wach type of engines to ensure greater economy in fuel consumption. I do not agree with that view. For some reason or other he does not favour a twin-screw vessel. I do.

24. *To Senator Sampson.*—The general practice now is to make provision for twin screws. From the point of view of coal consumption, a twin-screw vessel may not be quite so economical. I estimate the increased cost at between 2 per cent. and 5 per cent. in a vessel of the size of the proposed new lighthouse steamer, but there would be no increase in the engine-room staff. The advantages of a twin-screw vessel over a single-screw steamer, in my opinion, far outweigh any disadvantages. The *Karuah*, a twin-screw steamer, on one occasion stripped the blades of her portside propeller and was able to get into Cooktown with the starboard propeller. If that ship had been a single-screw steamer, the captain would have been obliged to hang on somehow until another vessel came alongside to tow him to port, in which case there would have been heavy salvage charges. Vessels equipped with twin screws are more easily handled than ships with only one screw. The specifications for the proposed new steamer for the New Zealand lighthouse services, provide for twin screws. I examined the specifications some time ago and came to the conclusion that a vessel of that type would be suitable for Australian waters. With a draught of 13 feet there would be no difficulty in getting in at Port Hedland, or alongside light buoys on the Western Australian coast. The new vessel need not go into Broome because her bunker capacity will enable her to make the trip from Fremantle to Darwin without re-fueling. Docking facilities will be available at Adelaide for the new steamer. It will not be necessary to take it to Melbourne for overhaul. I strongly favour a twin-screw vessel for the class of work that the new steamer will have to do. The *Lady Loch* is a very old fashioned ship, equipped with compound engines. The "Cape" steamers have triple-expansion engines. The engines in the *Lady Loch* are not of the type that would be built nowadays. The miles steamed by that vessel are in excess of those steamed by either the *Cape York* or *Cape Leeuwin*, for the reason that the *Lady Loch* is overworked. She goes from Melbourne to Adelaide and back four times a year and also to Tasmania four times a year. These long, straight runs give good steaming averages. The "Cape" steamers, on the other hand, have to do a great deal of standby work. They might be anchored three times a day with banked fires while repairs are being done to light buoys. All this means added fuel costs. I do not consider it fair to make a comparison between the steaming costs of the *Lady Loch* and the "Cape" steamers, because the former is a coal-burning ship, whereas the latter are run on oil fuel. The *Lady Loch* attends to 45 lights and the "Cape" steamers to 41 lights; but the latter steamers have innumerable buoys and 23 beacons to attend to. These are not listed in the official figures. I am satisfied that the design of the new steamer is suitable for our work. It may be possible, with the use of triple-expansion engines, combined with the Bauer Wach system, to effect a fuel economy of 20 per cent.; but I am chiefly concerned with the maintenance of our lighthouse services. I understand that, under the new system of propulsion, cargo tramp steamers effect an economy up to 25 per cent. in fuel consumption in long, uninterrupted runs; but whether the system will be as successful in lighthouse steamers is another matter. The Bauer Wach turbines are complicated, and there is no place in Western Australia where repairs could be effected if anything went wrong. Moreover, the turbines are not manufactured in Australia. I am not in favour of putting in complicated machinery which cannot be efficiently repaired in Western Australia. A new vessel of the type shown in the plan could probably be built in Great Britain for £80,000 against an estimated cost of £120,000 by Cockatoo Island Dockyard. In 1914, we had a number of quotations from English ship-builders. In that year we forwarded the plan of a lighthouse vessel to various firms in England and invited tenders for two or three vessels. The following quotations were submitted:—McKay Baxter, £35,500; J. I. Thornycroft & Co., £51,700; Rennoldson & Co., alternative tenders for £37,898, £39,998 and £41,678; Cammel Laird & Co., £53,040. The only local tender we received was from Messrs. Poole & Steele, Port Adelaide, for £51,500. The present cost of vessels of this type is back to pre-war levels in Great Britain, owing to the slump in the ship-building industry. But in 1914 many ship-building firms did not even acknowledge our request for tenders. When we invited tenders in Australia for the two "Cape" vessels, we received the following quotations:—Poole & Steele, one vessel, £140,000; two vessels, £276,000; Government Dockyard, Newcastle, one vessel, £121,000; two vessels, £239,250; Australian Commonwealth Shipping Board, one vessel, £117,187; two vessels, £233,124. We did not call for tenders in Great Britain on that occasion. The proposed new vessel should be dearer to construct than the one contemplated in 1914, because the bunker provision is for oil fuel instead of coal. The dimensions were approximately the same, the length being 220 feet, breadth 33 feet, moulded depth 16 feet, and loaded draught 12 feet to 11 feet, giving a mean draught of 13 feet and a cruising speed of 12½ knots, with a maximum speed of 15 knots. I consider speed an essential factor in the lighthouse vessels. To ensure an ordinary speed of 10 knots, we expect a trial speed of at least 12 or 12½ knots. It is desirable to provide for a vessel convertible from coal to oil burning or vice versa, because in the event of an outbreak of war, these ships would probably be taken over by the Navy for special work and might be utilized as coal-burners. Pulverized coal is not being used to the same extent as oil fuel; but I do not think there is much difference between the two systems. Possibly oil fuel would be a little more economical. It is probable that Collie coal could be pulverized and utilized in the running of the vessel. If pulverized coal were carried in the bunkers it would be necessary to pass exhaust gases from the boiler flues into the hold to prevent spontaneous combustion.

25. *To Mr. Holloway.*—Inspection of all light buoys and lighthouses is made regularly by our engineers and mechanics who reside at the head-quarters of the district. The district engineer is responsible for maintaining all stations in an efficient condition. It is impossible to maintain the desired standard of efficiency with the existing steamer service. We consider it necessary that all light stations should be visited four times a year. With the proposed new vessel it will be possible to carry out this programme. The construction and commission of a new steamer will not mean an economy in the working of the service, because if, as I suggest, we maintain the *Kyogle* in South Australian waters, the additional expenditure on our lighthouse services will be about £18,000, representing the estimated cost of maintaining the new steamer. We shall, of course, be giving a better service. I consider it absolutely essential that we should have a lighthouse steamer ready for service at a moment's notice at all the leading ports in Australia. The Commonwealth took over a considerable liability in regard to the marine lights, and, up to the present, it has not had sufficient ships to enable it properly to discharge that obligation. If a marine casualty occurred suddenly, the Commonwealth Government might not have a vessel available for rescue work; at present the *Lady Loch* is in Tasmania. We should have to charter a vessel from one of the private shipping companies to render aid. I do not think the danger has ever been properly realized. Prior to the Commonwealth assuming control of lighthouse services, the Victorian Government always had the *Lady Loch* or another vessel under constant steam, ready at a moment's notice. The Commonwealth has never been in that position.

26. *To Mr. Gregory.*—To discharge its obligations properly, the Commonwealth Government should have a lighthouse steamer always ready at the principal ports, except in Sydney, where so many other ships are always available in case of an emergency.

27. *To Mr. Holloway.*—Some portion of our work in South Australia is done under contract by the Coast Steamships, Limited. If we had the *Kyogle* stationed at Port Adelaide we could terminate these contracts and give a better service. Contract vessels do not remain at the lights for one moment more than is necessary, whereas our own vessel could hang on until everything that was required to be done had been done efficiently. We have a light at Cape Thevenard, at the beginning of the Australian Bight, but we are unable to attend to it, so we have to rely upon a vessel belonging to one of the local steamship companies. At present the South Australian Government is maintaining four coastal lights, which, properly, should be the responsibility of the Commonwealth Government. Those lights do not comply with the Commonwealth requirements and were not transferred. They are situated at Marsden Point, in Kangaroo Island; Price Island, the Four Hummocks and Flinders Island. If we took over those stations, we should have to replace them with more powerful lights to comply with our requirements.

28. *To Mr. Cameron.*—The new vessel, being specially designed with heavy scantlings for lighthouse services, would be able to take the sea in any weather. We propose to discuss this afternoon, with dockyard officials, the desirability of providing for twin screws, and I intend to press for Lloyd's Special Survey. By this I do not mean that the vessel should cost more than £120,000. I consider that that estimate is ample for the construction of a twin-screw steamer to meet all our requirements. I take the view that vessels intended for lighthouse work cannot be built too strongly. Even if they cost a little more, the expense would be amply justified. The work of handling buoys, which may weigh 12 tons, is exceedingly heavy. If they are continually bumping against the side of the ship they will strain the vessel unless it is specially built for that class of work. To ensure a cruising speed of 10 knots the trial speed should show at least 12½ knots, because a vessel is in its best trim on its trial run. After it has been at sea for a month or two barnacles adhere to the bottom and unless there is the margin of speed indicated, it will not average 10 knots. There is a limit to the economic speed of every vessel. If it is desired to exceed that speed heavier engines must be installed and running costs would be materially increased. We are receiving requests almost every day for an improved lighthouse service around the Australian coast. The Government of Western Australia has made repeated requests for improvements in the lighting of the Western Australian coast, but up to the present nothing much has been done. Since we took over control of coastal lights we have established lights at Eclipse Island, near Albany; at Escape Island, between Fremantle and Geraldton; at Sandy Cay and at Legendre Island. The policy of the department is to establish automatic lights provided there are sufficient manned lights, so that in the event of the automatic lights failing, the coast will not be totally unlighted. When we took over the lights at Cape Northumberland, Cape Banks, Penguin Island and Cape Jaffa, they were all manned lights. We have since converted Cape Banks and Penguin Island lights to the automatic system. If the manned lights get out of order the lightkeepers can effect repairs with the emergency gear which is supplied to them; but if the automatic lights fail, they must be attended to by mechanics, and sometimes considerable time elapses before they can be seen to. We have no lighthouse vessel stationed in South Australia. For the efficient maintenance of the service, we should have a lighthouse steamer at Port Adelaide, within striking distance of any part of the South Australian coast. The *Lady Loch* is over-worked. Recently I wished to have a buoy changed, but as time did not permit of this being done on the last visit of the *Lady Loch*, it will have to wait for another three months. Under the existing arrangement there is something always being left over.

29. *To Senator Sampson.*—At present we are not in a position to provide an efficient lighthouse steamer service in No. 1 district and because of the long distances to be covered, it is essential that a vessel

should be specially constructed for that work, and capable of taking the sea in any state of the weather. The Cockatoo Island people have some objection to twin screws, probably because of the increased cost of construction. I maintain, however, that the advantages of a twin screw vessel would more than compensate for any disadvantages from the point of view of costs.

30. *To Mr. Long.*—There has been an increase from 105 to 145 in the number of lights on the Australian coast since we took over control. We desire to improve the service and establish many more marine lights. This being so, this vessel, if constructed, will not meet our requirements ten years hence. I do not agree with the statement that the *Kyogle* has outlived its usefulness and is uneconomical. The vessel, however, is too small, and I am suggesting that it be transferred to South Australia, where it may be usefully employed. There is nothing wrong with the *Kyogle*. It is an excellent vessel for lighthouse work. Shipping companies consider that a vessel should be written off at the end of 25 years, and they adjust their finances with that end in view; but that does not necessarily indicate that a vessel 25 years old has reached the end of its useful life. The *Kyogle* has been properly maintained and there is no reason why she should not render good service for many years yet. The annual overhaul would cost probably £3,000. It may be necessary to put in new boilers in a few years time at a cost of about £6,000, but I consider that an average expenditure of £3,000 a year will keep the *Kyogle* in good trim for her work. The distances to be covered on the South Australian coast are not so great as in Western Australia. The *Kyogle* could attend to the lights on Kangaroo Island on one trip; on the next trip it could do the Gulf lights; and on another trip the lights along the West coast. I consider the saving in fuel in a single screw steamer compared with a twin screw vessel is between 2 per cent. and 5 per cent. As against that, we must remember that if a single screw vessel stripped her propeller she would have to wireless for assistance and hang on until she was picked up by another vessel in which case there would be a huge sum to pay for salvage. A twin screw vessel could always reach port on one propeller if anything happened. Captain Brewis and all other lighthouse authorities recommend the construction of twin screw vessels for lighthouse services.

31. *To Mr. Gregory.*—I consider that a vessel with internal combustion Diesel engines would be quite suitable for lighthouse services. I understand that that type of engine has been ruled out because it would mean the importation of machinery from Great Britain or elsewhere, as Diesel engines are not manufactured in the Commonwealth. All the auxiliary services on a Diesel ship would be worked electrically. It would be more costly to install that type of engine, but what the amount would be I am not in the position to say. Coal at Darwin costs us about £7 a ton. Owing to the short steaming radius of the *Kyogle*, we have to get bunker supplies at Darwin and other intermediate ports. If that vessel were working on the South Australian coast it would carry sufficient coal to take it to any port.

32. *To Mr. Cameron.*—Apart altogether from the *Kyogle*, we require a new vessel to maintain an efficient service on the Western Australian coast.

(Taken at Canberra.)

WEDNESDAY, 7TH MAY, 1930.

Present:

Mr. LACEY, Chairman;

Senator Dooley	Mr. Gregory
Senator Reid	Mr. Holloway
Senator Sampson	Mr. Long.
Mr. M. Cameron	

Jack Payne, Manager of Cockatoo Island Dockyard, and Chairman of the Commonwealth Shipping Board, sworn and examined.

