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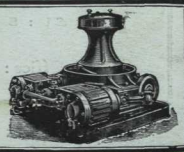

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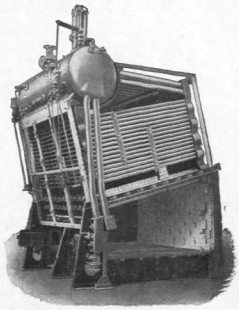

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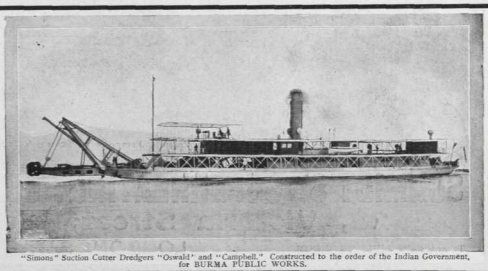

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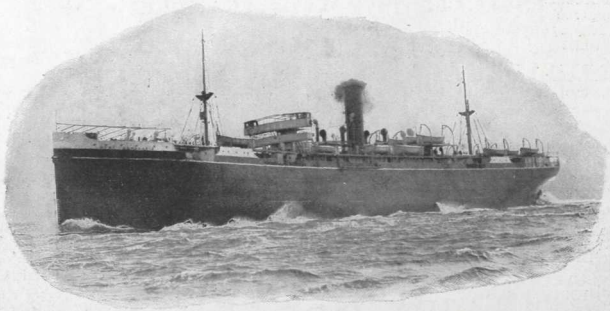

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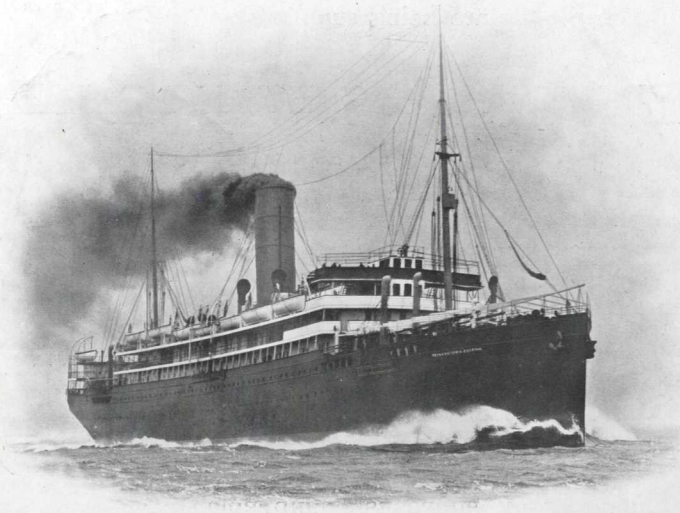

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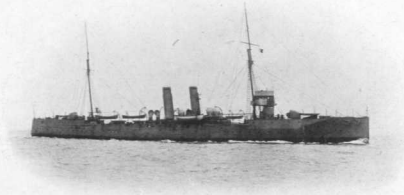

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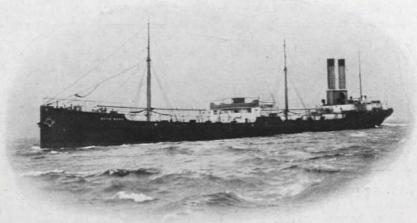

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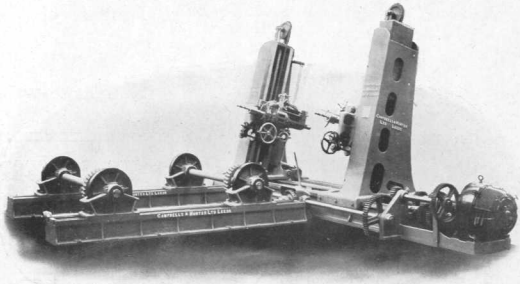

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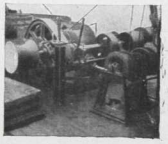

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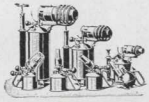

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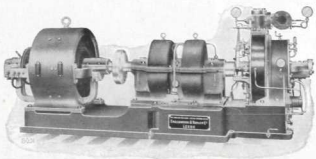

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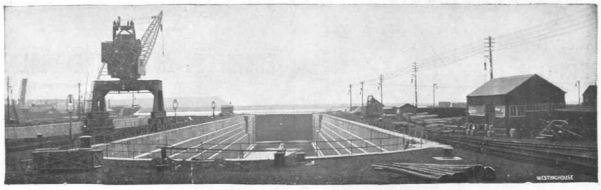

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VOL. I. THURSDAY, JUNE 26, 1913. No. 13.

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FOLLOWING on the reversal of the judgment of the Quebec Court of Inquiry in regard to the suspension of the certificate of the captain of the *Bengore Head*, to which we have already alluded, the case of the captain of the *Bellona* is particularly interesting. It will be recollected that the captain of the *Bengor Head* had his certificate suspended by the Quebec Court of Inquiry for alleged negligence in going below and leaving his vessel in charge of the second officer when going through the Straits of Belle Isle. The facts which came out at the inquiry were that the captain had been on duty for some 30 hours on account of fogs, and, anticipating a further long spell on the bridge when in the region of ice, gave sailing instructions to the second officer and turned in. The vessel went ashore, and the captain had his certificate suspended for three months, which judgment, however, the High Court in London reversed seven months afterwards. In the case of the ss. *Bellona*, she was passing through the Lower St. Lawrence with a pilot on board, and, as the captain was not feeling well, he retired to his room, leaving the pilot in charge on the bridge with the second officer. For some utterly inexplicable reason, the pilot handled the vessel in a most extraordinary way, eventually turning her in a direction entirely opposite to the course she should have gone. The officer reported this matter to the captain, who came on deck and assumed charge; but the net result of these alterations in the course took the vessel out of her bearings and she went on the rocks. The Court censured the master for staying below in his room, although, as a matter of fact, the seriousness of his illness was subsequently manifested by his having a paralytic seizure, and the Court suspended his certificate for three months, strongly condemning the custom "which appears to be too common in these waters, of the master practically giving over the charge of his vessel to the pilot and taking no further interest in the navigation thereof." When the appeal was heard in London last week, both the President and his learned colleague expressed the view that the Court below had taken a very harsh view and restored his certificate as from the date of suspension, December 5. The most unsatisfactory point of these unsatisfactory cases is that the captain had, of course, already served the full penalty set out by the Quebec Court. This makes the second case heard in London within a month in which the decisions of the Quebec Court have been reversed, but unfortunately in both cases the suspensory period had already expired, so that the victory of the appellant was more a moral than an actual one.

Quebec Stringency.

Although it is known that all the British steamship companies—notably the Royal Mail Steam Packet—interested in trade along the west coast of America, are preparing for big developments when the Panama Canal is opened, the plans of their Continental competitors are also well advanced. Indeed, whatever be the reason for their opinion, an expert committee, appointed by the French Government to consider the business changes that are likely to result from the completion of the waterway, state that Germany will derive most advantage, with Great Britain definitely second! At all events, the Hamburg-Amerika Line has not only effected an alliance with Mr. J. H. Welsford, of Liverpool, with a view to the development of trade between the North Pacific and Europe, but is also associated with Mr. Bernard N. Baker, of Baltimore, who was Chairman of the Atlantic Transport Company before its absorption by the International Mercantile Marine, in connection with the formation of an American corporation for the maintenance of a regular service on the New York-San Francisco route through the canal. The latter agreement was arrived at in mid-ocean, on board the *Kaiserin Auguste Victoria*, last November. Each of the parties is to find £1,500,000 for the joint enterprise, and it is proposed to build ten 10,000-ton steamers—six of them have, apparently, just been ordered—according to designs approved by the naval authorities at Washington, and with special reference to their use as auxiliary cruisers, or for transport purposes in time of war. This is, of course, coastwise trade, which is confined to American ships, but foreign investors can hold shares in the owning companies. There are other evidences of German activity, but the British lines are quite alive to the possibilities of the situation, and have important schemes under consideration.

Germany and Panama.

Legislation in the Commonwealth of Australia has not been uniformly kind to shipping interests. We are not surprised to learn that the Chambers of Commerce of London, Liverpool, Glasgow and Newcastle have made representations to the Government against giving assent to the Australian Navigation Bill. Indeed it is stated that in the meantime the assent will be withheld. The measure, which was framed by the Labour Government, is much more stringent than anything in the Imperial Merchant Shipping Acts. It is unduly protective in the favoured position it gives to Australian labour. For example, is lays down as imperative that under no circumstances must a crew work cargoes. In other respects it deals with shipowners in a spirit of unnecessary harshness. The same spirit seems to have extended to administration, as was seen in the recent legal proceedings against shipping companies concerned in the Australian coal trade for an alleged breach of the Commonwealth Preservation of Industries Act. Happily the Judicial Committee of the Privy Council has vindicated the innocent character of the arrangements which the Federal Government sought to impeach. But at the same time, such events reveal an attitude scarcely encouraging to the shipping interests, which contribute so much to the prosperity of the Commonwealth.

Shipping Interests in Australia.

Armed Merchantmen.

A debate in the House of Commons on the new policy of the Admiralty of arming merchant ships would, we think, be opportune. Misconceptions of the scope and aim of the scheme have arisen, and these are shared even by Members of Parliament. Mr. Molteno, M.P., we observe, has been taking objection to the policy, and if this country were acting in a spirit of pure aggressiveness then there would be ample reason for questioning its wisdom. But that is not the situation. On the outbreak of war, it is certain that if one of the belligerents were a naval Power of any importance, some of its swiftest ocean lines would be immediately commissioned for commerce destroying purposes. Certain nations further claim a right which this country has consistently controverted, to convert merchant vessels into warships on the high seas. Mr. Churchill put the matter with blunt cogency some time ago when he said that if British ships had no armament they would be at the mercy of any foreign liner carrying one efficient gun and a few rounds of ammunition.

The Thames Ironworks.

The decision of the Court of Appeal to allow the sale of the Thames Ironworks to proceed seems to be the end of the story of shipbuilding on the London River, although, despite his ill-health, Mr. Arnold Hills no doubt keeps a stout heart and is hopeful even yet of saving the business. The Poplar Borough Council's refusal to take an interest to the extent of £10,000 in a proposed reconstructed company must have been a disappointment to the promoters, because the disability—we had almost said the fatal disability—under which the Thames Ironworks laboured was made up of high Borough rates, high rates of wages, and conditions of labour which caused costs of construction to be unprofitably high. For the high wages and costly conditions the Borough Council was not to blame, but the people who elected them. For the high rates the Borough Council cannot be absolved from blame. But it would unquestionably have been just as blameworthy if it had taken up this £10,000 of stock, for the effect could not have failed to but add further to the rates without saving the district's shipbuilding industry. That is the fact of the matter which everybody east and west of Aldgate should fix in their minds. Shipbuilding and marine engineering cannot be made to pay on the Thames so long as wages are what they are and with the hours as the men would like them to be. It is nonsense to assume that the industry is being destroyed by the action of contractors in the North. The simple truth is that under the conditions which have been set up by the trade unions and the Borough Councils, shipbuilding cannot be made to pay on the Thames side.

The U.S.A. Seamen's Bill.

This Bill, introduced last year into Congress by Senator La Follette, vetoed by President Taft, and subsequently reintroduced this Session, is having a chequered career. The main features of the Bill were given in a note on page 246 of our issue of May 15. Latest mail advices state that the Committee on Commerce of the Senate has decided to postpone action upon the Bill, so as to give the new members of the Committee an opportunity to familiarise themselves with the testimony that was brought out at the extensive hearings last winter. This action was due to the very apparent fact that few members of the Committee are posted as to the provisions of the Bill, and it is desired that they shall all know what they are discussing before taking a vote. Of course, the sub-committee members are all well posted and are firm in their conviction that the Bill which was passed by the Senate last winter should be adopted; but aside from these three or four Senators little is generally known upon the subject. A strong effort is being made by the labour interests to try to get the full Committee favourable to the La Follette Bill. The Committee on Commerce has been in consultation with the Secretary of Labour and the Secretary of Commerce, and it is reported that he intends to try to get the full Committee agreeable to adopting the La Follette Bill. Now, however, the time of the Senate is fully occupied with the Underwood Tariff Bill, and so shipowners are hoping that the Seamen's Bill will be shelved until next Session.

The French Merchant Fleet.

Out of more than 42,000,000 tons comprising the whole merchant fleet of the world, England owns 19,000,000 tons, the United States 7,500,000, Germany 4,700,000, and France only about 2,300,000. The figures for France can hardly be satisfactory to that country when compared (1) with the greater importance of foreign merchant fleets, and (2) with the increase in French sea-borne traffic. In 1911 the sea-borne traffic of France amounted to 35,000,000 tons, but of this only 10,687,935 were carried by ships flying the French flag, or only about 30 per cent. The great difficulty in France seems to be to find heavy cargo for export. The total export in 1911 amounted to 8,000,000 tons. Of these, 4,370,662 tons were carried by French ships, or over 54 per cent. Few countries receive such financial assistance from the State as France. During 1911, the last year for which complete figures are available, over 22,000,000 francs were distributed to the merchant marine as navigation premiums, and the amount paid to shipbuilders in 1911 was over 11,000,000 francs. Thus a total of 33,000,000 was spent on the merchant marine in 1911 alone, without taking into account premiums to deep-sea fisheries, which are also paid to encourage men who live on the coast to undertake a seafaring trade. In 1902 the total premiums allotted to shipbuilders exceeded 15,000,000; in the following year they fell to 6,000,000, but in 1904 they were 8,650,000, while in 1908 they exceeded 12,800,000. The aggregate premiums allotted from 1902 to the end of 1911 amount to the huge figure of 90,000,000 francs. The aggregate navigation premiums from 1902 to 1911 amount to 273,000,000 francs. As early as 1881 premiums were given to shipping, and they were extended in 1893 to shipbuilding. From 1902 to 1911 364,000,000 francs were paid to the mercantile marine of France.

The Size of Cargo Steamers.

In recent years a point frequently made by commentators on shipping affairs has been that the bigger a passenger or a cargo steamer is the better will she pay. The statement is quite true, but only up to a point. For instance, more than one port authority is already complaining of the burden of capital expenditure which the leviathan liner is laying up for them. But there appears to be reaction in much less exalted a circle than that of the large liner. The average cargo steamer is growing too big for a good deal of the world's trade, although its greater carrying capacity is not a disability but rather an advantage in the long trades. Of late very few handy-sized cargo steamers—vessels of from 2,000 to 4,000 tons capacity that is—have been built, and a large number which were on the register of the United Kingdom have been sold to foreigners. The result is said to be that for trades like those to the Baltic and the Mediterranean there is a scarcity of ships of the size. It would be interesting to know a little more about the business—why, for instance, larger ships cannot be employed. The reason can hardly be that the larger vessels cannot be remuneratively employed, because in the economy of cargo carrying bulk counts heavily. Big steamers may be dear because of the demand on them elsewhere. But vessels of from 2,000 to 4,000 tons d.w. are not incapable of service on ocean trades, so that they also must be in brisk demand elsewhere. The types are on all fours so far as all-round competition is concerned. If the explanation is not that the modern cargo steamer has outgrown the accommodation of the average Baltic or Mediterranean port

the position to which the cargo steamer has come is distinctly perplexing. In any case, there seems to be an opening for builders of medium-sized general cargo steamers which nobody has up till now suspected.

The Kaiser and the Development of Shipping and Shipbuilding.

It is generally conceded that the enormous development of German industries during the past 25 years has been due very largely to the influence of the Kaiser. He has always shown himself a strong advocate of the practical application of science and the impetus given by his whole-hearted interest in the commerce of the German Empire is unchallenged. Even where the Germans have not commanded the market—and this applies especially to shipbuilding—it is acknowledged that their technical knowledge of the subject is certainly equal to ours and probably superior to that practised in the majority of shipyards in this country. In fact, many writers have urged that it is this practice of considering each vessel on its merits rather than endeavouring to make it conform to a common type that has retarded this branch of Teutonic industry. Be that as it may, the Kaiser has always been ready to lend his services wherever they could be of advantage. As regards the development of the Navy, his influence goes unquestioned, whatever may be one's views as to whether the excessive acceleration be wise or not. As regards shipbuilding generally, it is doubtful whether Germany has participated in the general boom in the same ratio as this country, but it is probably the fact that she has shown a greater relative development in shipping; and the building of such vessels as the *Imperator* and the *Vaterland* are proof that there is no decadence in her attempt to rank as a sea carrier of the first order.

Reduction of Material in Large Vessels.