33. *To the Chairman.*—I am aware of the proposal to construct a steamer for the lighthouse service. The dockyard authorities have for some time been negotiating with the Lighthouse Department authorities as to their requirements, and the type of vessel required has practically been decided upon. Preliminary plans have been prepared in the dockyard in consultation with the lighthouse authorities. In all essential details agreement has been reached, but the plans have not yet been finalized. It is proposed to construct a single screw oil-burning steamer of about 1,400 tons. There is no great difference between the proposed new vessel and the *Cape York* and the *Cape Leeuwin* now in use on the Queensland coast, with the exception that the new vessel is of less tonnage. I was at Cockatoo Island when the *Cape York* and the *Cape Leeuwin* were built. There was a proposal to give those vessels greater fuel capacity by installing additional tanks in the holds. That work was not done at Cockatoo Island. In addition, the original propellers, which were made of cast iron, have been replaced by propellers of manganese bronze. The specifications provided for cast-iron propellers, but manganese bronze propellers are more efficient and consequently they were fitted. The fuel capacity of the vessels was increased because oil fuel could not be provided where it was originally expected to be available. Moreover, the vessels were placed on different routes from those first intended, and a larger cruising range was desired. The new vessel is being designed for a definite range of 3,000 miles. There should be no necessity to increase its fuel carrying capacity. It is estimated to cost £120,000. The original estimate was £121,000 made up as under:—

	Labour.	Material.
	£	£
Hull	35,000	28,500
Machinery	14,500	8,500
Electrical fittings	2,000	5,000
	51,500	42,000
Other costs in connexion with the work, such as the cost of running our own power and light plants during construction, fuel, handling charges, &c, were	24,000	4,000
	75,500	46,000

I have not the amended figures giving details of the provisional estimated cost of £120,000. I submit a copy of the specifications as so far agreed to. There will probably be some minor alterations.

33A. *To Senator Sampson.*—Our estimate is based on a single screw steamer which the lighthouse authorities have asked for. It would cost an additional £4,000 or £5,000 to construct a twin screw steamer.

34. *To the Chairman.*—The work of construction should take about twelve months. Work could be commenced within eight weeks of receiving the order. I have had experience in shipbuilding yards in Great Britain, and have seen the type of vessel used in the lighthouse services of Great Britain and the United States of America. The British vessels are not quite so elaborate as is the one proposed, chiefly because they

have not the same length of coast line to attend to, and have not to remain at sea for so long. The proposed vessel does not differ greatly from the British lighthouse steamers, excepting that it is a little larger, and the accommodation required is much more elaborate. The vessel has been designed for a stated steaming radius. I think that the proposed vessel will be suitable for the purpose for which it is required, although I should have preferred it to be fitted with twin screws. I have had some sea experience, and have found that when working on a coast with many ports, some in narrow waters with swiftly running tides, especially if taking up moorings when running against buoys, a vessel with twin screws is more easily managed. In the interest of the lighthouse service I should prefer a twin screw steamer. The running costs of a vessel fitted with twin screws would not be very much greater, as one man could handle both engines and a larger crew would not be necessary. The oil consumption would, however, be slightly greater. A similar vessel could be built in England or Scotland for about one-half of what it costs in Australia. Wages in those countries are about half what they are in Australia, so that unless Australian workmen do more work per hour the labour costs in Australia must be nearly double the cost in those countries. In addition, the plates for the vessel have to be imported, involving a considerable expenditure for freight. Special appliances, including compasses, would have to be imported. The construction costs of a vessel using oil fuel are greater than they are for a vessel using coal, for the reason that an oil-burning vessel requires double rivetting to make it oil-tight, whereas single rivetting is sufficient for a coal-burning vessel which has to be only water-tight. Lloyd's would not sanction single rivetting for an oil-burning vessel's tanks. I could not say what the additional cost of an oil-burning vessel as against one burning coal would be. Double rivetting is not an expensive operation, but it adds to the cost of a vessel. Notwithstanding the additional cost of an oil-burning vessel, I would not recommend the construction of a vessel to use coal as fuel. The deterioration is greater in the case of a coal-burning vessel than it is in a vessel burning oil as fuel. Coal causes corrosion, whereas oil tends to preserve the structure. The fact that oil is available in certain ports at less cost than coal is an additional factor in favour of an oil-burning vessel. I do not know what percentage is allowed for depreciation, but it should not be so great in the case of an oil-burning vessel as it is for one which burns coal. I shall supply the information. I have seen the *Kyogle*, now used for lighthouse purposes, on the coast of Western Australia. The vessel is now over 30 years old, and I doubt whether the expense of converting it to an oil-burning vessel would be justified. I have not seen the vessel for some years and could not say what the conversion would cost. The *Kyogle* would require to be double-rivetted in the way of oil tanks before oil could be used for fuel. Without first examining the *Kyogle* I could not say whether it would be an expensive job to enlarge her coal bunkers to give her a greater steaming radius, or what her further useful life might be; but as the vessel is over 30 years old her further period of usefulness cannot be great. The depreciation each year in an old vessel is much greater than in a new vessel. Recently we had in the dockyard for repairs a vessel about 23 years of age. When we took off the wooden decking we found that the steel deck plates on which it rested had almost perished. The result was that, instead of a minor job, costing about £1,000 or £2,000 the repairs to that vessel cost about £25,000. The dockyard authorities prepared several plans for a lighthouse steamer, including one for a single screw vessel. For a ship of the size proposed it is usual to allow only one screw; but for a lighthouse vessel I think there should be two screws. I have not had any experience of the Bauer Wach system of machinery, but I have followed the references to it in engineering journals. Messrs. McIlwraith and McEacharn have a vessel on the Australian coast with that system of machinery installed in it; but I understand that there has been some difficulty in getting the guaranteed consumption of oil. The system is still in the experimental stage. The great claim for it is that it reduces the fuel consumption. The idea originated with Parsons, of Wallsend, England. Bauer Wach came into the field later. The parts under the Bauer Wach system could be manufactured in Australia. Metropolitan Vickers have a scheme of turbines somewhat similar to the Bauer Wach system, but the power from the turbines is used to drive a dynamo, which in turn supplies current to a motor which is fixed to the propeller shaft, so that the same result is obtained. The Metropolitan Vickers system being electrical would necessitate importing the machinery. I could not say what the cost of installing the Bauer Wach system would be, but it would certainly make the vessel more expensive. It would also have the disadvantage that the ordinary engineer is not used to it. In the event of trouble with Bauer Wach machinery I dare say that repairs could be made almost anywhere, but Cockatoo Island is about the only place in Australia in which marine turbines have been constructed. I should not like to say that the vessel could not be repaired elsewhere. I do not recommend the installation of Bauer Wach machinery on this vessel. I should like to see the system given a further trial before that is done. In my opinion it would not be right to make experiments in a lighthouse steamer.

35. *To Senator Reid.*—As far as I know, only the Cockatoo Island management has been asked to furnish particulars in regard to the construction of this vessel. As a matter of fact we have not yet been asked to tender, because we are still at the negotiation stage. We have received no order for the vessel. Cockatoo Island is not busy at present. We have about 600 men employed. The normal number of men employed is from 1,000 to 1,200, consequently some of the machinery is now standing idle. We have given a nominal price for the work, including a normal overhead charge. The work could be done in Great Britain for about half the amount of what it would cost in Australia. My estimate is really a guess because we have not tested the market; but roughly it is correct. That does not apply only to Cockatoo Island. We have called tenders for winches, both in Australia and in Great Britain, and the Australian prices were approximately double those of Great Britain. We obtained prices from local manufacturers of winches in Melbourne, Perry and Harman. The only difference in the cost of manufacture in respect of Australia would be freight and handling charges, plus customs duties, if any. We usually pay customs duties for private work, but I take it that in this case we would not have to do so. If duty is charged the Government pays it and then gets it back again. I was in the old country in 1926-1927 on business for the board, and from my observations I gathered that our men were turning out work, equal in quality to that turned out by British workmen. The only way in which British workmen can beat our workmen, per man, is by working piece-work. If the British workmen worked on time they would turn out no more work than do our men. Generally all the steel-workers of Great Britain are on piece-work. One would naturally expect to get more work done on piece-work because of the incentive given to the workmen. Under piece-work the Australian workman would turn out as much as the British workman. Some of our

vessels were constructed under piece-work and our workmen, per man, turned out work equal to that done in the Old Country. The construction work was cheaper under the piece-work system, and was equal to the English standard. I am referring to labour. If we are entrusted with the construction of this vessel I understand we are to build it to the requirements of the Lighthouse Department. I favour oil-burners, rather than coal-burners, because the former are cheaper and more efficient in service.

36. *To Mr. Long.*—When the *Kyogle* was in dock at Cockatoo Island we had no occasion to examine the hull. All we carried out was a certain amount of repair work. I do not think that the life of the *Kyogle* would be as much as eight years. However, I have only a scanty knowledge of the vessel. It would appear that an additional vessel is necessary in the lighthouse service. I am of the opinion that the proposed steamer would meet the requirements of the service, but whether the vessel should be fitted with twin screws is an open question. It is more a matter for those who have to work the vessel. I anticipate no disabilities in respect of the construction of a double bottom to the vessel and also of the tanks for storage water for domestic use. I do not remember whether the *Kyogle* has a single or double bottom. It would be possible to obtain in Australia the whole of the steel sections for the hull, but not to the sizes required by Lloyds and the Board of Trade. The tensile strength of ships' plates is from 28 tons to 32 tons. Steel of that strength can be obtained from the Broken Hill Proprietary Company. The difficulty is not in the tensile strength, but in the rolling of the plates. As a matter of fact we would get at least 40 per cent. of our steel sections for this ship, if the order were given to us, from the Broken Hill Proprietary Company. That would include reverse bars, angles and tee bars. We have machinery at Cockatoo Island with which to bend or shape steel sections in accordance with our requirements. The shape of the section depends on the rolling at the mill. We do not alter the shape of steel sections. Boiler plates are not manufactured in Australia. There are no mills in this country that can roll them. The furnaces for the proposed vessel will be corrugated. Tubular stays cannot be made here, although we can make a solid stay. More than 50 per cent. of the material required for the construction of the vessel would be procured in Australia. The cast iron would be made from ore in Australia. It would take from nine to ten months to have the vessel ready for commission from the laying of the keel, that is, working ordinary day work without overtime. From press reports, we understand that our boats which have been examined in the Old Country are as good as any built on the Clyde, and I understand that the Clyde is taken as the standard. Quality comes before quantity. The difference between Australian and British prices is mainly in the wages. I do not think that the saving in fuel consumption that would be effected by having a single screw instead of a twin screw vessel, would amount to 20 per cent. It would be more like 5 per cent. It would cost about £4,500 extra to fit twin screws as against the single screw. It might be argued that with twin screws there is greater danger of fouling buoys, mooring chains and other obstacles, and that they would be a disadvantage when towing other vessels. On the other hand it may be argued that twin screws would enable the vessel to be more easily handled. I should say that twin screws would minimize the danger when manœuvring round buoys. I consider that twin screws would be preferable, but of course we would have to obtain the point of view of those who have had experience of the job. There are to be two derricks each of 12 tons lifting capacity on the forward deck. When it is necessary to lift heavy buoys, weighted by marine growth and mooring chains, both derricks could be used at the one time. The more space that is provided on the forward deck the better. If additional space were provided it would mean altering the lines of the vessel a little. It could be made fuller forward, and finer aft. A minor alteration could be made without causing any serious disability to the boat.

37. *To Mr. M. Cameron.*—If Cockatoo Island constructs this vessel, the work will be directly under the supervision of the assistant manager and myself. My estimate for the vessel is £120,000 off the slips and after a trial run. The vessel would take from nine to ten months to complete after laying the keel. Our estimates of periods of construction are usually well up to time. In fact we have been complimented on the promptness of our deliveries. I do not agree with Mr. Battle, the engineer and ship surveyor in chief, who recommends the installation of engines of the triple-expansion reciprocating type in conjunction with a high-speed low-pressure turbine operating on the main shafting, because, as he contends, such a system would result at a conservative estimate, of 20 per cent. economy in fuel consumption, with at least equal efficiency as compared with the ordinary reciprocating type of engine. We have not had sufficient experience of the Bauer Wach system to warrant such a statement. Several systems similar to the Bauer Wach have been adopted by various builders and ship-owners, but I do not know of any Government ship in which that system is installed. I know of no vessel in Australia that has that system except one, about which the reports were unsatisfactory. Evidently Mr. Battle obtained his estimate of a saving of 20 per cent. in fuel consumption from technical journals. In the first instance the fuel consumption might be less, but over a long period the cost of maintenance and wear and tear might offset that advantage altogether. The specification calls for the ground tackle to be about 5 per cent. heavier than Lloyd's scantlings, and also provides for various plates to be stiffened up to greater than Lloyd's requirements, because of the special nature of the work that the vessel will be called upon to carry out. It is practically salvage work. The vessel is to have a speed of 11 knots, and 10 knots will be the sea speed. To increase the speed by a couple of knots would necessitate increasing the power of the machinery, and that would probably mean an alteration of the lines of the vessel. If the work of construction is carried out at Cockatoo Island Dockyard, we shall employ an additional 230 men for the next ten or twelve months. I think that the Australian workman would do just as good work under piecework as he does under day work.

38. *To Mr. Gregory.*—I have had nothing to do with the construction of vessels used in the lighthouse service of Great Britain. I have only seen them. In the United States of America a vessel of a type similar to the one now proposed, is used, and both twin and single screws are in use. I favour twin screws, although my opinion may not be that of those engaged in the lighthouse service. A motor vessel could be used in this service, but it would not be quite so reliable as an oil or coal-burning vessel. I favour oil-burning vessels because the Diesel engine must be started with compressed air. Such a vessel would need to carry a certain number of cylinders of compressed air, and after a number of quick starts and stops might have to wait until more compressed air was made available. An oil-burning vessel can be started or stopped at any time without any wastage of fuel; that is not the case with coal-burning vessels, because it takes considerable time to get steam up once the furnaces have been allowed to cool. The oil is pumped automatically. The "Cape" boats were built for either oil or coal-burning. The proposed vessel would carry sufficient oil for steaming 3,000 miles with a reserve of an additional 33 per cent.

to come and go on. I believe that the "Cape" boats have been using oil for the last couple of years. They are bigger vessels than the proposed vessel and one would expect them to burn more oil. These vessels use crude oil. The oils that we get here do not vary much in their values. The navy gets its oil from Borneo, but also it comes from the Anglo-Persian wells. I have not seen the plan or specification of the vessel that is going to New Zealand, but I believe that Mr. Wilson, the Assistant Manager at Cockatoo Island, has seen it. We provide full spares for the vessel; in fact more than is stipulated by Lloyds. The vessel will be very complete with spares. The fitting of twin or single screws, would make no difference in cleaning the hull of the vessel, because I understand that the vessels are beached on a hard sandy bottom, and do not sink in the sand.