The modern tendency is to reduce the weight of ships of large dimensions and, in consequence, the displacement, in order to increase their speed. This may be effected by a change of construction on the longitudinal frame system and the better distribution of material, so as to raise the moment of resistance of the midships-section. However, classification societies differ considerably in their practice as to the permissibility of certain scantlings. The Germanischer Lloyd, who up to 1904 granted considerable concessions for fast, fine-lined vessels, now only grants certain reductions on the basis of carefully prepared calculations of the ship's strength and in consideration of the circumstance that fast ships combine a high freeboard with fixed load conditions. The British Corporation is inclined to be more stringent as regards this type of vessel than on the normal type of steamer. Lloyd's Register leans to the opposite direction, for according to its regulations large vessels of fine lines, little load and fixed freeboard enjoy *a priori* the privilege of reduction in material, determined by the Committee. It is true, as the older opponents of such concessions maintain, that the vessels in question are subject to frequent changes of strains owing to their sharp-cut extremities and to the fact that, the displacement being concentrated midships, they are exposed to higher vertial oscillation as well as to a greater pitch. Recent research, however, inclines in favour towards fast steamers with sharp, clean outlines, rather than to the ordinary type as regards the strains in question, especially since in fast passenger steamers, with an almost constantly equally distributed load, heavy local weights cannot cause an increase in the moment of inertia of the mass midships. Denny realised in 1892 the very best results with his structures of very fine design. Alexander arrived at the same conclusion, finding that a steamer with full lines is more heavily taxed as to strain. The conclusion arrived at, therefore, seems to be that the steamer of large dimensions with a reduced cross-section of material corresponds to the requirements of modern technical science.

Cylinder Laggings for Marine Engines.

With the internal combustion type of engine efforts have to be directed towards getting rid of the heat set up in the course of working, whereas in the case of the steam actuated engine the endeavour is in the opposite direction, namely, that of keeping the heat in. In the "good old days" of compounding the steam jacket was familiar to those who were at sea. The method was then chiefly teak or mahogany, brass bound and packed with hair felt, the outward appearance being a pleasing and well-finished one. To-day planished steel sheeting is the usual lagging, and in many cases there is no non-conducting material or packing other than that supplied by Nature. This subject was dealt with some time ago in a paper read before the Institute of Marine Engineers, entitled "Notes upon a Marine Engine," when the author incidentally remarked that with the high temperatures of modern steam pressures hair felt, when used for lagging, burns to dust, while asbestos sheets but inadequately fill up the uneven spaces. There is, he remarked, nothing like a good mortar non-conducting composition put on when the cylinders are under steam, either in the shop or on board, and the steel sheets fixed in place afterwards. It is, moreover, important that such lagging should be allowed to dry out before the sheets are screwed up, otherwise they will rust badly from moisture. Brass instead of steel screws are recommended for securing the sheets as being impervious to rust and thus much less likely to cause trouble and expense when removing the sheets after a period of service.

Boilers on German Warships.

Until 1890 the cylindrical fire-tube type of boiler was almost exclusively used in the German Imperial Navy. However experience soon showed that what suited the merchantman did not of a necessity suit the man-of-war. And thus we find at the above date, whilst the merchant fleet used exclusively the cylindrical tubular boiler of improved types, the Navy tended to use exclusively the water tube, especially the Schulz generator. However, this transition from fire-tube to water-tube was not so sudden in so far as at first both types were used on the one and same ship at the same time, amongst others on the *Kaiser Wilhelm der Grosse*, *Wilhelm II*, *Barbarossa*, *Karl der Grosse*, &c., on which three-fifths of the power was generated by cylindrical boilers and two-fifths by the Thornycroft or Schulz, boiler. The same was the case with the cruisers of the *Braunschweig* and *Elsass* class ordered in 1902. More recent vessels, however, except the *Deutschland*, use the Schulz boiler exclusively. France, England and America did not stop at the Navy, but also introduced the water-tube boiler of the Belleville, Niclausse and Babcock & Wilcox types. This example was not followed by the Germans, who maintained that (1) the water-tube generator requires a specially trained staff little suited to attend boilers of a different type found on other ships and hard to replace at foreign ports, and (2) that safety and economy with the water-tube boiler were harder to achieve, depending on very careful handling, and there was, moreover, the long and costly maintenance work. Of course, in the Navy these inconveniences fall away, because the crews are specially trained. For this reason, the German Admiralty tends to unify the type of generator on all its ships, adopting exclusively the Schulz generator. This, in one sense, is of course of considerable advantage, since the vessels become as it were homogeneous as regards working, cost of fuel, coaling, consumption of coal, water and material. Moreover, the boiler staff can be changed from boat to boat with great advantage. It may be urged against these advantages that the same type is not suitable for every class of vessel in a Navy and the perfecting of this one type is after all limited. In France, apparently, different divisions are fitted with different types of boilers. However, the Germans seem satisfied with the results.

THE "INSTITUTE TIME AGREEMENT."

While there is no doubt that the "Institute Time Agreement," which came into operation last year, was forced upon underwriters by the circumstances in which they found themselves, steam shipowners are naturally beginning to feel the pinch of advanced rates of insurance. The agreement in question only applies to tramp steamers registered in the United Kingdom and expressly excludes insurances on "liners," trawlers and tugs, as well as on passenger steamers, Government steamers, railway and telegraph steamers, and also on dredgers. Up to the middle of last year it had been possible for owners of tramp steamers to systematically undervalue their boats for insurance and make up the difference by effecting insurances on "disbursements." For example, should an owner acquire a new steamer for £50,000 he could value her for insurance at £40,000 and cover the balance on disbursements, at say 35 per cent. The consequence was that underwriters found themselves in the position of having to pay claims, the cost of which had rapidly increased, and for which they were getting no compensating premium. The basis of the Hull time agreement was, therefore, the insistence of a "15 per cent. disbursements" clause, by which the amount allowed for disbursement insurance was limited to 15 per cent. of the value of the hull. This amount had to cover the usual disbursements of the voyage, &c., so it was tantamount to compelling an owner to insure his steamer at her full value. The agreement itself called for an increase in the values of 15 per cent., or, as an option, an increase of 10 per cent. in the value and 5 per cent. in the rate of premium aggregating on the whole of a fleet. It will be seen, therefore, that the agreement was not actually an advance in rates, but was in effect to compel owners to place the values of their steamers on a basis which was equitable for underwriters. The agreement in question has now been in operation for nearly nine months and appears to have worked out satisfactorily in spite of various attempts to upset it.

On the other hand, tramp owners have much reason for complaint. Liners are expressly excluded from the agreement, and yet many boats in the fleets of liners are employed from time to time in taking full cargoes which ordinarily would fall to the lot of the tramp.

The real hardship, however, is that the agreement only applies to vessels registered in the United Kingdom. British vessels registered abroad and foreign-owned tramp steamers can be insured in London on the old terms and conditions. The result of this is that the British tramp owner is compelled to face competition with foreign-owned boats insured on less onerous terms in the London market. The case of French owners is particularly flagrant. French underwriters, for reasons best known to themselves, underwrite French hulls at lower rates that it is possible to cover similar vessels under the British flag and permit values which are absurdly out of proportion to the cost of the vessel. New British tramps are insured in London at 6 gs. per cent., with a valuation which must be about £12 per ton on the gross register. A similar steamer for French owners, which would cost them considerably more to build, is insured for about 5 per cent. and the value is based on about £6 per ton—the difference being covered on "safe arrival" at a total loss rate. To make matters worse, British companies accept these rates and terms through their French agencies and the balance is frequently completed at Lloyd's. Dutch underwriters are making an effort to formulate a tariff for Dutch hulls, but complaint is made that whenever an attempt is made to put up rates, underwriters at Lloyd's at once step in and take the business. In the case of German hulls the market in Hamburg is generally able to absorb the greater part of the business, but here again rates are more favourable to German tramp owners than to their British *confrères*. Norwegian hulls have for years been effected almost entirely in Norway, where a tariff is in existence which is more elaborate than anything attempted on this side. The premium is based on rates which vary automatically by the value per ton of the steamer. The owner is, therefore, compelled to effect a full insurance, because if he does not he has to pay a proportionately higher rate.

The actual result of the movement by underwriters is shown in the disposition of British tramp owners to modify their rates of premium by running a proportion of their particular average claims themselves; and there is no doubt that this idea will be considerably developed in the future. One thing is quite certain. Underwriters in the past have had to pay more for particular average claims than owners were actually entitled to claim; and it is an extraordinary fact that the boats of owners where a proportion of the particular average is uninsured become payable risks, whereas under the old condition underwriters lost money on the fleet every year.

SHIPYARD LABOUR TROUBLES.

The labour outlook in shipbuilding has undergone some improvement since the date of our issue of last week, although the main trouble which threatens the industry is still uncomposed. The members of the Boilermakers' Society and of the Allied Shipyard Trade Unions are now balloting for or against the offer which the employers made at the last conference in Edinburgh, and by the middle of July the industry, as a whole, should know the worst the future has in store for it. The strike at Southampton of men belonging to the engineering trades has, however ended, and work has been resumed both at the docks and at the shipyards. Fifteen weeks ago the men struck because the employers, in the district, would not concede to them an advance of 3s. a week. The employers offered first a shilling on what is called "a long agreement," and subsequently a shilling unconditionally. The men rather scornfully rejected both offers. Then, as a result of the intervention of outsiders, including two Labour Members of Parliament in the persons of Mr. Barnes and Mr. Henderson, the offer was increased to 1s. 6d. The employers were led to believe the men would accept that. But the men did nothing of the kind, and so the strike dragged on until last week, when the 1s. 6d. was accepted by as decisive a majority as it had been rejected a week or two earlier. As a shilling was offered before the stoppage took place, the cost of securing the additional sixpence has been rather heavy.