39. *To Mr. Holloway.*—I should think that the fitting of twin screws would increase the annual cost of repairs, particularly as more propellers are likely to be damaged. I was of the opinion that the vessel would be more easily manœuvred by having twin screws, but I understand that some persons say that the vessels can be more easily manœuvred if fitted with a single screw. Various vessels have been imported from England, such as the ferry boats of Sydney. The Ferry Company has its own workshops and carries out any necessary alterations. I do not know the nature of the alterations that are made. I should think that the large slip-building yards of Great Britain, that have modern equipment and are continuously making the same type of vessel, would be able to construct them at a cost much below that ruling in Australia, even if the wages were the same in both countries. We have only to turn to the Ford Car Company to ascertain that. The last boat that we launched was a punt for the Hawkesbury River. The vessel before that was the *Albatross*. We seldom construct consecutive vessels alike.

40. *To the Chairman.*—If duty were paid on material used in the construction of this vessel it would amount to approximately £1,000. It is very likely that when this ship is in commission it will have to tow lightships. Tug masters are generally against twin screws. They contend that one big single screw gets a better grip of the water than do two small screws. The danger of the tow line fouling the screw is much greater in the case of twin screws. The towing that this vessel would do would be fairly heavy because it would be sea towing. A tug is built deep in the keel especially to take a big propeller.

41. *To Mr. Holloway.*— It would be necessary to tow light-ships for periodical repair and cleaning. Their moorings are lifted occasionally for examination. As a matter of fact a light-ship recently broke adrift and was towed in by the warship *Geranium*. I do not know of any other towing that this vessel would do. I am not conversant with the lighthouse service.

42. *To Mr. Long.*—The plates used in the construction of this vessel would be a little heavier in certain parts than those specified by Lloyds.

(Taken at Canberra.)

WEDNESDAY, 21st MAY, 1930.

Present:

MR. LACEY, Chairman;

Senator Dooley	Mr. M. Cameron
Senator Reid	Mr. Gregory
Senator Sampson	Mr. Holloway.
	Mr. Long

James Fleming, Principal Mechanical Engineer, Department of Works, sworn and examined.

43. *To the Chairman.*—I am aware of the proposal to construct a new steamer for the lighthouse service on the Western Australian coast. I have been in touch with the Cockatoo Island Dockyard authorities as to the class of vessel required. My department will be responsible for its supervision and construction, if approved. The proposal is to construct a new vessel to replace the *Kyogle* which is engaged on the lighthouse service in Western Australian waters. The *Kyogle* is a coal-burning twin screw vessel of approximately 1,200 tons displacement. It was built on the Clyde to the order of the North Coast Steam Navigation Coy. in 1902, and is therefore 28 years old. Being designed for the northern river trade, it is of light construction, and vessels of this type do not usually last more than, say, 30 years. It was purchased for the lighthouse service in 1924, the purchase price being £12,750, and an additional £3,477 was spent in repairs, making the total cost £16,227. Of that £3,477, only about £1,700 represents actual repairs, the balance being for special equipment and fitting up for lighthouse service. Since the date of purchase, the average cost of maintenance has been £2,260 per annum. It is capable of a speed of 10 knots, but the economical speed is only 7 knots. The cruising radius is 1,680 knots at 10 knots speed, and 1,480 knots at 7 knots speed. These cruising radii are insufficient for requirements, and necessitate utilizing a large amount of the cargo space for extra coal, and the shipping of large quantities of coal at Darwin for the return trip, at the high price of £6 4s. 7d., plus handling charges, say a total of £6 10s. per ton. This disadvantage might be largely overcome by converting the vessel to oil burning at an estimated cost of £4,000. A fuel capacity of 150 tons of oil could be provided, giving the vessel a cruising range of 3,000 miles, and as fuel oil is obtainable at Wyndham and Darwin at 90s. and 66s. per ton, respectively, no inconvenience would be experienced as regards cruising range. As regards the condition of the *Kyogle*, while the cost of maintenance to date has not been unduly high, there are indications that it will rapidly increase in the near future. The framing in the fore and aft peaks and the tank margins in engine room and after hold are deteriorated, and will probably require replacement within the next two years. Some of the hull plates have also wasted on the wind and water line. When repairs of this kind are undertaken on a lightly constructed vessel of the age of the *Kyogle* it is not possible to foresee where replacements will end. Parts which are apparently good, and which remain serviceable while they remain undisturbed, will not stand the cutting out and replacement of rivets, and it is quite possible that the cost of making good these parts would amount to anything between £10,000 and £15,000. Even with this expenditure, the vessel would still be an old one, and no assurance can be given that further heavy expenditure would not be required shortly afterwards. If the *Kyogle* be retained, it is almost imperative that it be converted to oil burning, consequently the cost of its retention even for a limited period of a few years is:—

	£
Repairs, say	15,000
Conversion to oil burning	4,000
Total	19,000

An expenditure of this amount is not considered an economical proposition, and the construction of a new vessel is accordingly recommended. The estimated cost of the new vessel, as supplied by Cockatoo Island Dockyard, is £121,000. The sale value of the *Kyogle* is estimated at £5,000, but it is very doubtful if this price will be realized, as much depends upon the nature of the demand for a boat of the type at the time of the sale, and, in the event of the demand being poor, it would not be feasible to hold the vessel for any length of time with a view to obtaining better offers. Assuming that the *Kyogle* can be sold in the Eastern States

for £5,000; the cost of the proposal is estimated as follows:—

	£
Construction of new vessel	121,000
Cost of transfer from *Sydney* to Fremantle	1,000
Cost of transfer of *Kyogle* to Sydney ..	1,000
	123,000
Less sale value of *Kyogle*	5,000
Net cost	118,000

My department supervised the construction of the *Cape York* and *Cape Leeuwin*. Each of those vessels cost £121,000 to construct. The contract price was somewhere about £119,000, but certain extras account for the difference. The cost per annum for repairs, renewals, alterations and maintenance of those two vessels is as follows:—

	£
Cape York.	
1927-28	
1928-29	3,047
1929-30	2,063
Cape Leeuwin.	3,000
1927-28	
1928-29	4,405
1929-30	2,879
	3,950

The costs for the year 1927-28, two years after the boats were built, were fairly high, as they were then converted from coal to oil burning. I do not agree with the statement that if a new vessel were provided, there would be very little expenditure for repairs and renewals for the first eight or nine years that it was in service. My contention is borne out by experience with the Cape boats. The maintenance of the new vessel would be very similar to that of the Cape boats. The new vessel would be about 15 ft. to 16 ft. longer than the *Kyogle*, and there is only one slip at Fremantle capable of taking that vessel. It is problematical whether the new boat would go on the Fremantle slip. In that event it would be necessary to bring it each year to the coast for the purpose of dry docking and overhauling. That would involve an additional £2,000 per annum, expenses for the return journey. My assistant, Mr. Hastie, will appear before the committee to-morrow. He has just returned from Western Australia, supervising the overhaul of the *Kyogle*, and he knows the Fremantle slip. He will be able to give evidence as to its capabilities. At the same time I think the slip owners are the only ones who could give definite information as to whether the slip could take the new boat or not. It would probably be necessary for them to see the boat first. I think that the committee would be well advised to proceed on the assumption that the Fremantle slip could not accommodate the new boat. I think the slip is privately owned, and it might be possible to induce its owners to lengthen it. The use of pulverized coal on steamers has shown an economy over the use of lump coal, but it is not yet being used to any extent in Australia. I do not think that pulverized coal would be the most suitable fuel for the proposed new vessel, as coal cannot be obtained on the north-west coast of Australia at anything like a reasonable price. On the other hand, oil can be obtained there at a very low price. If the vessel were to use coal it would have to have a greater bunker capacity than if it used oil. There would be no necessity to make provision for it to carry pulverized coal, or for a conversion from oil to pulverized coal. That can be done at any time on any boat, but hold space would have to be sacrificed for the purpose, and I do not recommend such a step. The principle requirements of the new boat is a long cruising range, and it would be best to fit it to burn oil. The only difference in depreciation when oil is used as against coal, is that the oil tanks are not subject to the same hard usage to which coal bunkers are put. That would be only a minor difference in depreciation in favour of the oil-burning boat. I have some knowledge of the Bauer-Wach engine. It has come into use only during the past couple of years, and is at present more or less in an experimental stage. The general principle is that it is an ordinary reciprocating engine which uses its exhaust steam through a low pressure steam turbine that is connected to the main propeller shaft through helical gearing. It has been proved to show an economy of from 17 per cent. to 25 per cent. over the ordinary type of engine, but on the other hand I should say that the wear and tear on the turbine would be heavy. I do not favour its use in a small boat such as that proposed. I know that the engine has been fitted to boats of from 10,000 to 15,000 tons, but I am not aware of its being fitted to such a small boat as this. Any saving in fuel would be more than offset by the excessive cost of maintenance of the turbine. Further, the turbine gear could not be made in Australia, and would have to be imported at a cost of from £5,000 to £6,000. It is quite probable that the teeth of the gear would be stripped from time to time, and they would have to be replaced from the country of manufacture, probably Great Britain. The boat would not be held up in the interim, as the turbine could be put out of operation altogether if necessary, but its use would be lost for the time being. I consider that £121,000 is a very high price for the proposed new vessel. The Cape boats were built at Cockatoo Island Dockyard in 1925, and they have a displacement of 2,012 tons. They cost £121,000 each. The proposed new vessel would have a displacement of only 1,380 tons and would cost the same amount. I have not a detailed statement of the Cockatoo Island estimate, so I am not in a position to analyse the cost, but on the weight and the general type of the new boat I believe the price to be too high. The Cape boats cost £60 per ton displacement, whereas the new boat would cost £87 10s. per ton displacement. While the cost ratio should be higher with a smaller boat, the types are similar and I cannot see any reason for an extra £27 10s. per ton displacement. Wages are practically the same as they were in 1925, while material has decreased slightly in price. I admit that compulsory insurance, child endowment and possibly the 44-hour week would account for some difference, but nothing like the big margin that I have named. Again, practically all the material would have to be imported; therefore, such factors as compulsory insurance and child endowment would not affect its price. The extra cost is evidently involved in labour. The original cost of the *Kyogle* to the Commonwealth was £12,750. I mentioned £5,000 as its present sale value, taking into consideration its original cost, less depreciation. Before £5,000 could be obtained it would be necessary to find an anxious buyer who really wanted a boat for a special purpose. If put up at forced sale, it might bring only £1,000 from some person who treated the deal as a speculation. The boat is eminently suited for trading purposes between the northern rivers of New South Wales and Sydney, and anybody requiring it for such use might be prepared to pay from £5,000 to £6,000 for the boat. The *Karuah*, which was sold when the two *Cape boats* were built, was constructed in 1908. It was eighteen years old when sold, and brought £700. I do not know its original cost. It was purchased second-hand for lighthouse service, and had a displacement of only about 600 tons. I do not think that it would be worth while endeavouring to re-model the *Kyogle* to make it more suitable for its present work. It was specially designed for the North Coast Company, trading between the northern rivers of New South Wales and Sydney, carrying dairy produce. Its plates are thin and it has a shallow draught. I would not advise any extensive repairs to it. The surveyor has intimated that at its next overhaul it will

have to undergo extensive renewals. That would involve considerable expense and would place the *Kyogle* out of commission for a number of weeks. It would be impossible to estimate the cost. I do not think that a contractor would give a price for work of that description. The specification for the new vessel is more or less a skeleton one. It makes no provision for trials, which usually form part of a contract of this description. The design of the vessel has been very carefully considered, and I think that it provides all the accommodation and facilities required by the lighthouse service. I consider that a speed of eleven knots, on trial, would ensure a sea-going speed, under working conditions, of ten knots per hour. Very little shipbuilding has been done in Australia in recent years, and we have not very much to guide us as to prices, but I am confident that a saving could be effected on the estimate of £121,000. There are private firms in Australia quite capable of building a boat of this description, who are anxious to get work, and I believe that a fairly keen cut price would be tendered if the work were made available for open competition. I should not be surprised if an Australian firm tendered as low as £100,000. I have not any figures to enable me to compare the cost of running of the *Kyogle* with the Cape boats, but the following figures may be interesting to the committee. They refer to a trip by the *Kyogle* from Fremantle to Darwin and return, a distance of 4,760 knots. Coal was taken in at Fremantle, 108 tons in bunkers, 170 tons in the forehold and 30 tons in the aft-hold, making 308 tons at £2 10s. a ton, a total of £770. A further 150 tons of coal was taken in at Darwin, at £6 10s. a ton, or a cost of £975, making the total for the 458 tons, £1,745. If converted for oil burning, that cost would be only £862, or a saving of £883 for fuel on the return trip, in addition to eliminating probably two or three stokers. The *Kyogle* coal consumption is not extravagant, but its short cruising range makes it necessary to buy coal in the north at the high price of £6 10s. a ton, as coal is not available at any port between Darwin and Fremantle. Oil can be purchased at Darwin for 66s. a ton, which is lower than it can be bought anywhere else on the Australian coast, and at Fremantle it costs 75s. a ton. If necessary, the boat can go on to Wyndham and obtain oil there at 90s. a ton, which is quite a reasonable price. I do not recommend the conversion of the *Kyogle* to an oil-burning steamer, because of its present condition. Irrespective of whether a new boat is built or not, the *Kyogle* has got to such a stage that it is not economical to keep it. It should be got rid of.