In the shipyard question all the executives have recommended the men to accept the offer of the employer. That offer is to increase to the extent of a shilling a week, as from the first pay in August the wages of all timeworkers, and to add the 2½ per cent. desired by the Boilermakers' Society for the riveters to the current piece prices. The employers decline to give anything to the piece-workers. Moreover, they stipulate that the proposed terms of settlement must be accepted by the whole of the trades—by the boilermakers, that is to say, as well as by the members of the Allied Unions. The effect of that stipulation is to make acceptance or rejection dependent upon a pooled vote. Strictly speaking, the Boilermakers' Society is not obliged to pool its vote, because it is not bound by the terms of the Shipyard Agreement. As the great majority of the piece-workers to whom an advance has been refused are members of this Union, there is a danger here which can hardly be ignored. But it is minimised by two things. One is that the executive council of the organisation has recommended the men to accept the terms. The other is that the effect of their last ballot on the question was really to pledge the Society to a pooled vote. They were asked to vote for or against giving authority to the executive council to act in the matter of the general advance with the executive of the other unions. If the other unions are agreeable to allow a pooled vote to decide the matter, the Boilermakers' Society can hardly stand out.

As has been stated, all the executives concerned have counselled their men to agree to the proposals. The leaders of the Boilermakers'

Society do so in unmistakable terms. They were, they admit, disappointed. But there was some satisfaction. They go on to say, in the concessions to the riveters which would settle a long-standing difference. It is pointed out that even with this shilling added to their wages, the timeworkers will have received less in this spell of activity than the advances conceded in the same period to piece-workers. A plea which is likely to carry more weight with the men is that in consequence of their high wages and the employers' complaints about the time they habitually lost, they could count on very little Trade Union sympathy in a strike. Then, there is a suggestion that having obtained practically all they asked for, the timeworkers may vote heavily for acceptance. Members are, therefore, recommended to vote for acceptance of the terms as the best obtainable in the circumstances. The Shipyard Trades' Committee is less definite in its advice, but its meaning is clear enough. A cessation of labour in the shipbuilding industry would involve, they say, not only the members of the joint trades, but also a large mass of lower-paid workmen. A stoppage should be avoided, it is stated, if at all possible. The boilermakers are voting this month, and the ballot of the Allied Trades is to be completed by July 10.

MARINE BOILERS.

Where marine practice is concerned the present is a time of change with regard to types of boilers. For large ships under ordinary conditions, and where the extremes of lightness or of speed on a given displacement have not to be attained, the Scotch boiler seems at present to be considered as fulfilling most satisfactorily the all-round requirements for a marine boiler, and in consequence it is found almost universally in the mercantile marine. It is also used to some extent in naval practice, though the use of water-tube boilers is extending rapidly in this direction where their special features become of marked value. It is, in fact, not too much to say that in most of the modern naval constructions the water-tube boiler is accepted as the standard type, to the exclusion of the fire-tube boiler.

In a recent issue we reviewed a somewhat notable work entitled "Practical Marine Engineering," in the course of which this subject of marine boilers was very largely and admirably dealt with. It was there pointed out that the water-tube boiler is at present making large advances in the mercantile marine, and not a few modern ships included therein are now equipped with this type of boiler. For fast yachts, launches, all craft of the torpedo boat type, and, in fact, in all cases where the highest speed is to be obtained on the least weight, the water-tube boiler has become a necessity, and in one of its many forms or another is universally employed.

The weight of Scotch boilers, without water, per sq. ft. of heating surface is usually from about 25 to 30 lb., and water-tube boilers of the lighter types from 12 to 20 lb. The weight of the contained water per sq. ft. of heating surface is usually from 12 to 15 lb. for Scotch boilers, and from 1·5 to 3 lb. for water-tube boilers. It results that Scotch boilers with water will weigh from, say, 35 to 50 lb. per sq. ft. of heating surface, while water-tube boilers will similarly weigh from 13·5 to 23 lb. These figures are not to be considered as giving absolute limits, but simply as representative values for average types. It should be noted however that a square foot of heating surface in a Scotch boiler seems to be somewhat more efficient than in a water-tube boiler. It is difficult to estimate the difference numerically, but other conditions being equal it will probably be safe to give to the water-tube boiler additional heating surface to the extent of from 10 to 20 per cent. On the other hand it must be remembered that water-tube boilers can stand forcing to a much higher degree than fire-tube boilers. With the latter supplying steam to triple-expansion engines the ratio heating surface to i.h.p. can hardly be reduced below 2, whilst with the former this ratio has been reduced in many cases to less than $1\frac{1}{2}$, and in certain extreme cases to something between 1 and $1\frac{1}{2}$.

Water-tube boilers have the further advantage that they are more readily adapted for the higher steam pressures which modern practice is continually demanding. With water-tube boilers there is, owing to the construction and the smaller amount of contained water, less danger from disastrous explosion. The type is a much

Type of Ship.	Intermediate Passenger Steamer.		Large Cargo Liner.		Large Combined Passenger and Cargo Liner.		Large Intermediate Atlantic Liner.			Large Fast Atlantic Liner.			Large Fast Atlantic Liner.	
Estimated steam production per hour from feed at 150° F. 200 lb.	75,000		112,500		140,000		240,000			750,000			1,000,000	
Estimated steam per I.H.P. per hour for all purposes ...	15		15		14·0		15			15			14·3	
Equivalent horse-power	5,000		7,500		10,000		16,000			50,000			70,000	
Type of boiler	Cylindrical	Babcock	Cylindrical	Babcock	Cylindrical	Babcock	Cylindrical	Babcock	Babcock alternative	Cylindrical	Babcock	Babcock alternative	Cylindrical	Babcock
Heating surface, sq. ft.	13,300	16,370	21,750	25,850	28,500	32,515	52,150	57,810	66,200	146,000	188,510	164,650	158,350	221,544
Grate area, sq. ft.	335	450	530	650	700	900	1,260	1,600	1,800	4,000	5,170	4,480	4,050	5,474
Approx. weight of boilers and water, and all mountings and fittings, but no funnels or uptakes, or stokehold accessories, tons...	420	195	535	282	780	380	1,320	672	825	4,200	2,380	2,035	4,750	2,615
Draught	Howden	Assisted	Assisted	Assisted	Howden	Assisted	Natural	Natural	Natural	Assisted	Assisted	Assisted	Howden	Assisted
Floor space occupied by boiler-rooms, sq. ft.	1,850	1,585	3,420	2,280	3,835	3,068	7,275	5,700	5,920	20,298	20,268	13,460	18,235	16,115
Fore and aft length of boiler-rooms and transverse bunkers	56 ft.	44 ft.	72 ft.	51 ft.	77 ft.	71 ft.	127 ft.	108 ft.	117 ft.	321 ft.	321 ft.	232 ft.	—	—
Increase of H.S., per cent. ...	—	23·0	—	19·0	—	22·5	—	10·81	26·9	—	29·0	12·8	—	39·9
Increase of G.S., per cent. ...	—	34·3	—	22·5	—	28·5	—	27·0	42·8	—	29·15	12·0	—	35·3
Saving in weight, tons	—	225	—	303	—	400	—	648	495	—	1,840	2,165	—	2,135
Saving in floor space, per cent.	—	14·33	—	Entire forward stokehold	—	20 per cent. and longitudinal bulkheads now fitted 6 ft. 6 in. from sides	—	Entire forward stokehold	10 ft. saving in length and longitudinal bulkheads 7 ft. in from side adopted	—	Existing spaces used to instal much larger boilers	Longitudinal bulkheads installed	—	11·63
Saving in fore and aft length ...	—	12 ft.	—	Abt. 27 ft.	—	6 ft.	—	21 ft.	—	—	—	69 ft.	—	53 ft.

Table showing comparative Sizes, Weights and Spaces of Cylindrical and B. & W. Boilers.

more portable one and steam may be raised much more quickly by its use than with fire-tube boilers. Against these advantages it may be said that the water-tube boiler imperatively requires fresh water feed. Under modern conditions this should be provided, no matter what the type of boiler in use, but if, in an emergency, salt water must be used, the fire-tube boiler will receive the lesser injury. Again, from the small amount of water contained as a stock upon which to draw, the water-tube boiler requires a more uniform feed than the fire-tube boiler, and is generally more sensitive to variations in the conditions under which it works. The rupture of a tube is a more serious matter in the water tube than in the fire tube boiler, and the first-named type is not so readily made in large sizes or units. Scotch boilers may be made in 2,000 h.p. units, or even larger, while half of this or less is about the maximum for the water-tube boiler.

The paper which was ready a month or so back before the Institute of Marine Engineers, by Mr. James H. Rosenthal, gave some interesting particulars regarding the Babcock & Wilcox water-tube boilers for marine purposes. In the early installations of this boiler, troubles were encountered, but much valuable experience regarding designs and operations was gained from them and this materially assisted in eradicating defects and leading to the present-day successful use of this boiler in the mercantile marine. The troubles referred to were only to a small extent due to questions of construction, and practically the only real defect in design was the lack of combustion space in the furnace. The troubles mainly arose from salt water leaking into the feed water through the condensers on some of the ships being unsatisfactory; from the steam production for which the boilers were designed being assumed to be less than what was really required, and from lack of suitable attention.

Constant improvements in material, especially in the quality of tubes obtainable, and design of detail coupled with improved proportions of furnace and in the heating surface for the work to be done, together with the increased knowledge, resulting in a large measure from the earlier experiences, have been the elements upon which the present day success has been based. The large grate and combustion chamber in the Babcock boilers is found to be of great advantage, and experience has shown that the essentials necessary to ensure the successful use of water-tube boilers in the merchant service are:—

1. Well constructed and tight condensers.
2. The use of as little oil as possible in the engine cylinders and proper means of filtering the feed water.
3. Evaporators of adequate size, or other means of ensuring fresh water for feeding the boilers.
4. Regular examination of the water in the boilers.
5. A careful and interested engineer.

The whole of these matters have received very careful attention at the hands of the makers of the Babcock & Wilcox water-tube boilers, the use of which in many classes of sea-going vessels is rapidly extending.

We reproduce on page 461 a table included by Mr. Rosenthal in his paper, for the purpose of showing the comparative sizes, weights and spaces of cylindrical and Babcock & Wilcox boilers.

One point of disadvantage in the present type of marine boiler, where the gases are lead direct from the furnaces into the smoke tubes is that combustion stops a very few inches along the inside of the tubes, entailing a great loss of heating power arising from the gases by incomplete combustion. The design of marine boiler made by the Inglis Boiler Syndicate, Ltd., is such as to quite overcome this, while a correspondingly greater efficiency is obtained The construction at the same time ensures constant temperatures at the tube plates which will naturally considerably increase the life of the boiler.

The attention of marine engineers has for some long time past been given to the question of superheating; the adaptability of superheated steam for marine purposes being now an assured fact especially on the Continent, as a means for increasing the efficiency of the boilers and engines. In several instances in marine practice, where superheaters have been installed, there has been a gain of 18 per cent. over the saturated steam conditions. The earlier troubles of faultiness of design, lubrication, packing, &c., having been overcome, there is no reason why superheated steam should not now make the same progress in marine practice that it has done on land. The present trouble in connection with fitting superheaters to marine boilers is that they are usually placed in the uptake, in a position where they are more or less inaccessible, and at present it is a question not so much of the saving of coal and better steam conditions, but of the cost of upkeep that has to be considered.

With the Inglis boiler the front combustion chamber seems to be an ideal place for the superheater, and this, we think, is a point which will readily appeal to marine engineers. By removing the cover the superheater can be inspected, cleaned of soot and any section removed without interfering with or disturbing the whole superheater or the connecting pipes, also by placing the superheater in this position the tubes do not come in the direct path of the gases, and are, therefore, less liable to burn out when the superheater is out of action—a very important matter from the marine engineer's point of view. At the same time, however, the superheater is in a chamber where a constant temperature is maintained.

PUBLICATIONS RECEIVED.

[*A short notice of any publication does not necessarily preclude the subsequent appearance of a longer review.*]

Machine Construction and Drawing. By G. Udny Yule. London: G. Routledge & Sons, Ltd., 68 to 74, Carter Lane, E.C. $8\frac{1}{2}$ in. × $5\frac{1}{2}$ in. × $\frac{1}{2}$ in. pp. 143. Cloth, 1s. 6d. net.

This is somewhat of an elementary text book, and is particularly suitable for students in the early course of their studies at the evening technical school. The drawings are well reproduced and should afford material assistance to young students, although the work is not to be despised by those who have considered themselves past their embryo stage.

Rhodes's Directory of Passenger Steamers, 1913. Issued by Thos. Rhodes & Co., London, W.C. London: George Philip & Son, Ltd., 34, Fleet Street, E.C. $7\frac{1}{2}$ in. × 5 in. × $1\frac{1}{2}$ in. pp. 389. Cloth, 2s. 6d. net.

This useful publication needs no introduction to the shipping fraternity, and it follows the lines generally adopted in previous editions, with, of course, the up-to-dateness and enlargement consequent upon the increased activity and augmentation of our merchant fleet.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by correspondents.*]

CHANNEL TRAIN FERRIES.

6, Boulevard des Capucines, Paris.
June 23.

To the Editor of The Shipbuilding and Shipping Record.

I am gratified to see from a note in your issue of the 19th instant, that you appreciate the convenience of a channel train ferry for the purpose of conveyance of merchandise. Perhaps you will permit one who has had this matter under constant study for the last 10 years, to correct one or two slight misconceptions contained in your note.

The French rail gauge is for all practical purposes identical with the English, the actual difference being a matter of a few millimetres only. The load gauge is no doubt different, but it should not be forgotten that the Western Railway of France was originally built to the English load gauge, and has been accommodated to the larger rolling stock of the other French lines by the ingenious

expedient of lowering the track under bridges and tunnels, so that the cars of the other lines can now run to Dieppe and Havre. The convenience of the scheme for the travelling public is no doubt a matter of personal appreciation, but the testimony of all those who have travelled on the existing ferries, and particularly on the Sassnitz-Trelleborg ferries which convey through trains every day between Berlin and Stockholm over a sea passage just about the same length as the Newhaven-Dieppe crossing, will certainly not coincide with that of the Brighton Line official whose remark you quote.

Such constructional problems as would be presented in the Newhaven-Dieppe crossing have all been solved elsewhere; and as for shunting difficulties, these in practice are so insignificant that an ordinary express train can be transhipped within a space of 10 minutes.

OLIVER E. BODINGTON.

THE "QUEEN MARY" RUDDERS.

A feat of more than ordinary magnitude has recently been carried out at the Newburn Steel Works of Messrs. J. Spencer & Sons, Ltd., and we illustrate the work on pp. 473 and 474. These illustrations refer to the making of the two rudders, the rudder trunk and the propeller struts, for the *Queen Mary*, the cruiser built by Messrs. Palmers Shipbuilding & Iron Co., Ltd., Jarrow-on-Tyne. The *Queen Mary* has two balanced rudders, each frame being of the following dimensions:—Length from top of head to extreme bottom, 25 ft.; from centre of head to extreme aft, 15 ft. 9 in.; from centre of head to extreme forward end, 7 ft. 8 in.; weight, 34 tons.

The whole of the head was machined and a phosphor-bronze sleeve fitted, the sleeve being 36 in. diam. The rudder trunk illustrated gives direction to the two rudders. The weight of this is 22 tons. The weight of the propeller strut is 24 tons. The photograph of Messrs. Spencer & Sons' machine shop shows the rudder frame on the machine.

THE NEW LIVERPOOL PILOT STEAMSHIP.

There has just been completed by Messrs. Murdoch & Murray, Ltd., Port-Glasgow, the steel screw steamer *Alfred H. Read*, which has been built to the order of the Mersey Docks and Harbour Board, Liverpool, for their pilotage service, the vessel being named after Mr. Read, the chairman of the Pilotage Committee.

The dimensions are 140 ft. × 27 ft. 6 in. × 14 ft. moulded, and there are complete main and lower decks and long forecastle and boat deck, forming promenade. Sleeping accommodation is provided on the lower deck for 36 pilots in large four-berth state rooms entered from a handsome alleyway, and bathrooms and lavatories are arranged conveniently. At the after end of the lower deck comfortable accommodation is fitted up for apprentice pilots, engineers, cooks and firemen. On the main deck amidships there is a large dining saloon extending the full width of ship. Opening off fore end of saloon there is a large smoke room and lounge, handsomely panelled and upholstered. Lavatories and cloak rooms are arranged in convenient positions throughout the ship. Two master pilots are berthed in large rooms opening from the chart-house. The boarding punts are handled by means of a special steam winch arranged for the purpose. Morse signalling apparatus is fitted on the masthead and controlled from the bridge, as well as the latest type of semaphore signal.

The machinery is by Messrs. Ross & Duncan, Govan, and consists of a set of triple-expansion surface-condensing engines, having cylinders 13½ in., 22 in., and 36 in. diam., by 24-in. stroke, giving a speed of 11½ knots per hour. The engines are reversed by direct steam gear of Brown Brothers' make. Lockwood & Carlisle's patent rings are fitted in all the pistons and in the high-pressure valve which is of piston type. The bearings are all of specially large surface for easy running, and the connecting rod bearings and main bearings are lined with Stones' navy bronze.