44. *To Mr. Gregory.*—The northern river trading to which I referred would be from Sydney round the Clarence and Hunter Rivers. The trips would be short, and would be in sheltered waters. The *Kyogle* is suitable for the north-west trade, except that its life there must be much shorter as it goes out into the open waters and, being lightly constructed, must be in first-class condition. All of our annual overhauls are carried out under the instructions of a marine surveyor. We do not, as a rule, get any report from him. He simply goes aboard and states what needs to be done. When the work is completed he issues a note to the effect that it has been done to his satisfaction. When I give my opinion as to the *Kyogle's* condition, I rely principally on the information obtained from the surveyor. He has informed my department that, at its next overhaul, the *Kyogle* will have to undergo extensive renewals to its hull. He does not make a general report to the department, but we know the surveyor's mind on the matter, and that information, in conjunction with our own knowledge of the boat, justifies us in making our recommendation that the boat should be disposed of. The last survey of the *Kyogle* took place about a fortnight ago, and I will supply the committee with a copy of the report. I do not think that the lighthouse people have ever contemplated transferring the two Cape boats to the north-west coast, as their services are fully required on the Queensland coast. It is a matter for the lighthouse department to determine whether the *Kyogle* should be transferred to the east coast, where adequate supplies of coal would be available. I think that the vessel would be too small for that service, as there are so many lights on the Queensland coast, and such a considerable quantity of stores has to be carried. The work was done with the *Karuah* many years ago, but I believe that since then the number of lights has been vastly increased. I understand that when the two *Cape boats* were built one was intended for the Queensland coast and the other for the Western Australian coast, hence the names *Cape York* and *Cape Leeuwin*, but it has not been possible to release one for the west. The control of lighthouses does not come under the control of my department, and I cannot speak specifically on that point. The *Kyogle* is a very much smaller boat than either the *Cape York* or the *Cape Leeuwin*, 1,200 tons as against 2,012. In addition, she steams only at 7 knots an hour, whereas the Cape vessels steam at 10 knots an hour. Those two factors would account for their fueling costs and mileage returns comparing favorably with the Cape boats. I am quite satisfied with the cost of consumption in connexion with the oil-burning boats. The figures of £6 10s. a ton for coal at Darwin was supplied to me by the lighthouse people as what they pay there. When coal reaches Darwin it has to be loaded on to trucks and taken to the railway yard about three-quarters of a mile away, where it is unloaded on the dump. The process has to be repeated when coal has to be loaded on to any vessel at the jetty. As against that, oil is run aboard vessels through the pipes, the pipe line being coupled with the tank of the ship. The *Kyogle* needs a better cruising range than it now has. It has to make the trip to Darwin a few times a year, and even has to go to Wyndham. Such trips necessitate it carrying some 200 tons of coal, utilizing space which should be allotted to stores. If the *Kyogle* were put on a coast where coal could be picked up every 1,000 miles or so, there would be no necessity to convert it to oil burning. I believe that, if tenders were called in England for the building of a new lighthouse steamer, the cost would be about £50 per ton displacement, or a total for the vessel of £60,000. The cost of bringing it out here would run into about £5,000.

45. *To Senator Dooley.*—I do not think that there would be any saving in the cost of maintenance of the new vessel, as compared with the *Kyogle*. It would be a bigger boat, and the probability of having to go to the Eastern States to be dry-docked would increase costs. Morts' dockyard or Walsh Island Dockyard would be quite capable of building the ship desired, but they have not been asked to submit a price. I understand that Cockatoo Island Dockyard submitted a price and made the necessary arrangements before my department came into the matter. It may not be possible for the Walsh Island Dockyard to build the ship, but it is my personal opinion that the work could be done there if necessary. Cockatoo Island Dockyard is a very big establishment, capable of carrying out very much more work than it is now asked to do. Consequently, if a single ship were being built at one time, it would have to carry more than its fair share of overhead charges, which would inflate its cost.

46. *To Senator Reid.*—The *Kyogle* was built in 1902 and was purchased by the lighthouse department in 1924, so that it has been on the north-west coast for about six years. Its running expenses are no higher to-day than they were six years ago, but my department is apprehensive as to the extent of the future cost of maintenance. These lighthouse steamers are classed as passenger carrying vessels, and the survey requirements for a passenger vessel are much

more severe than for cargo vessels. Probably the *Kyogle* would be up to the latter requirements if it were purchased by some one and used for cargo carrying on the east coast. At present it carries the wives and children of the lighthouse keepers, and all the precautions applicable to a passenger-carrying vessel must apply to the *Kyogle*. I have not seen the ship, but am going on the reports that I have received from my officers who have been sent over to supervise its overhauls. I have personal experience of the *Karuah* which was also constructed lightly for shallow water trading. I know that when we were carrying out the repairs on that vessel it was amazing how the old parts would fall to pieces as soon as an endeavour was made to put in new rivets, and that kind of thing. I do not know the Queensland coast very well, but I do not think that there would be any difficulty in getting coal at Rockhampton, Cairns or Thursday Island. I have not the price cost of coal at those ports, but that could be easily ascertained. I do not think that £2,260 per annum is too high a maintenance charge for a boat the size and age of the *Kyogle*. I have never seen the Fremantle slip and would prefer the committee to address questions regarding it to Mr. Hastie. If the Government really want the new vessel to be built at Cockatoo Island Dockyard it would be hardly fair to call for tenders from Mort's Dockyard and the Walsh Island Dockyard, as a considerable amount of preparatory work is necessary when submitting tenders. The only fair basis would be to accept the most favorable tender. If an open tender were called it would probably be found that the price quoted by the Cockatoo Island Dockyard would be lower than £121,000, as competition reduces prices. I would not recommend that £19,000 be spent in reconditioning the *Kyogle*. The boat would still be old, and near the end of its useful life.

47. *To Mr. Long.*—I am a practical mechanical engineer. The last overhaul of the *Kyogle* cost about £1,600. About three years ago the cost was something like £3,000, the average cost of maintenance since the date of purchase being £2,260 per annum. It is a very open question as to what repairs would run into once you began to interfere with the vessel. I have mentioned a sum of from £10,000 to £15,000, but it is almost impossible to give an estimate. I anticipate that it will be difficult to sell the boat, and I would regard further recommissioning it as a false economy. Regarding Mr. East's comments on the reconditioning of the vessel, particularly that to the effect that the cement work in the aft hold was not taken up so as to enable an opinion to be passed regarding the hull at that place, a good deal would depend on the condition of the cement. If it were adhering closely to the plates and there was no sign of moisture between, there should be no deterioration, as the cement would act as a preservative if intact. One can easily ascertain whether a plate has gone to a dangerous extent by hammering it on the outside, but the tapping test must go over the whole area of the plate. I have known a plate to be one quarter of an inch thick in one place, and the hammer to go through it six inches away. I believe that, as a passenger carrying boat, the *Kyogle* has reached the end of its tether, and as a lighthouse steamer it must fulfil the requirements of a passenger carrying vessel. I understand that the *Kyogle* was built to Lloyd's A1 requirements, that is the highest class. The conditions under which the boat would be used were taken fully into consideration, and all provision was made to meet the requirements. In fairly sheltered water the *Kyogle* would probably be allowed to continue to run in its present condition for another two or three years, and it would be a reasonable buy for anybody needing her for that purpose, at £5,000. It would not be economical to recondition the boat if it is to continue to be classed as a passenger carrying vessel. The longer it is retained in service the higher will be the maintenance costs. I expect that the cost of its next overhaul will be staggering. If the new boat had to be brought to the east to be dry docked, its maintenance costs would be increased. I am not sure that the work could be done at Adelaide. It would be necessary to ascertain the prices at the different ports and act accordingly. If the new boat were constructed in Great Britain it would probably cost from £75,000 to £80,000 landed here. It is recognised that we cannot do ship building in Australia at anything approaching the prices obtaining in Great Britain. Our wages are higher and our volume of work negligible. The industry is well established overseas, and work is practically continuous. The quality of the shipbuilding work done in Australia compares favorably with that done anywhere else. The Australian artisan is as good as any other. I do not think that it would be an extravagant step to have the boat built here, notwithstanding the difference in price.

48. *To Senator Sampson.*—A single screw ship is less costly than a double screw, and it is slightly more economical in fuel consumption. Its disadvantage is that it is not easy to manœuvre in tight corners. Both the *Cape York* and *Cape Leeuwin* are single screw steamers, and apparently have proved sufficiently satisfactory to induce the authorities to determine upon another single screw steamer. The two Cape boats are costing on an average almost £4,000 a year for maintenance. Nearly all of the time they are in tropical water, where the deterioration is very much greater than in milder climates. They have to be painted two or three times a year, while the internal fittings need constant attention. No doubt, a suitable secondhand ship could be purchased in Great Britain, but it would be necessary to spend a few thousand pounds to fit it for lighthouse service. I believe that present costs are still about 50 per cent. higher than pre-war costs.

49. *To Mr. Cameron.*—So far as I know, tenders were not called for the building of the Cape boats. I do not know whether they were constructed by day labour or not. The Cockatoo Island Dockyard gave my department a definite contract price for them. Full provision was made for oil burning, and the oil burning equipment was supplied, but not installed. At the time when the boats were put into commission it was more economical to use coal than to use oil. That condition of affairs changed about eighteen months later. That was foreseen when the vessels were built, and all provision was made for the conversion. The new boat will need an overhaul yearly after being placed in commission, in accordance with the requirements of the Navigation Act. It does not necessarily follow that because a ship is surveyed, £300 to £400 would have to be expended on it. It has to be repainted annually and the engines opened up for examination, which would run into about £900 to £1,000. I should say that the maintenance costs of the "Cape" boats are higher than those of private boats as their service is more strenuous. For weeks at a time they are amongst the reefs. My estimate of £15,000 to recondition the *Kyogle* is practically a guess. It might cost £20,000 or only £8,000. I do not think that the cost of construction is any cheaper now than it was in 1925, although material may be a little cheaper. At the same time, I consider that if tenders were called for the new boat, the price would probably be cheaper than that of 1925, on account of the present scarcity of work. I do not consider that the new boat should cost above £5 to £6 per ton displacement more than the Cape boats. I am not prepared to comment on the policy of the Government in regard to Cockatoo Island Dockyard, but I believe that the new boat could be built in Australia for £100,000. The specification that I have is merely a general outline. I do not think that the committee will have an opportunity to examine the actual specification which, however, will not differ in the general construction of the ship. It would merely have clauses making sure that the contractor was legally bound to do all the work that he contracted to do, and providing for speed trials and subsequent engine examination. My department will see that such clauses are included in the specification.

The modern tendency is for private owners to dispose of their vessels before they reach the age of the *Kyogle*. Frequently vessels of from 10,000 to 12,000 tons are broken up before reaching the age of 20 years. It is entirely within the province of the surveyor to say when a ship shall be condemned. The Navigation Act prescribes that sea-going vessels shall be surveyed once a year by a State or Commonwealth surveyor. The State surveyor does the work in West Australia, and he has authority to say whether a boat is in a sea-going condition or not. Except as a matter of policy, I do not know why the building of the new boat should be confined to Cockatoo Island Dockyard. Although it could be built at a lower price overseas, it is perhaps preferable to keep the money in Australia and to give employment here.

50. *To the Chairman.*—There would be a close specification in regard to the work needed on the new boat, together with a plan stipulating in detail the accommodation, type of engine, type of boiler, length, breadth and displacement of the vessel. The specification would prescribe that the hull should be A1 at Lloyds, and would stipulate any special provisions in regard to the thickening of the bow plates and so forth. The contractor would have to submit his detailed working drawings to us for approval. I have not seen the plans of the lighthouse steamer that is to be used in New Zealand, but there is nothing very special in these steamers, except that they require special accommodation for passengers. Lloyds specify that certain spare parts should be carried for the propelling machinery. They are usually of a comprehensive nature. The only addition that I should make would be a spare propellor, as the original one might be damaged. Labour represents a fairly big item in the building of a boat, and there has been no tendency for its costs to go down in Australia. Material should be less, although it is a fair percentage still above pre-war rates.

51. *To Senator Reid:*—When Cockatoo Island Dockyard built the two Cape steamers, extras amounting to about £2,000 were incurred on each vessel. That was extra work asked for after the contract had been let. The Cockatoo Island Dockyard kept to the contract prices, as we treat it the same as we should any contractor. If the cost is higher than that of the contract the dockyard stands the loss. I should not think that there would be any considerable loss on the building of the proposed boat at £121,000.

(*Taken at Canberra.*)

THURSDAY, 22ND MAY, 1930.

Present:

Mr. LACEY, Chairman;

Senator Dooley	Mr. Cameron
Senator Reid	Mr. Gregory
Senator Sampson	Mr. Long.

George Hastie, Mechanical Engineer (in charge of ships), Department of Works, sworn and examined.

52. *To the Chairman.*—I recently made an examination of the lighthouse ship *Kyogle*, and afterwards submitted the following report to the Public Works Department:—

With reference to the proposal to construct a new lighthouse steamer for No. 1 district, the following evidence is West a considerable sum was spent in alterations and additions to make her suitable for the lighthouse service.

The *Kyogle* is a twin screw steamer of 1,200 tons displacement, and built by A. & J. Inglis, of Glasgow, in 1902, to the order of the North Coast Navigation Company, of Sydney, for services on the Northern Rivers trade. In order to negotiate the bar-bound entrances to those rivers the vessel was built under Lloyds' special survey 90A1, allowing lighter scantlings, so that draught would be restricted to a minimum. In 1924 the vessel was bought by the Commonwealth Government to replace the *Governor Musgrave* for a sum of £12,750, and before proceeding to the West a considerable sum was spent in alterations and additions to make her suitable for the lighthouse service.

During the last six years, an average expenditure of approximately £1,550 has been spent on overhaul, repairs and maintenance, and this has included part renewals of wood boat deck, saddships and aft, the construction of two additional cabins for chief and second engineers. The renewal of part of framing in fore hold, the margin plate of the double bottom in engine room and after hold has corroded in places, and patches have had to be fitted over same. The framing in the fore and after peaks is showing signs of corrosion, particularly the fore and aft flanges of reverse bars, and while no sign of undue stress is evident the scantlings are considerably weakened, and will require to be renewed in the near future. To undertake this repair the vessel would require to be on the slip for a considerable length of time, and, owing to the inaccessibility of the parts to be renewed, the cost would be abnormally high, somewhere in the region of £10,000 to £15,000, and such an expenditure on a steel vessel of light scantling 28 years old is not recommended. The probable value of the *Kyogle* is about £5,000.

Test holes in shell C shake 10 feet from stem ¼ inch
P. & S. G shake at fore end fore hold 5-16 inch
P. & S. G shape midships 3-16 inch, ¼ inch, ¼ inch, 5-16 inch. G shake aft 5-16 inch.

The *Kyogle* was specially built with light scantlings to do light draught work. She is 28 years old, and a vessel so constructed usually has not a life of more than 30 years. If the necessary repairs were effected, and the vessel converted to an oil burner, she might have an effective life of another ten years. It is doubtful, however, whether the repairs could be made at a reasonable figure. Once one begins to open up an old ship, one never knows where the repairs will end. It might take easily £15,000 before the *Kyogle* was put in proper shape, and even then one would have an old ship which would always have to be tinkered with. I should say that even after an immediate expenditure of £15,000 it would take approximately £2,000 a year for repairs and overhauls to keep the vessel seaworthy. I do not think the annual charges for repairs would be reduced very greatly if the vessel were employed in southern waters. If she were employed as a cargo vessel she might have an effective life of a further ten or fifteen years without excessive cost, provided the fore and aft peaks were properly repaired. The *Kyogle* might, in its present state, be worth nearly £6,000. The *Bucla*, which belongs to the State Government of West Australia, and which in its present condition is unseaworthy, was recently offered for sale and fetched a bid of £5,000. The bidders desired chiefly to get the fittings out of the vessel. If the new vessel is constructed to the specifications prepared, she could probably be docked for overhaul and repair at Adelaide, but not at Fremantle. The *Kyogle* is 950 tons and 180 feet long, and she is just about the maximum that can be handled on the slip at Fremantle. Mr. Bennett, of the Fremantle Harbour Trust, informed me that a ship of 700 tons and 190 feet long was the heaviest that he could take up on the slip. I am not familiar with the docking facilities at Adelaide, but I understand that the *Kybra* can be docked there, and, if that is so, the dock should be able to handle the new vessel. I estimate the new vessel to be of about 843 tons. Apart from unforeseen damage, vessels must be docked at least once every twelve months for their certificate in order to

comply with the *Navigation Act*. It can be taken for granted that the new vessel will have to dock once a year, and that she can go into dock at Port Adelaide. About eight years ago we made a comparison of ship-building cost in Australia and Great Britain. We estimated that an "E" class ship would cost in England about £15 per ton dead weight to build, whereas the cost in Australia was approximately £25 per ton dead weight. I do not think that the costs have varied materially since then, except that they may have become cheaper in England. The Australian price was for materials obtained here free of duty.

53. *To Senator Reid.*—I do not think that the *Kyogle* can go any longer in her present state without fairly extensive repairs. The surveyor has told me that if the ship is to be kept in commission for any length of time, the framing of the fore and aft peaks must be attended to. The vessel has a certificate for this year, but these repairs will have to be done shortly. Even if the vessel were taken off the north-west route the repairs would still be necessary. I do not know of any suitable ship which could be used on the north-west coast in place of the *Kyogle*. Practically all of those available are of too deep draught. In some of the ports which the *Kyogle* has to visit only 13 feet of water is available. It is necessary that a ship working the north-west coast be of shallow draught. Having regard to the class of work that has to be done I think it would be better to sell the *Kyogle*, and put another ship in its place. If tenders were called for the construction of a new ship, Mort's Dock and Walsh Island Dockyard might put in fairly good tenders. I do not think that it would be possible to build a ship in Australia for very much less than the estimated price. It would be very difficult to get a second-hand ship to do the work properly. It would be much better to build a new ship. I cannot say whether the Department has made any inquiries for a second-hand ship. At present I am in favour of an oil burner for this class of lighthouse work. If powdered coal came into use it might prove a better proposition, but at present an oil burner would be the best to use. It would be cheaper than a coal burner, and oil supplies would be available at Darwin at very much less cost than loading coal at £6 10s. a ton. I should certainly recommend the building of a new ship in preference to repairing the *Kyogle*.

54. *To Mr. Long.*—I am a ship-builder, and I have just come back from making an examination of the *Kyogle*. Three years ago the reverse frames were practically renewed in the forehold of the *Kyogle*. This year I renewed 9 feet of the side keelson. Nothing has been done on the after part of the vessel in my time. There is a patch of cement in the after peak which the surveyor knows about, and which has been there for years. Outside there is no appearance of any damage at all, the plate being quite good. An examination of the plates has been made in the after part by boring. We have tested the hull plating for deterioration, and at the fore end this year one plate was found to be down to a quarter of an inch. The plates between the light line and the waterline had also deteriorated, and the engineer ordered me to put a new plate over one weak part. The original thickness of the plate was ½ inch. The cement in the after part of the vessel is sufficient to maintain the standard of safety at the level demanded by Lloyds. The reverse frame, bilge keelsons, and sister keelsons were in a bad state three years ago, and were renewed. It cost a fair amount to do the work, but it was not so expensive as would be the renewals to the peaks which are necessary now. If we could get over this peak difficulty, we could carry on for some years yet at an annual cost of approximately £2,000 a year for repairs. However, an immediate expenditure of about £15,000 is necessary. The *Kyogle* is an expensive vessel to run, partly because she has not sufficient coal carrying capacity. She has small bunkers, and has to carry coal in the fore and aft holds, and has to rebunker at Port Darwin. I do not think that it would be wise to turn her into an oil burning vessel, owing to her age. I should think that the building of a new vessel, even at a cost of £120,000 would be justified because this is a long coast to serve. However, I do think that £120,000 is rather high for such a ship. A Cape boat of 2,000 tons cost only £120,000, and the vessel now under consideration is only 1,300 tons. If the vessel were built in England or Scotland she could be brought out here practically for nothing because she would carry a cargo. It would probably cost about £60,000 or £70,000 to build such a vessel in Great Britain. There is a difference of about £50,000 between the British and Australian prices, which is accounted for to some extent by the fact that wages here are higher and that iron at home can be obtained direct from the mills. Seeing that the ship-building industry here has yet to be established, I should certainly say that it would be a good thing to have the ship built in this country, and to keep the money here. The Australian artisan is just as good a workman as the overseas man. Australian workmen would be quite competent to handle a job of this description. Probably by calling tenders for the job a lower price than £120,000 could be obtained. Besides Cockatoo Dockyard, there are only Walsh Island Dockyard and Mort's Dock which could undertake this work. Cockatoo Island Dockyard is probably the best equipped of the three, but the others could build the vessel without any important additions to their plant or equipment. The specifications of the new vessel call for a single screw, and I should imagine that for a vessel of the size a single screw would be more efficient, and more economical, than twin screws. It is true that lighthouse vessels have to go into places usually avoided by ordinary trading vessels, and expose themselves to dangers which do not ordinarily confront other ships. In such circumstances a lighthouse ship might lose a screw and, being off the track of shipping, might be wrecked as a result before assistance could arrive. Taking the factor into consideration it might be advisible to fit twin screws, which would cost about £4,000 more.

55. *To Senator Sampson.*—I have not inspected the Cape boats, but I am familiar with their plan of construction. There is a difference of £27 a ton between the cost of Cape boats and of the vessel now under consideration, and I cannot give any reason for it. I cannot understand why this vessel of 1,300 tons should be the same price as the *Cape York* of 2,000 tons. According to the table of costs in the possession of the Committee the annual charges for repairs and overhaul for the Cape boats seem to me to be excessive. In my opinion the *Kyogle* should be sold or scrapped. She is too old for the work she is at present engaged on.

56. *To Mr. Cameron.*—The *Kyogle* is not suitable for a 5,000 miles service. For a shorter service she has still a life of anything from eight to ten years, but even for such work as that the repairs to the fore and aft peaks would have to be done. This year, in order to get out of reframing the fore and aft peaks, I fitted stringers which were passed by the surveyor, but he told me that if the vessel was kept in commission any longer the reframing would have to be done. She is quite seaworthy at present. This year the repairs cost about £1,700, and last year they cost about £1,800. The surveyor has decided that the reframing of the fore and aft peaks must be undertaken at the end of this year if the vessel is to be kept in commission. I do not think it would be an economical proposition to spend £15,000 on this work, even to make the vessel seaworthy for another ten years, although, with the

expenditure of the sum, she might be put into commission on the South Australian coast, and give satisfactory service. If the new ship were built in Australia it would be necessary to import plates which are not rolled in Australia, and the plates are one of the biggest items of construction. It would probably be necessary to import material for the construction of the vessel to the value of about half the cost of the total material used. It would take about eighteen months to build the ship here; I should not expect to see it turned out in anything less. I have not been consulted regarding the estimates for the new vessel; I presume they were prepared by the Cockatoo Island Dockyard.

57. *To Mr. Gregory.*—I am eligible to be a surveyor under Lloyd's. I have not here the last report of the surveyor who examined the *Kyogle*, and it would be a good thing if the report were obtained from West Australia. Next year the surveyor will probably call upon us to make the repairs to the fore and aft peaks; and that will cost much more than is really justifiable. The *Kyogle*, being a coal burning ship, is a very expensive proposition for the run she is now on. It might be cheaper to transfer the *Kyogle* to the Queensland coast, and put one of the Cape boats, which are oil burners, on to the north-west coast. For new ships, the Cape boats seem to have cost a great deal for repairs and overhaul, but I cannot say why this should be. I have not seen the specification in the Navigation Department for the new twin screw ship to be constructed for the New Zealand lighthouse service. The overhaul of the Cape boats is done at Brisbane by our department. I have not been up there. The work is under the charge of an official of our department. I have been specially asked to report on the *Kyogle* because I have been in charge of the last three overhauls she has undergone. I think that it should be insisted on that the new vessel shall be an oil burner. Oil is the best proposition yet, at least until the powdered coal system is perfected. In any case, as it would be necessary to use Newcastle coal, I do not think that a coal burning vessel would be more efficient for north-west run than would an oil burner. I have no hesitation in saying that oil and oil alone should be used on a ship engaged in this service.

SATURDAY, 1st JUNE, 1930.

Present:

(SECTIONAL COMMITTEE.)

Mr. GREGORY, in the Chair;

Mr. Curtin	Mr. Long.
Mr. Holloway	

Bernhard Wallach, Director of Lighthouses, and Engineer in Chief, Marine Branch, recalled and further examined.

58. *To Mr. Gregory.*—The *Kyogle* visits 33 lights and a few buoys along a coastline of 5,390 miles on the coast of Western Australia and North Australia. In addition to that there are a few buoys and beacons that we look after for the Western Australian Government. All round the coast of Australia the lights inside harbours are attended to by some State harbour authority; we attend only to coastal lights. We are paid by the State authorities what it costs us for coal and overtime. Taking the outer track the coastline on the Queensland coast is 3,000 miles in length, but actually we cover a much greater distance. On that coast we attend to 80 marine marks, comprising 53 lights, and 27 beacons and buoys. The 33 marks in Western Australia are made up of 32 lights, and one unlighted mark. Actually, the distance that we cover in Queensland is only about 1,000 miles less than in Western Australia. The *Kyogle* goes only about 100 miles north of Darwin. There are much longer runs between lights on the Western Australian coast than on the Queensland coast. A great deal of time is taken up in stopping and anchoring at lights. The north-west coast of Western Australia ought to have many more lights than are provided at the present time. We have done practically nothing up there, one reason being that we are not equipped to carry out that work. It is very much more exposed than the Queensland coast, the northern portion of which is inside the Barrier Reef. The north-west coast of Western Australia is exposed to the full influence of the Southern Indian Ocean. We can enter the majority of harbours only at high water. Further provision on that coast is essential, but we could not make it with present facilities. The lights would need to be outlying from the shore, and a vessel would have to stand by while the construction work was in progress. During that constructional period, we should require at least two vessels. At the present time we have no funds, but even if we had it would be impracticable to increase the marine marks on the north-western coast of Western Australia, unless we had two vessels. We could work in the southern waters, because we should not be affected by monsoons. We have recently built a light between Geraldton and Fremantle. It is not likely that we shall build any more manned lights; they will all be automatic. The steaming radius of the *Kyogle* is too small and she cannot carry the necessary amount of material to establish an automatic light. When we had occasion to build lights in the Clarence Strait, near Darwin, we had to use the *Kyogle* and one of the Cape vessels to carry the material to the site. When our own vessel has been engaged in this work it has been necessary to charter another to do its ordinary work. The only two lights we have built on the Western Australian coast have been at Legendre Island and in the Mary Ann Passage, called Sandy Cay. We used only the one vessel for that work. It was intended originally that the *Cape Leeuwin* should be devoted to the Western Australian coast and the *Cape York* and *Karuah* to the Queensland coast. The two Cape boats were placed on the Queensland coast when Mr. Ramsbotham was Director. I agreed with the decision, for the reason that we needed them where construction was actually in progress. We now have in hand the construction of three new lights on the Queensland coast. Within another year we shall have practically completed the preliminary lighting between Brisbane and Thursday Island. The reason that we have had the funds for that work is that we have had the means to construct the lights. We have no funds this year, and we are "hung up;" but we have ot order apparatus for three new lights, one at Point Lookout, south of Cape Moreton, one at Hannah Island, north of Cairns, and the other at Esbelby Island, in Whitsunday Passage. We could give a satisfactory service on the Queensland coast with the *Cape York* and the *Kyogle*, thus permitting the transfer of the *Cape Leeuwin* to the Western Australian coast, but we should be no better off than we are now. We should have to use the *Kyogle* on the run between Townsville and Thursday Island; She would not carry sufficient for all the lights south of Townsville. The Cape boat would have to be used between Brisbane and Townsville. The expenditure on coal would be pretty well the same. We have not had coal from Cairns for some time. Newcastle coal costs from £3 5s. to £3 8s. a ton, whereas in Fremantle we get Collie coal for about £2 10s. a ton. We use that coal on the *Kyogle*. We only obtain the other coal when we get up to the distant ports. We have had no trouble with Collie coal.