The condenser is of pear shape, the circulating pump being of Messrs. Gwynne's centrifugal type, the air pump Messrs. G. & J. Weir's Monotype, and the feed pumps a pair of Nichol's vertical direct-acting type, fitted with gunmetal water ends and float tank with automatic control gear. The vessel is illustrated on page 465.

SS. "PALMELLA."

The ss. *Palmella* (see page 464) was built by Ramage & Ferguson, Ltd., Leith, for the Ellerman Lines, Ltd., for the firm's London and Portuguese trade.

The *Palmella* is slightly larger than the *Estrellano*, built by the same builders two years ago, the dimensions being:—

Length	233 ft. B.P.
Breadth	37 ft.
Depth moulded	18 ft. 9 in.

The vessel is of the poop, bridge and forecastle type, with two decks laid. A distinctive feature of the hull is a cruiser stern, which provides large deck space in the poop and will prove beneficial when the vessel is in a heavy following sea. The steamer is built in excess of the requirements of Lloyd's highest class on the longitudinal girdered pillar system, without side stringers or hold beams, bilge keels formed of bulb plate and tee bars. Pillaring in the holds is of the cylindrical tubular built type. Three large hatchways are fitted with winches, derricks and cargo gear of a suitable description for the rapid handling of cargo. The saloon is in a steel house on bridge deck, and is tastefully fitted with polished hardwood panelling. Accommodation for officers and engineers is provided in steel houses on the bridge deck, and the rooms, throughout are exceptionally large for a vessel of this class.

Steam steering gear by Hastie is placed in the engine room, with controlling shafting to steering column and wheel on flying bridge. A steam windlass of the positive clutch type, by Clarke, Chapman, is fitted on forecastle head. A Lord Kelvin's standard compass is placed on the top of chart house.

Stockless anchors and a full outfit of boats to the Board of Trade requirements have been supplied. Steam heating is fitted throughout, with heat radiators in each room.

Electric light is fitted throughout the vessel, and there is a complete outfit of electric cargo lamps.

The deadweight capacity of the vessel is about 2,000 tons, and on the trial trip a mean speed of 11 knots was obtained, the machinery working smoothly throughout the trials.

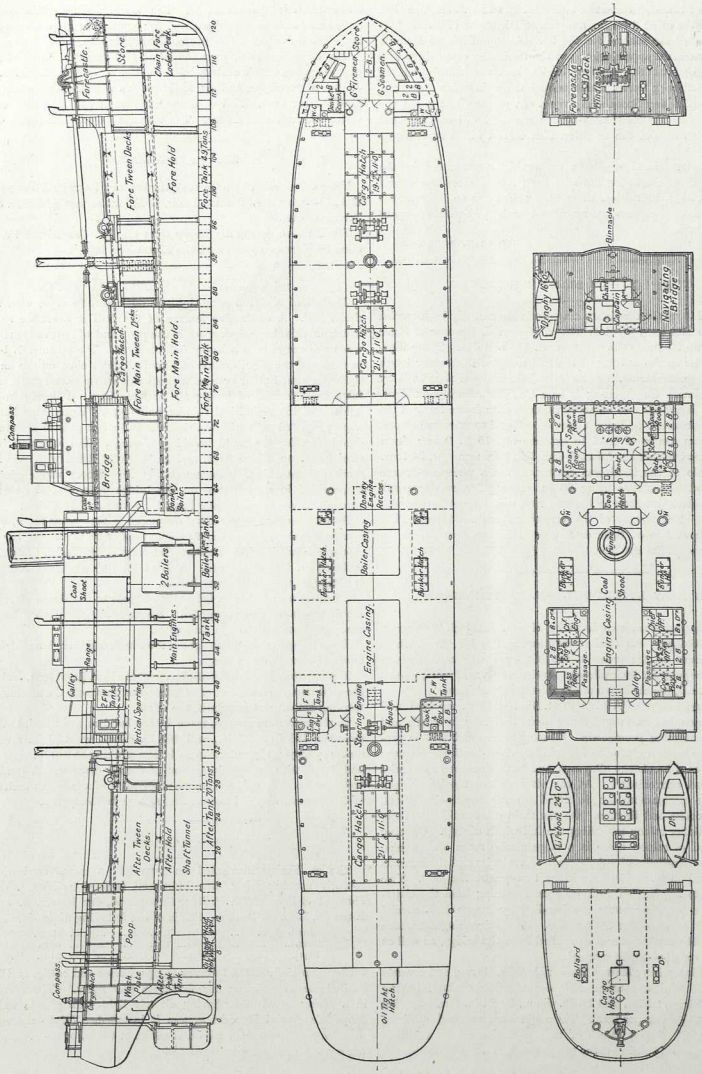
Triple-expansion engines, made by the builders, are fitted, having cylinders 16½ in., 28¼ in., and 48½ in. diam., with 33 in. stroke. Steam is supplied from two large boilers working at 210 lb. pressure and fitted with Howden's system of forced draught. A donkey boiler is also fitted, and the engine room outfit of auxiliaries includes Weir's pumps and feed heater, and a large ballast pump.

SS. "HARLOW."

The ss. *Harlow*, illustrated on page 466, a new vessel which recently ran her trials, was built and engined by Messrs. Wm. Doxford & Sons, Ltd., Pallion, Sunderland, for Messrs. J. & C. Harrison, Ltd., of London. She is of the following dimensions:—

Length	470 ft.
Beam	58 ft.
Depth	28 ft. 5 in.

She is specially fitted to carry troops, horses and cattle, and has limited accommodation for first-class passengers. The *Harlow* is a nicely fitted boat having electric light throughout, whilst Howden's Forced Draught system is installed. Triple-expansion engines, with cylinders 29 in. × 49 in. × 80 in. × 60-in. stroke, are capable of propelling her at 13 knots.


Fore Castle
Store
Chain Fore Locker Deck
Fore Tween Deck
Fore Hold
Fore Tank 23 Tons
Cargo Hatch
Fore Main Tween Dck
Fore Main Hold
Fore Main Tank
Compass
Bridge
Boiler Casing
Boiler Casing Hatch
Boiler Casing Ventilator
Boiler Casing Ventilator
2 Boilers
Coal Shoot
Galley
Engine Casing
Main Engines
Vertical Spurring
Steering Engine
Rudder
After Tween Deck
After Hold
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After Tank 20 Tons
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Wash Room
Rope Locker
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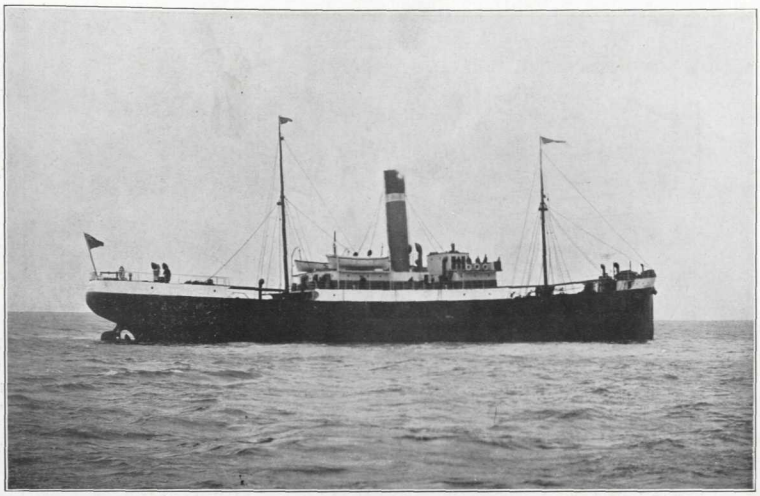
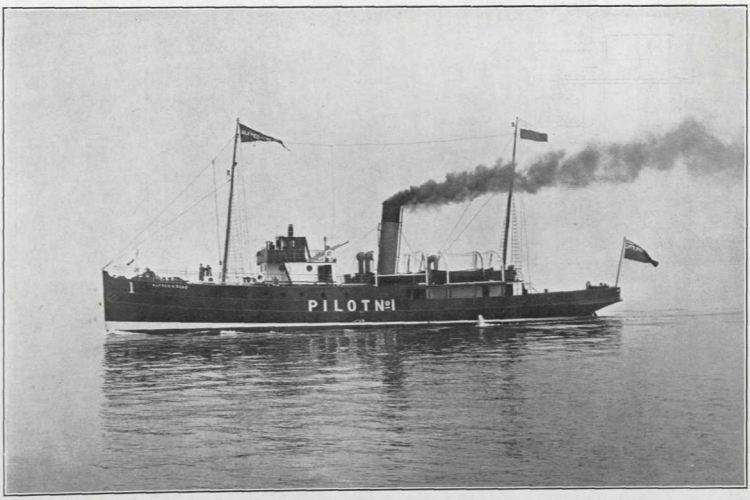
Cargo



SS. "Palmella," built by Ramage & Ferguson, Ltd., Leith, for the Ellerman Lines, Ltd. (*See page* 463.)