59. *To Mr. Curtin.*—I have not been in control of the vessels since 1927 when they were handed over to the Navigation Service. Prior to that we obtained

Collie coal in Fremantle, and it took us along as far as Port Hedland, where we got Newcastle coal from McIlwraith's, that was shipped from Fremantle.

60. *To Mr. Gregory.*—I have nothing whatever to do with the Navigation Service. Prior to 1927 the Director of Lighthouses was in complete control of the lighthouse service, including steamers, crews, and the staffs of lighthouses. In 1927 there was an amalgamation, and we came under one branch called the Marine Branch. The control of the lighthouse staff was then given to the secretary of the Marine Branch, the control of the steamers to the navigation service, and the engineering details and lighthouse services to the Director of Lighthouses. This is the only service in the world where control is thus divided. It is only a question of time when the system will break down. We are on the verge of trouble now with some of the light-keepers. The anomalous position is that I have nothing to do with the light-keepers, yet they are responsible to me for the maintenance of the lighthouses and their quarters. If we find fault with them the District Engineer must report to the secretary of the Marine Branch. I do not know why this action was taken. I have not been able to find a reason for it, and I know of no instance of a lighthouse service being split up in this way. I am quite certain that the cost of running the service has not been reduced.

61. *To Mr. Curtin.*—Divided control does not make for as much efficiency as control by one authority. That is the ideal system, because under it one man is responsible for all the details of the service. At the present time the secretary is responsible for the acts of the staff. If the ships fail to do what I want them to do the Director of Navigation is responsible. It is just as foolish as it would be to make the commander-in-chief of an army responsible for a campaign and hand over to another authority the duty of providing for communications. I cannot say where the ships shall go. I have had difficulty in having my wishes complied with. I am responsible for the location and establishment of all new lights and the maintenance of existing lights.

62. *To Mr. Gregory.*—If I wish to go to Western Australia I must make application to the secretary of the Marine Branch. I have not made an extended tour of the Western Australian coast since 1916. The whole question should be investigated by some competent authority.

63. *To Mr. Curtin.*—The secretary of the Marine Branch is responsible to the Comptroller-General of Customs for the administration of that branch. The Marine Branch comprises the navigation service and the lighthouse service. From the point of view of salaries, expenses, and revenue, the lighthouse service is seven times greater than the navigation service.

64. *To Mr. Gregory.*—My statement that the *Kyogle* would be suitable for the North Queensland coast is based on actual experience of the working of the vessel. I have been in the lighthouse service for seventeen years, and I know every detail of these vessels We had them under our control until 1927. The *Cape Leeuwin* would not be suitable for the North Queensland coast because oil cannot be obtained at Thursday Island. At one time the Navy Department maintained an oil lighter at Thursday Island, but when their estimates were reduced they had to cease the practice. The price of coal at Cairns is high because it is Newcastle coal and it has been shipped up to that port. The figure I have given is the price delivered into our bunkers. The corresponding price at Thursday Island is £6 7s. a ton. We have to ship it there in bags, because Burns Philp will not carry it unless it is bagged. It is delivered on the wharf at Thursday Island, carted to the Customs House yard, and then carted back to the wharf and put into the vessel when required. That is why it is such an expensive proposition. There is no demand for bunker coal at Thursday Island. The cost of the service would not be reduced if the *Kyogle* were transferred to the Queensland coast, because the price of coal at Thursday Island approximates to the price at Darwin. It is not possible to arrange for supplies of crude oil at Thursday Island, because we have no tanks there, and the cost of constructing them would make it an unpayable proposition.

65. *To Mr. Curtin.*—The Navy Department carried oil at Thursday Island in lighters.

66. *To Mr. Gregory.*—My original scheme was to run a vessel from Townsville right across to Darwin, including that portion of Northern Australia in a new district with North Queensland. The *Cape Leeuwin* would be suitable for the North Queensland work if we could obtain oil at Townsville. We should always be beaten at one end. We can procure supplies of bunker oil at Brisbane, but the only way in which we can get it to Townsville is to meet an oil tanker when she comes in to discharge case oil. There are no facilities at Townsville for obtaining oil. It would be too expensive to purchase the crude oil in large drums. If we are to carry on with the existing boats for at least two years it will pay us to leave things as they are. The accommodation of the proposed vessel is arranged somewhat better than that of the "Cape" boats, but in all other respects, they are of the same class. I have had nothing to do with the running of the "Cape" boats since 1927; consequently, I do not know much about their running cost. A lot of money has been spent on alterations to those vessels.

67. *To Mr. Curtin.*—Several details have been altered and a cross bunker is going to be put in for oil, There are too many experts on the job.

68. *To Mr. Gregory.*—The figures show that in 1927-1928 the expenditure on the *Cape Leeuwin* was £30,000; consisting of crew's wages, £14,000; fuel, £5,120; engine-room and deck stores, £1,300; victualling, £3,000; repairs, alterations and overhauls, £4,465; other expenses, £2,114. The only item that could be cut down is "repairs and alterations."

69. *To Mr. Curtin.*—An annual overhaul is necessary. The average cost, in the case of these vessels, is about £2,000.

70. *To Mr. Gregory.*—Alterations are still being carried out to these vessels, and I do not know that they will be any the better for them. It is frequently found necessary to make alterations to vessels after they have been constructed. The interstate companies have had to alter some of their vessels when they have come out from Great Britain. But the point that I am making is that these alterations are going on continuously. Those who are in charge accede to requests by seamen that would probably be refused by me. Time after time I have turned down recommendations for alterations to ships. I am satisfied that the vessel proposed will meet requirements. I can see no reason why the cost should be greater by £27 10s. a ton than the cost of the Cape boats. The price of plates and all other steel work has decreased considerably. On the afternoon of the day that I gave evidence before the committee previously, we had a conference with representatives of Cockatoo Dockyard. I then stressed the importance of giving us some more deck-space, and also of having twin-screws. We have compromised by making provision for strengthening the hatch, so as to allow buoys to be landed on the hatch covers. My proposal that the vessel should have twin-screws was turned down. I have examined the plans and specifications of the new lighthouse steamer that is being built for New Zealand. Taking it all round, that vessel is superior to ours, particularly as she has twin-screws. Her accommodation also is more elaborate. It is intended that she shall be used by the Governor-General of the

Dominion, and other officials, in addition to doing lighthouse work. I understand that she is costing £77,700. That price provides for a large proportion of spares. We have nothing to complain about in regard to our "Cape" boats; they were fitted out very fully by Cockatoo.

71. *To Mr. Long.*—There are certain spares provided with every new vessel, but they can be cut down to a minimum. Cockatoo did not do that; we got out of them everything that we wanted.

72. *To Mr. Gregory.*—When we previously called tenders in Australia Cockatoo Dockyard was the lowest tenderer. If we were to call tenders now we should have to draw up a plan and specifications, and advertise. The only firm that I think can compete with Cockatoo is Walsh Island, another Government dockyard. It is a question of policy whether it would be advisable to call tenders both in Australia and in England. I do not know whether any duty would be charged on a vessel built in England. In comparing British tenders with those obtained in Australia, we must take into consideration the amount of duty that is charged. I consider the price that this vessel is estimated to cost is high, and have told the Cockatoo officials so; but it is a matter with which, under existing arrangements, I have nothing to do.

73. *To Mr. Long.*—As Director of Lighthouses, it is my policy to have efficiency in the service. I do not think that the efficiency would be impaired if the *Kyogle* were transferred to the Queensland coast. We could carry on there just as well with the *Kyogle* as with the *Cape York*. The transfer could be affected quite simply, by arranging for the vessels to meet at Darwin. The Cape vessels are quite suitable for the West. There is one direction in which the cost would probably be increased; the Cape vessel would have to be taken to Melbourne for docking. At the present time we avoid that expense by having the *Kyogle* in the West. The *Kyogle* would not do as great a mileage if she were placed on the Queensland coast, but the work would be quite different. She would have to do about 8,000 miles of steaming; but in addition, once a year she would have to tow a lightship from a point 80 miles west of Thursday Island into Townsville, and tow another one up to that point. She has not the powers of the "Cape" boats for the handling of light ships. That is one reason why I wanted this proposed vessel to have twin-screws. At the present time the *Kyogle* steams approximately 14,000 miles. The Queensland coast inside the Barrier Reef is very much more surveyed, in detail, than the north-west coast of Western Australia. I should say that it is far more difficult to navigate on the latter coast, and there is greater risk attached to it, because of the lack of surveys and efficient lighting. The *Kyogle* would not be exposed to as great a risk on the Queensland coast. The cost of fueling the *Kyogle* is stated to be £33.17 per 100 miles. The only way to reduce that cost would be to convert the vessel to oil burning, and I do not think she is suitable for such a conversion. The proposed vessel, if built, will be oil burning. She ought to do about 21 or 22 miles to a ton of oil. Even if the *Kyogle* were used on the Queensland coast she would still have to undergo an annual overhaul. For a general overhaul she would go to Brisbane, but intermediate overhauls could be carried out at Townsville. In all the circumstances it would not be an unsound proposition to carry on with the *Kyogle*. She is a most valuable vessel. I want to put her into South Australian waters, where she would be eminently suitable. We can get ten or more years out of her at a cost of about £3,000 per annum. That figure makes allowance for repairs in a few years. I am quite certain that we would not get more than £2,000 or £3,000 if we sold her. She is worth a lot more than that to the Government. I do not regard the proposal to build a new vessel as an unsound proposition. We want a number of new vessels. The Government, having taken over the service, must provide the means to carry it out. This question has been put off every year since 1915, and it must be faced We should have a minimum of six vessels.

74. *To Mr. Holloway.*—We will not obviate the necessity of providing a new vessel, even by keeping the *Kyogle* going for a number of years. If I had had my way new vessels would have been built many years ago. I do not know whether tenders have been called for portions of the ship or its equipment. If it is decided to build the vessel, Cockatoo dockyard will get the order, and it will be bound to stick to its estimate of the cost. I take it that a contract will be entered into with the dockyard, and that it would call tenders for the supply of the machinery that it requires. If it can obtain parts for less than the estimated cost, it will benefit. It will try to complete the job as cheaply as possible. We shall have to appoint inspectors to see that the requirements of the contract are carried out. The dockyard will build the hull and the main portion of the machinery. I understand that electric light machinery taken from destroyers that have been dismantled in Sydney, is to be used. It is in good order. A lot of work will be given to brass founders. The brass work is not cast at Cockatoo. A job like this involves splitting up the work among many shops. In my estimate of £3,000 a year for ten years, I have allowed £6,000 for new boilers. I think it can safely be assumed that repairs and maintenance for a period of ten years will not cost more than about £30,000. If I could use the *Kyogle* in South Australian waters I would be able to dispense entirely with charters. We are paying over £1,000 a year at the present time for an overland service to Kangaroo Island. One of our difficulties at the present time is that we are dependent on the master of the vessel; he has us under his thumb. If he says that the weather is not good enough to hang on, the men have to clear out and leave the job half finished. That increases the cost. In considering the cost of the service we must not overlook the fact that a considerable sum is being saved by the conversion of manned lights to automatic lights. We have converted 37 manned lights to automatic working, and have thus been able to dispense with 62 light-keepers. Their salaries and district allowances totalled £19,200 per annum. That does not include education allowance, child endowment, medical attention, transport, and the cost of upkeep of the quarters. But we have had to increase the number of the mechanics to look after the automatic lights, and we want a better steamer attendance so that we can carry out the work efficiently.

75. *To Mr. Curtin.*—I have read the report of the Western Australian State Ships Surveyor. His figures cover a period of five years, whereas mine cover a period of ten years and make provision for the expenditure of £6,000 on a new boiler. Mr. Hunter, who for many years was the State engineer-surveyor, and who has a very intimate knowledge of the *Kyogle*, has informed me that the *Kyogle* can be used for another ten years without any increase in the cost of maintenance. When we purchased that vessel I asked Mr. McGowan, at Mort's Dock, what he considered her life would be, and he said; "Five years," meaning five years from that date. The general idea is to regard a vessel as uneconomical to run after it has been in commission for 25 years. But in the commercial world there are factors that do not operate with us. A vessel may become unfitted for the particular trade for which she was built. We are always doing the same kind of work; the conditions and circumstances never vary; therefore, we can run our vessels much longer than it would pay a commercial concern to run them. When boilers are 25 years' old it may be necessary to renew them. It would not be economical to continue to run a ship if

the other parts were not in a satisfactory condition. There are certain parts that require renewing. My estimate of £3,000 a year includes everything. This report bears out my evidence to some extent. It has not made allowance for the renewal of the boilers. I consider that the *Kyogle* would give satisfactory service on the South Australian coast for a period of ten years at a cost of £3,000 a year. There are several tracks on the Queensland coast that have to be lighted. The lighting of a coast is never completed; the circumstances vary from day to day. Fresh surveys make the provision of new marks necessary. A new route may be laid down for shipping. We have only scratched the surface on the Queensland coast, but we have practically completed the lighting of the outer track. A vessel going from Brisbane to Thursday Island may call only at Townsville or Cairns. Others may call at Maryborough, Rockhampton, Bundaberg, and so on. We have hardly touched the lighting of that track. We build lights only where the existing surveys justify their establishment. We could not undertake the lighting of the north-west coast of Western Australia with the existing knowledge that we have from the surveys. We could light portions where a fair amount of survey work has been done. For years we have been urged by the shipping companies to increase the number of lights on that coast. The Premier of Western Australia has several times written to the Prime Minister about the scarcity of lights there. Schemes have been drawn up, and we could make a start to-morrow if we had the money and the steamer. I agree that it is necessary to increase the lighting on that coast. There is no systematic lighting there; only an odd light here and there. There should be very many more. At the average rate at which the work on the Queensland coast has been carried out, we could not complete the lighting of the north-west coast under 25 years. Before we can make a start with it we must have this extra vessel and the money to carry out the work.

76. *To Mr. Holloway.*—It would not be of any use to contemplate starting the work without another vessel.

77. *To Mr. Curtin.*—A proposal is now receiving consideration to appoint a committee to report to the Minister on proposals for new lights. The hydrographer of the Navy Office would be a member of that committee. The Navy Department is not debited with any portion of the cost of lighting the coast; but it bears the whole of the cost of making surveys, and does not debit shipping with any proportion of it. We levy light dues on shipping, and thus get some return for the facilities that we give, but it does not nearly meet the total cost of the service. I have no hesitation in saying that Cockatoo dockyard is in every way capable of providing a satisfactory ship.

78. *To Mr. Gregory.*—I do not agree with the statement of Mr. Hill that the engineer-surveyor has omitted to include in his figures a sum of from £10,000 to £15,000 for renewals and repairs. He could not have arrived at an average that I regard as a fair one—£2,000 per annum—unless he had taken into consideration the cost of replacements. The only point I wish to make clear is that his figures cover a period of five years, and that he, evidently, considers that the boiler is able to last that length of time. I have taken a period of ten years, and have made allowance for a new boiler.

79. *To Mr. Long.*—The *Kyogle* has one single ended boiler.

WEDNESDAY, 4TH JUNE, 1930.

Present:

Mr. LACEY, Chairman;

Mr. M. Cameron	Mr. Gregory
Mr. Curtin	Mr. Long.

Thomas Hill, Director-General of Works, Canberra, sworn and examined.

80. *To the Chairman.*—The first intimation that my department received of the proposal to construct a lighthouse steamer for service on the coast of Western Australia was on the 14th March last. Pursuant to an appointment made by telephone, I was waited on by Mr. Hall, Controller-General of Customs, who was accompanied by Captain Williams and the manager of the Cockatoo Island Dockyard. I was then informed that the Treasurer had directed that the work of constructing a new lighthouse steamer at Cockatoo be proceeded with, and that they would be glad if we would give effect to that decision. A discussion ensued on the matter, and it was arranged that a further full discussion in regard to the details of the proposed vessel should be held in Melbourne in a few days. Subsequently my department received a memorandum dated the 13th March, 1930, intimating that the Treasurer and the Assistant Minister for Industry (Mr. Beasley) had had an interview with Mr. Payne, Mr. Wilson, Mr. Hall, and Captain Williams, and that it had been decided to construct a steamer on the basis of the cost of the *Cape York* and *Cape Leeuwin;* that the estimated cost was between £110,000 and £120,000, but was not to exceed £120,000; and that no funds were to be required during this financial year, the whole of the payments to be made in the following year. The minute stated that the Treasurer directed that steps be taken immediately to put the work in hand. It was understood that only the preliminary details had been threshed out, and that a firm price was to follow the preparation of full details. Steps were taken at a later date to bring the proposal before this committee. The purpose in referring the matter to us was that we should supervise the construction of the vessel. The preliminary plans and specifications shown to us at the time had been prepared by the management of Cockatoo Island Dockyard. The usual practice with public works is for the department requisitioning to consult with us so as to fix the details of its requirements and obtain an estimate of the cost. When those details have been approved by the requisitioning department and the Minister for Works, plans and specifications are prepared and public tenders called. In the case of a steamer, an outline of the vessel accompanies the specification. When tenders are received they are examined, and the most suitable is accepted. Before any work is put in hand, the successful firm submits the lines of the vessel. If they are approved, the work is put in hand, and full details are submitted by the firm as it proceeds, well ahead in each case so that they may be approved before the work is undertaken. I would not say that in this case the action has been irregular; but it has not been in accordance with the usual procedure. No one firm would have an advantage over others if tenders should be called. The three firms that I anticipate would tender are equally capable of doing the work, and they would enjoy the same conditions. A report on the *Kyogle* by the Western Australian State Ships' Surveyor, Captain Davison, was forwarded to my department by the Marine Branch. Captain Davison is a State officer, and his word is accepted in every detail as to the seaworthiness of a vessel. I differ from his estimate that the *Kyogle* can be kept in commission for a further five years at an average maintenance cost of £2,000 per annum, because I am strongly of the opinion that he has underestimated the cost. We have actual knowledge, spread over many years, of

what those boats cost, whereas, as a rule, a surveyor has only to administer the law, and is not concerned with costs; his duty is to see that a boat is seaworthy and safe in accordance with the rules laid down. We know very well what these boats cost to repair and maintain. The *Kyogle* is 28 years old. She was purchased second-hand in 1924 for £12,750. At the time of purchase the sum of £3,477 was spent on repairs and reconditioning. The annual expenditure subsequently was—

	£
1924-25	403
1925-26	284
1926-27	2,016
1927-28	3,181
1928-29	1,594
1929-30	1,680

The average for those years was greater than £2,000 per annum, and we have no reason to believe that we can keep the expenditure upon ordinary repairs and maintenance below that figure in the future. The frames in the fore and aft peaks will have to be replaced shortly. Captain Davison's opinion that that work can be done without increasing the average expenditure in the next five years to a figure above £2,000, cannot be concurred in. The fore and aft peaks are the most difficult and inaccessible positions on the boat for the purpose of effecting repairs. The vessel would be on the slip for about two months. The slip dues would be £25 a day, or a total of £1,250. I am certain that the vessel will have to be brought to Melbourne to have these repairs effected. The frames have to be bent accurately to shape, and bevelled. This cannot be done in Western Australia, where there is not the necessary machinery at the present time. The cost of the journey would be £1,000 each way, for fuel, crew expenses, stores, &c. Apart from the replacement of those frames, which are known to be defective, it is recognized that when one commences to renew frames in a boat of this age and with its light construction—she was built for the Northern Rivers traffic—it is not possible to forecast at what point the work will be found sufficiently substantial to connect the new work to it. The shell plates are known to be thin, and after the disturbance of removing the frames it will probably be found impossible to replace these plates and make them watertight.

81. *To Mr. Long.*—I have not seen the *Kyogle* on the slip recently.

82. *To the Chairman.*—It is doubtful if the old plates would be put back on the bent framing, and that would mean the provision of new plates. So the extent of the work grows, and no forecast can be made as to where it will end. The case of the lighthouse steamer *Governor Musgrave*, which was replaced by the *Kyogle*, may be given as an instance. In 1923, it was found to require a new boiler and the renewal of the framing under the boiler. That work was estimated to cost £9,400. The vessel was taken to Cockatoo Dockyard and the work commenced. After the boiler had been removed and the ship had been opened up at a cost of something under £1,000, it was found that if it was to be made seaworthy an expenditure of at least £19,000 or £20,000 would have to be incurred. No reliable estimate can be made until the preliminary opening up has been carried out. In the case of the *Governor Musgrave* it appeared to be reasonable to expect that the repairs could be effected for £10,000. As we were not prepared to expend £20,000 on her, we sold her for what we could get in her dismantled condition, £100. We fear that our experience will be similar with this light shell boat. When we make a start it will be difficult to find good sound work to connect up to, and we cannot say that the repairs will cost less than from £15,000 to £20,000. I wish to stress the point that the ordinary ship's surveyor gives a certificate in the light of the knowledge that the vessel will come up for overhaul and inspection in another twelve months. As a rule his opinion does not go further than that. I am looking at this matter from the point of view of the circumstances that are likely to exist in the next five to ten years. In addition to the repairs that I have already mentioned, the ballast tank margin in the engine-room and after-hold are bad, and will probably have to be renewed. That will necessitate the removal of the auxiliary machinery; and even then the position of the tank is such as to make it almost inaccessible. I should not like to say what we may discover when we remove that machinery. Experience has taught us that our realization has always been worse than our expectations. A similar boat of light construction, the *Karuah*, at one time was used on the Queensland coast. She was found to be unserviceable when she was eighteen years old, and was sold for £750. We found that the repairs were too costly, and that we practically had to rebuild the boat. The view is still held that the *Kyogle* should be replaced. If it is retained and an attempt made to renew the frames and tank margins it is believed that the experience of the *Governor Musgrave* will be repeated, and that we will be faced with a heavy expenditure. Rather than do that, she should be sold for what she will bring. We are very concerned in regard to the small price that can be obtained for these old steamers. If the market were good we might get £5,000 for the *Kyogle* in Sydney, but it would cost about £1,000 to bring her there. I do not give that as a firm estimate. From bitter experience we have found that as a rule our estimates are wide of the mark. Until the work is put in hand it is impossible to forecast what the cost will be. I admit that in his particular sphere Captain Davison is an efficient officer; but his position does not require him to have a knowledge of costs. His department rarely carries out work itself. His estimate of £2,000 per annum would not cover my estimate that from £10,000 to £15,000 will be required for repairs over a period of five years. As I have already pointed out, the cost of repairs over the last five years has averaged more than £2,000 per annum, and in the case of the *Kyogle* I should expect it to increase. The only conclusion I could arrive at when I studied his figures was that he had omitted the cost of the renewals mentioned in his report, and that his estimate of £2,000 per year was based on what the ordinary repairs and maintenance would be; but I understand now that that is not correct. I have since received advice that he has included in his estimate the cost of the renewals to which I have referred. I cannot concur in that estimate.

83. *To Mr. Gregory.*—The report was not sent back to Captain Davison.

84. *To the Chairman.*—If the question should arise of keeping the *Kyogle* in commission she would come up for overhaul and survey. It is possible that some of the repairs I have mentioned would not be required for five years. But if we are asked to look ahead for ten years we cannot estimate the cost of repairs, maintenance, and renewals at less than £40,000. There will be at least £2,000 a year for ordinary repairs and maintenance, and £20,000 spread over a period of ten years for renewals. I have consulted Mr. Hustic, our specialist in this work, in whose opinion I have every confidence. Our advice to the department would be that the cost over a period of five years would be something like from £28,000 to £30,000. I cannot agree that the *Kyogle* can be kept running satisfactorily on an average expenditure of £3,000 over a period of ten years.

85. *To Mr. Long.*—The *Kyogle* was on the slipway for overhaul recently. The inspection showed that the fore peak, frames, and plates needed replacing, especially at the water line. There was nothing special

below the water line. The side frames of the ballast tank are showing signs of wear and rust. I would not regard as a sound proposition with a boat of this description the placing of sheathing plates on the bottom of the vessel. Because of her age and light construction, I would not advise attaching frames to the keelsons, sister keelsons, cross bars and reverse bars of the *Kyogle*, nor would I advise the expenditure upon her of £15,000 or £20,000. I agree that the work which lighthouse steamers have to do is abnormal, and some of it is distinctly what may be described as dangerous. The longer the *Kyogle* is kept in commission the less efficient she will become. She has reached the age when it would be better to have a new steamer. Further expenditure upon her is not advisable. In the present condition of the market our estimate of a tender for a new steamer would be about £100,000. Action has been suspended until it has been decided whether or not the new vessel is to be approved. There are three yards in Australia equally capable of undertaking its construction—Mort's Dock, Walsh Island, and Cockatoo Island. There is no machinery in Western Australia capable of making new frames for the *Kyogle*. If that work were done in Western Australia it would have to be done by hand, and it would not be as accurate as machine work. It is essential to have it done with a bending machine. The equipment at Cockatoo Island is not more up to date than at the other yards I have mentioned. I have no hesitation in saying that the Australian artisan is competent to build a boat of this description. The difference in costs in Great Britain and Australia is due to the conditions that prevail, not to the capacity of the workmen. The ship-building industry has been established abroad for many years, and it is in its infancy here. The cost of labour and materials is greater in Australia. A great deal of the work, such as riveting, is done at piece-work rates. The figure quoted is only an estimate, and is subject to revision when the details have been further gone into. The construction of the vessel would be directly under the control of my department. We controlled the construction of *Cape York* and *Cape Leeuwin* at Cockatoo. All Commonwealth vessels except naval vessels have been under our control for many years. That is why I can speak with a knowledge of costs. My experience of day work is that, under good control, it is quite as efficient as contract work. I do not think that there is a danger of lack of efficiency under piece-work conditions any more than under any other conditions. It is the practice to fix rates for some work, making sure that a man will get a sufficient wage for his day's work. It is generally found that he is able to earn a little more. That work is done quite as efficiently as work done by men who are paid by the day. I have always found that if the Australian artisan is given fair conditions he will do a fair day's work in return.

86. *To Mr. Gregory.*—I did not have any experience of the work done on H.M.A.S. *Adelaide*.

87. *To Mr. Long.*—We have found the Australian workmen quite all right.

88. *To Mr. M. Cameron.*—The Treasurer has to find the funds, and it is possible that that is why this proposal originated in his department. The general practice is for the Minister of the department concerned to requisition the Minister for Works, but there have been departures from that practice. Departmentally we cannot accept Captain Davison's estimate; we think it is, too low. It is our opinion that the committee would not be safe in accepting it. No action has been taken by our department other than in consultation with the officials of the other department, in connexion with the preparation of the specification. We have no knowledge departmentally of plates having been purchased. No order has been given, and Cockatoo has been advised accordingly. At the first interview I intimated that until I had the approval of my Minister they should not take any action, because I could not commit the department in any way. No decision has been arrived at as to whether tenders shall be called on the work done by day labour. If any of the three yards I have mentioned is given the work, it will only be a matter of our seeing that the vessel is built to the specifications. We accept complete responsibility. Our experience with the "Cape" boats has not been as favorable as we expected that it would be. They have cost over £3,000 per year from the commencement. We can expect that the expenditure on this vessel will be equal to, if not greater than that figure, because it will be a bigger boat and will work in tropical waters. Independent of renewals with the exception of minor renewals, the cost for annual overhaul, repairs and maintenance will be quite as great as in the case of the *Kyogle*.