New Pilot Steamer "Alfred H. Read," built by Murdoch & Murray, Ltd., Port-Glasgow, for the Mersey Docks & Harbour Board, Liverpool. (*See page* 463.)

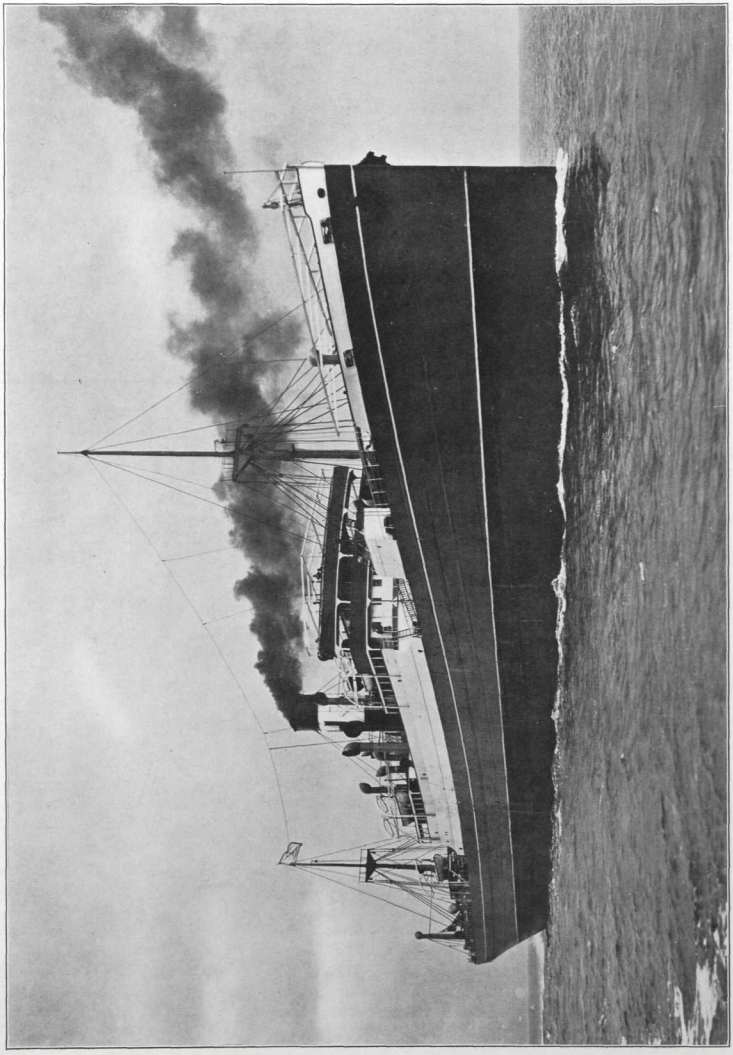


Photo by] **SS. "Harlow," built and engined by W. Doxford & Sons, Ltd., Sunderland, for J. & C. Harrison, Ltd., London.** (*See page* 463.) *[Frank & Sons, S. Shields.*

THE ALLAN LINERS "ALSATIAN" AND "CALGARIAN."

It is difficult to realise the enormous strides represented between the *Canadian*, the first steamship built for the Canadian trade by the Allan Line in 1853 and the modern ships *Alsatian* and *Calgarian*, which we deal with this week. The progress has been more or less gradual, but it is worthy of note that several striking landmarks stand out which constitute epochs in ship construction and engineering achievement for the introduction of which the Allan Line is responsible.

The history of the Line ever since the sailing of the brigantine *Jean*, of 169 tons, from Glasgow for Quebec, in June, 1819, under the command of the shipowner-mariner, Capt. Alexander Allan, down to the present time, is one of enlightened advancement and enterprise. It includes the changes from wood to iron in naval construction; from iron to steel, from single to twin and triple screws, from reciprocating compound engines to direct-acting turbines driving triple screws, and in the case of the new steamers, the latest of turbines driving quadruple screws, and the adoption of the Admiralty or "cruiser" stern.

The *Alsatian* was built by Messrs. William Beardmore & Co., Ltd., Dalmuir, and the *Calgarian* by the Fairfield Shipbuilding & Engineering Company, Glasgow. The only difference in dimensions between the two vessels is that the *Calgarian* has 2 ft. less beam than her sister ship. With regard to the scheme of decoration, the style is Jacobean in the case of the *Alsatian* and Georgian in the case of the *Calgarian*.

The principal dimensions of the *Alsatian* are :—

Length	600 ft.
Beam	72 ft.
Depth (to C deck)	45 ft. 6 in.
Tonnage (about)	18,000 gross.

In point of size and splendour they will be the largest and finest in the Canadian trade. In design and construction the vessels represent the acme of naval architecture, the unique experience and resources of the Allan Line having been drawn upon to the fullest extent in the production of the highest class ships for mail and passenger service and the conveyance of freight.

The Board of Trade Regulations for ensuring the safety and comfort of the passengers and crew have been more than complied with. The vessel has been subdivided by means of transverse watertight bulkheads, watertight decks, &c., so that she will be able to keep afloat with any four adjacent compartments open to the sea. A cellular double bottom is fitted all fore and aft, and is carried well up the bilge on each side as an additional protection in case of grounding. Boats and other life-saving appliances are provided, sufficient for every person on board in accordance with latest requirements. A further factor of safety in this vessel is that all the vertical and horizontal watertight doors which it is found necessary to fit in the watertight bulkheads below (E) deck are actuated hydraulically on the Stone-Lloyd system, and provision is also made for working them independently at the doors or from (E) deck.

The vessel has the usual merchant pattern stem, but the stern is of the warship or "cruiser" type, with an exceptionally long outreach beyond the after perpendicular. The rudder is of the semi-balanced pattern, formed of cast steel in three pieces bolted together, and so arranged as to be readily unshipped and repaired, or portions replaced in case of accident. The steering gear actuating the rudder is placed immediately over the rudder-head in a compartment under the waterline. This gear consists of a Brown's steam tiller with emergency gear of usual type controlled from the different steering positions by means of telemotors.

The four propeller shafts are enclosed within the framing and plating of the vessel, which are bossed out, and the plating is strongly connected to the specially designed cast steel shaft brackets which support the tail shafts and propellers at the after end of the vessel.

Bilge keels of Admiralty type are fitted for about one-half the vessel's length amidships to minimise rolling in heavy weather.

The vessel has eight decks in all, namely: (A) boat, (B) upper promenade, (C) lower promenade, (D) shelter, (E) upper, (F) main (G) lower, and (H) orlop; a navigating bridge is fitted on top of officers' house at fore end of boat deck. Two pole masts are fitted and two large oval funnels with Admiralty pattern tops, the spacing of which, in conjunction with the arrangement of the superstructures, gives the vessel a very striking appearance.

The facilities and appliances for handling cargo are up to date, being the outcome of a century's experience in the trade.

Accommodation is provided for 200 first-class, 450 second-class and 1,000 third-class passengers. The endeavour has been to supply the best possible in each case.

The first-class quarters have been designed in suites, special cabins, one berth and two-berth state rooms. The sleeping accommodation throughout is of the highest character. There are four sets of *en suite* cabins, consisting of two bedrooms, sitting room, bath and dressing rooms. These are convertible. Each bedroom is provided with two large wooden bedsteads, dressing table with concealed marble top, wash basin, couch, wardrobes, &c. Each sitting room has two large couches (one available as a bed), writing table, concealed wash basin, and suitable luxurious furniture. Eight special cabins are provided with bath room adjoining, and are furnished somewhat similarly to those already described. Hot and cold water taps supply the wash basins. The panelling and furniture of these apartments is in oak, and further special rooms to the number of 16 are provided, the remainder being single and double cabins.

The public rooms comprise dining saloon on shelter deck, library, lounge, card room, and lower smoking room on upper promenade deck, verandah café, upper smoking room, and gymnasium on boat deck.

All the decorations in these rooms have been designed by Mr. G. A. Crawley and are in the style prevalent during the Stuart period, with the single exception of the card room, which is in the Adams style.

The dining saloon is oak panelled in the Jacobean style, the central portion being open, having a spacious gallery all round with a balcony at one end for musicians. The woodwork throughout has been treated to give the appearance of oak mellowed by time. The ceilings are carried out in hand modelled "plaster" work after the Jacobean style in low relief and specially designed to suit the surroundings. The buffets and chairs are copied from antique Elizabethan models. This really magnificent saloon is 45 ft. long and the full breadth of the vessel. The height from deck to deck is 12 ft. A large dome 19 ft. high, extends the full length of the central portion of the apartment.