89. *To Mr. Curtin.*—Whenever renewals are required we obtain very close reports. Mr. Hastie never leaves any of this big work. We are concerned about the cost, and exercise the closest scrutiny, so as to keep it down to the minimum.

90. *To Mr. M. Cameron.*—The *Kyogle* could be kept running for some years, but it would be necessary to incur the big expenditure that I have mentioned. A lighthouse steamer has to venture into such positions that she must be in real good condition. The *Kyogle* has outlived her useful life.

91. *To Mr. Gregory.*—We have been doing marine engineering work for the lighthouse department since about 1906. Mr. Hastie is our marine engineer. We spend about £20,000 or £30,000 a year on repairs and maintenance, slipping, painting, &c. You are quite justified in assuming that Captain Davison is a competent officer. I would not in any way impugn his capacity to administer the act; but I do question the estimate that he has given. I do not question his report very seriously. We cannot get a certificate without carrying out in every detail what his department requires. We have to go very closely into matters relating to costs, because we have to find the money. I have not consulted Mr. Wallach in regard to this particular matter. He may consider that the *Kyogle* could be utilized on the South Australian coast for ten years for an average expenditure of £3,000 per annum on repairs, including new boilers; that is a matter of opinion. Before any decision was reached in regard to the future of the *Kyogle*, the matter would be submitted to his department. No decision would be arrived at until all the evidence had been collated and a report furnished. I have based my estimate of the probable expenditure on repairs, alterations and overhauls on the age of the vessel and the cost of the renewals that are necessary. The fact that the matter was initiated by the Treasurer did not suggest to me that the proposal was made with a view to providing employment at Cockatoo Island Dockyard. A circular was sent to all departments to put in hand, necessary works to relieve unemployment, and I came to the conclusion that it was decided that a new boat for the lighthouse service was one of the good works that ought to be put in hand. The cost of repairs, alterations and overhauls over a period of three years was £9,610 in the case of the *Cape York*, £11,204 in the case of the *Cape Leeuwin*, and £6,781 in the case of the *Kyogle*. The *Kyogle* is a smaller vessel than the "Cape" boats, but even so the expenditure on the latter is alarmingly high. We have not been able to keep it down to a figure that I should like to see. The "Cape" boats work in very dangerous waters, more dangerous than those on the north-west coast of Western Australia. They have to go round the Gulf, and there is always the likelihood that they will scrape their bottoms on coral reefs and other obstructions.

92. *To Mr. Curtin.*—The cost of repairs and renewals would not have been different if the vessels had been built in Great Britain. It is accounted for by the awkward places they have to visit, the salinity of the water and the temperature.

93. *To Mr. Gregory.*—Whenever the Navy Department has material that it does not need we try to make use of it as far as possible. This matter has only reached the stage of preliminary discussion. If the wireless equipment from any destroyer that has been thrown out of commission is available you can rely upon it that it will be used. That matter would be inquired into before the contract was made.

The witness withdrew.

Cecil Edwin Breakwell Boden, Naval Architect, Sydney, sworn and examined.

94. *To the Chairman.*—I am aware of the proposal to construct a steamer for the lighthouse service, and should like to place before the committee some figures that I have prepared. I served a full apprenticeship in ship-building at Cockatoo Island Dockyard, and gained the Commonwealth Government's scholarship, which enabled me to attend the Sydney University, where I took the degree of B.Sc. I then proceeded to Glasgow, where I was employed on the construction of the H.M.S. *Nelson*, in the establishment of Armstrong Whitworth. I had experience in mercantile work and cruiser work at the establishment of John Brown during 1926 and 1927. I was designing officer for that ship-yard. During those years I attended lectures at the Glasgow University, and qualified as a naval architect, obtaining the degree of B.Sc. Nav. Arch. When I returned to Australia I was employed as senior design draughtsman for the Walsh Island Dockyard. During the last six months I have been engaged in a professional capacity in the city, on design work and supervision work. I suggest that the plans and specifications drawn up by any firms that have already submitted tenders ought not to be used, but that separate plans should be prepared and competitive tenders called thereon, so that they would be on an equal basis. I am in a position to do that work and to give helpful consultative advice to the committee. I have gone to the trouble of preparing an approximate estimate of the cost of constructing a vessel with dimensions similar to those given in the newspapers in relation to this vessel, namely, 195 feet x 34 feet x 16 ft. 9 in. to the upper deck, accommodation for 20 passengers and a crew of 30, a displacement of 1,380 tons, and a gross tonnage of 990 tons. My estimate for construction in Great Britain is as follows:—

Item.	Material.	Labour.	On Cost.	Total.
	£	£	£	£
Steel work	6,190	6,780	3,220	..
Wood and outfit	12,030	5,490	2,550	..
General expenses ..	18,220	12,250	5,770	36,240
	..	..	..	830
Total Hull Cost ..	..	..	..	37,070
Machinery	..	..	..	23,880
Total Equipped Ship ..	..	..	..	60,950
Profit 5 per cent... ..	..	..	..	3,050
Total Cost in Great Britain	..	..	..	64,000

The approximate cost of constructing that vessel in Australia, so far as my experience has enabled me to work out an estimate, is as follows:—

Item.	Material.	Labour.	On Cost.	Total.
	£	£	£	£
Steel work ..	8,015	9,037	4,485	..
Wood and outfit	15,628	8,461	3,816	..
General expenses ..	23,643	18,398	8,281	50,322
	..	..	..	1,520
Total Hull Cost ..	..	..	..	51,842
Machinery (100 tons) ..	..	..	..	36,000
Total Equipped Ship ..	..	..	..	87,842
Profit, 10 per cent. ..	..	..	..	8,784
Total Cost in Australia ..	..	..	..	96,626

These two sets of figures will enable comparisons to be made in regard to material, labour, and on cost. In the case of Great Britain, I have given the cost at the ship-yard. I am not altogether competent to give a considered opinion of the cost of bringing a vessel of that kind out to Australia, but I should imagine that it would bring the price to well over £70,000. At first sight it would appear that the Australian cost should be about twice that of Great Britain. Those who make that statement base it on the fact that labour is generally considered to be twice as dear here as it is in Great Britain. The steel-workers wage for time-work is in the region of from £5 10s. to £5 15s. a week in Australia, whereas in Great Britain the wage is from £2 10s. to £2 15s. a week. The comparison is not quite valid, because the workmen who are engaged on the steel side of ship construction in Great Britain are almost entirely piece-workers, and the amount which they earn weekly is approximately from £5 to £6, about the same amount as the Australian workmen are paid in a week. If, as has been stated, the cost in Australia is twice as great, one must assume that the amount of work performed by the Australian workman is only half that performed by the British workman. Thus the comparison depends upon the amount of work done, not on the wages paid. I think it will be conceded that the Australian workman working on a time basis does more than half the amount that the British workman does on piece-work. Therefore, the argument that the cost is double breaks down in that direction. I think we can take it that a piece-worker in Great Britain may do half as much again as a time-worker in Australia. That would suggest that the difference in costs should be about 50 per cent. greater in Australia. I think it will be found that that is the difference between the two estimates that I have submitted. I believe that the vessel could be built in Australia for delivery in from fifteen to eighteen months. One must bear in mind the advantage of saving the time spent on the voyage to Australia. There is the added disadvantage that construction in Great Britain would necessitate expert supervision by a person acquainted with the requirements of the department and possessing an understanding of Australian conditions. In Australia the work could be carried out under the direct supervision of those who would afterwards use the vessel. The preparation of the design and specifications could be done in much the same way, thus ensuring greater satisfaction of all requirements. It appears to me that those factors, coupled with the fact that the money will be spent in Australia, warrants the expenditure of the extra sum involved in constructing the vessel in Australia. My estimate does not include anything for supervision in Great Britain. I have had experience of general ship-building, but not of lighthouse steamers. I have a

knowledge of the requirements in the case of lighthouse vessels. I realize that they have to handle mooring appliances and heavy buoys, that they must have accommodation for the staff of lighthouses, that they must do a certain amount of towing, and that they must carry a certain quantity of stores and water. Cockatoo Island Dockyard, Walsh Island Dockyard, and Mort's Dock are capable of constructing satisfactorily a ship of this description. So far as actual equipment is concerned, I believe that Cockatoo Island has the best plant, but it has more than is required for a job of this kind. Walsh Island and Mort's Dock have plant that is capable of constructing the vessel satisfactorily. I have no figures relating to costs in America. There are different factors affecting costs in Australia. On the steel that we use we have to pay freight charges. We use mostly overseas steel, with the exception of sections that can be purchased from the Broken Hill Proprietary Company. The cost of steel sections landed at the dockyard from that company is in the region of £13 10s. a ton. The cost of steel sections in Great Britain is from £7 to £8 a ton. The freight to Australia would increase that figure to about £11 a ton, and the duty payable upon it would make it a little higher than the cost delivered from the Broken Hill Proprietary Company. The cost of plates is much on the same lines. Broken Hill does not roll plates, and they must be ordered from overseas. The freight and duty add considerably to the cost. Then there is the difference in the cost of labour, which at the present time is rather aggravated, because vessels of this type are not built more than once in every three or four years. If ship-building in Australia were developed to the stage that would enable us to build almost all the vessels that are used on the Australian coast, the percentage for on cost would drop, and the cost of labour would be reduced, because more work would be turned out in a given time on account of the workmen's familiarity with what was being done. I have no idea what it cost to construct the *Cape York* and the *Cape Leeuwin*. It is very difficult to make comparisons on a tonnage basis. Vessels built for the passenger trade or for specialized work cannot very well be compared on the basis of tonnage cost.

95. *To Mr. Gregory.*—I have not as yet made representations to the department that I should be engaged to draw up plans and specifications. When this matter was being considered I had other work on hand. I shall be very pleased to undertake the work if the opportunity arises. It is not usual for the constructing authority to draw up plans and specifications. The usual method overseas is to introduce a liaison officer between the authority requiring the vessel and those who construct it. That practice enables both to get a fair deal, and the interests of those who will use the vessel are watched very carefully. It prevents unnecessary friction, and enables the owners of the vessel to have some of their ideas, which from a technical point of view are not always suitable or convenient, smoothed out before the contractor has the plans and specifications placed before him. The question as to how far the plans and specifications should go is left in the hands of the naval architect. Some architects will go so far as to specify definitely displacement, speed and horse power, as well as to submit a midship section, indicate the general arrangements, and give a very full specification. Others prepare designs for submission to the contractor for criticism and modification. In every case the matter comes within the supervision of somebody who is competent to criticize and suggest modified arrangements. In the case of the construction of a vessel that is to be engaged in specialized work such as lighthouse work, I certainly think it is most desirable to have an expert on the technical side of ship construction collaborating with an expert who is acquainted with the requirements of the service. That system would enable the service to have its requirements satisfied by the best technical provision that could be made from a naval architect's point of view. I have no wish to disparage the ability of the service. People in the service are competent in their own particular sphere and know exactly what they require, but to interpret those requirements in terms of a ship, and to provide one that will give adequate service in addition to being seaworthy necessitates the introduction of some person who is competent in naval architecture. Oil as a fuel has very many advantages over coal and generally is more efficient. For a boat of this kind I would recommend that oil fuel be used. The question whether there should be a single screw or a twin screw is one entirely for the service. A twin screw vessel can be manipulated much more readily in confined waters, where it is necessary to manoeuvre quickly to counteract the effect of adverse currents. Care would have to be exercised to avoid the danger of damage in the vicinity of buoys. The extent of the danger would depend largely on the overhang of the stern, and on whether the propellers projected outside the line of the vessel. I have known of vessels to be built in such a way that the screws are well protected, by bringing them as close into the ship as possible. The amount of protection afforded by the stern design would have to be considered very carefully, in conjunction with the nature of the buoys used.

96. *To Mr. Long.*—The limit of the distance that can be availed of depends on the diameter of the screw, and that again depends upon the type of engine used. When you use a high speed engine you use a smaller propeller. I would not suggest a high speed engine for this kind of work. An alteration of the lines would be necessary to get the propellers closer together.

97. *To Mr. Gregory.*—As this vessel is intended for the Western Australian coast, the cost of getting it there would have to be added to the estimate that I have submitted. The Bauer Wach engine is an addition to the ordinary triple expansion job. Generally speaking, in a triple expansion job a certain amount of power is carried away with the steam when it enters the condensor. That power can be availed of by passing it through such an addition as the Bauer Wach engine. That engine is coupled on to the main shaft and does not impede the work of the triple expansion engine. From my reading of the results that have been obtained, and my knowledge of the ships that have been fitted with these engines, I should say that they are an advantage. I have not actually fitted one, or been connected with them. I think that they have been working long enough to justify the belief that they are all right.

98. *To the Chairman.*—My reason for thinking that, is that they are being fitted by owners who are engaged in the ordinary way of trade. They find that it reduces the cost of fuel. I do not think that they would embark on such an equipment if it were an experiment. It has been adopted overseas as an addition to the equipment that makes for greater efficiency. The estimates that I have submitted are based on a knowledge of the wages that are paid in Australia, and the experience that I gained in Australian yards. I was on the Walsh Island staff, and I know the conditions that obtain there. I am acquainted with the wages that are paid throughout the industry in Australia, and I know what the costs are overseas. I have given estimates of a vessel that incorporates most of the requirements of a lighthouse steamer engaged in this service, such as heavy derricks, winches, accommodation for crew, provision for the carriage of fresh water, adequate hold space and deck space for handling buoys. A knowledge

of the features required enables one to estimate a price. There is no special trade equipment and nothing that is unique.

99. *To Mr. Long.*—A boat of this description would come under Lloyd's full classification. It is not absolutely necessary to bring it under that classification, seeing that it is being built for the Government service; but so as to obtain the proper mechanical service and a satisfactorily built ship, I certainly suggest that it be built under Lloyd's full classification. You would then have a definite guarantee that the vessel was strongly constructed, and that it would have a reasonable lifetime of service. I am quite of the opinion that the Australian artisan is competent to build a ship that will meet those requirements.

By Authority: H. J. Green, Government Printer, Canberra.