The smoking room is of the time of James I, and is in two tiers, a special feature being the staircase leading to the upper gallery. The chimney-piece is copied from the celebrated example at Old Place, Lindfield, Sussex. The furniture is copied from well known old examples of upright sofas, &c., at Knole, Kent, the seat of Lord Sackville. This is one of the most strikingly magnificent apartments to be found in any ship afloat, the whole plan of the room being original and the effect most remarkable. The staircases and corridors are also in the early Jacobean style, much attention having been given to the plaster work on the frieze and ceilings. The library is in the style prevalent in the reign of William and Mary, and is reminiscent of some of the apartments in Kensington Palace. The book cases in this room are copied from those in Pepys' Library, Magdalen College, Cambridge, which contain the celebrated Pepys' diaries. The very appearance of this delightful apartment creates a feeling of repose, the whole scheme being suggestive of restfulness. There being no traffic through the room, quietness is assured.

The card room is an exception in design to all the other apartments, being in the style invented by the Adams Brothers towards

the end of the 18th century. It contains a very fine antique marble mantelpiece. Another noticeable feature is the hand-painted furniture, which commands attention.

The lounge, which is undoubtedly the finest apartment in the vessel, is in the style designed by Sir Christopher Wren for the Royal apartments at Hampton Court Palace. The centre part of the room, which is 18 ft. high, is decorated at either end with paintings by Geo. Lambert, the Australian artist. Under these are fine carvings in the style of Grinling Gibbons. Very great care has been taken in the selection of the furniture, and all the colours and materials used in this and all the other apartments are in correct style and designs of the periods. A handsome fireplace is situated at the forward end, and a specially fine mirror at the opposite end of the room adding greatly to its appearance. A carved trophy at one end is by the hand of Mr. Mark Rogers, one of the most celebrated wood-carvers in England. A special charm is given to this beautiful apartment by three large bow windows on each side, and a magnificent skylight extending for its full length and about a third of the breadth of the room.

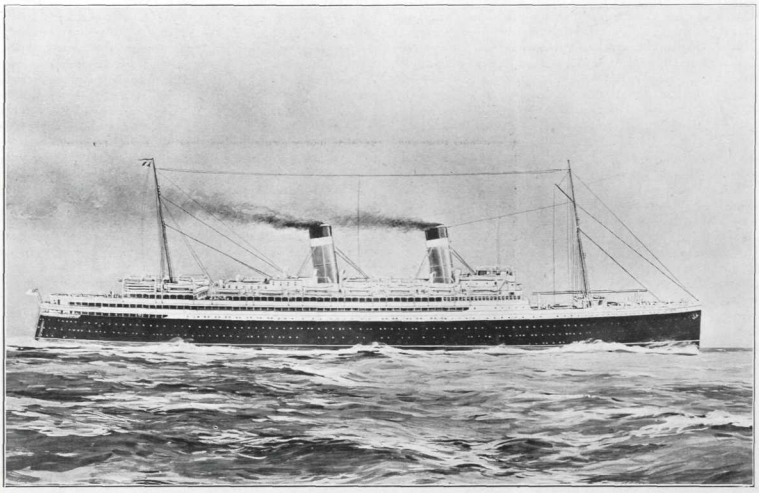
The gymnasium is a lofty apartment fitted with the latest appliances for affording health-giving exercises, and its surroundings are in keeping with its object.

The verandah café is a large airy apartment about 27 ft. long and 40 ft. wide, and furnished with small tables, chairs, &c., in the orthodox Continental fashion. This is one of the most popular resorts in the ship, and the simple taste exercised in its arrangement will be appreciated. Direct communication is made with the upper smoking room, which is placed immediately abaft the café. A handsome double staircase leads directly from the verandah café to the accommodation on the upper and lower promenade decks.

The main entrance and grand staircase are situated immediately abaft the library. It is spacious and contains a few small tables and chairs. The staircase extends from the upper promenade down to the lower deck, and encloses a large passenger lift with handsomely designed framework.

The promenading spaces for first-class passengers are arranged on the boat (A) deck, and on the upper promenade (B) deck. At the forward end of the latter the sides are plated up, and large sliding windows are fitted, thus providing a closed-in promenading space and observation room in rough weather. Bulwarks are provided for the remainder of the promenading space on this deck and at the extreme fore end an open observation space is arranged for use in fine weather.

The second-class accommodation is provided on the upper (E) deck, and is of a very superior character. The state rooms are exceptionally well furnished, somewhat similarly to those of the first-class. The public rooms comprise a splendid smoking room on the upper promenade deck, lounge on the lower promenade deck, and dining saloon on the shelter deck. The whole of these apartments are spacious and handsomely furnished, being in every sense most up to date, and in design also of the same period as the first-class.



Q.S.S. "Alsatian," from a Drawing, showing the Vessel as she will appear when completed.

Passengers travelling in this class are exceptionally well catered for. Ample deck space is reserved for promenading purposes. It is an interesting fact that the second cabin class was first instituted by the Allan Line.

Particular attention has been given to the accommodation for third-class passengers, and an important feature is the arrangement by which it can be divided into two distinct portions, each section being provided with sleeping and dining accommodation, public rooms, hospitals, lavatories, promenading spaces, &c. Provision is made for sleeping nearly 1,000 passengers in two, four and six-berth rooms. It is worthy of note that the Allan Line introduced separate berthing for ocean passengers travelling third-class.

A captain and officers' house is fitted at the forward end of the

boat deck with mess and pantry amidships, and hoist leading direct from first-class galley to serve same. Adjacent to the mess room is the wireless telegraphy office room for Marconi operators, and public office for the sending of messages.

The stewards have been arranged as far as practicable in those portions of the ship nearest to their work. Those connected with the galleys, pantries and dining saloons, are arranged in rooms on the starboard side of (F) main deck, with stairways leading direct to the galley. The bedroom stewards are placed generally in compartments at the ends of the vessel. Separate mess rooms are provided in each case for firemen, seamen and stewards.

Electric lighting is installed throughout the ship, and the heating also of a large number of individual rooms is also accomplished by the same agency. The main electrical generating plant consists of three steam turbine-driven dynamos, each of about 250 kw. capacity, whilst an emergency dynamo, oil-driven, is also provided and placed in a separate compartment well above the loadwater line of the vessel.

All the latest bath and sanitary accommodation is provided throughout the ship, and is convenient for passengers wherever berthed, and in whatever class they may be travelling, the proportion of such facilities probably exceeding that in any vessel afloat.

The galleys, pantries, &c., are arranged amidships between first and second-class dining saloons, a lift being provided from the third-class kitchen to the serving space on (F) main deck, which is midway between the pantries of the two third-class dining saloons. The whole of the cooking gear for this vessel has been provided by Messrs. Wilson, of Liverpool.

The warming, ventilating and hot-water arrangements have been installed by Messrs. Ashwell & Nisbit, Ltd., on their patent system.

Provision stores are provided on (F) main and (G) lower decks of large capacity, refrigerating chambers being provided for beef, wines and spirits, poultry, fish, beer and minerals, dairy produce, fruit and vegetables, in addition to ordinary store rooms for stewards' stores, grocery stores, bonded, potatoes, flour, &c.

Two electric lifts are provided for working these stores, which are shipped through large gangway ports, one on each side of the ship, on the level of (E) upper deck, and these lifts also extend from the lowest store rooms on (G) lower deck to the galley and pantry spaces on (D) shelter deck.

Mail rooms, parcel and sorting rooms are arranged on (G) lower deck, with electric lifts to (D) shelter deck for shipping same, and special rooms are provided for the carriage of specie and valuables.

In addition to the ship's refrigerated provision chambers (of about 10,000 cub. ft. capacity), refrigerated cargo holds and 'tween decks are provided of about 70,000 cub. ft. capacity, of which about 30,000 cub. ft. is for cold-air storage. These are placed at the after end of the ship, as shown on plans, and are subdivided as necessary into different compartments suitable for the different natures of the cargo to be carried and the different temperatures required for same. The refrigerating machinery is of the CO_2 type, and is in duplicate, and is supplied by the Liverpool Refrigeration Company, Ltd.

The steam winches for working cargo are 10 in number, six of which are 8 in. by 12 in. double, and four are 8 in. by 12 in. single, all by Messrs. Wilson, of Liverpool.

The gear for working the anchors consists of two separate and independent engines each driving one cable holder, and one warping capstan by Messrs. Napier Brothers. The engines are placed on (D) shelter deck, and the cable holders and capstan heads on (C) upper promenade deck. In addition, there are four independent steam warping capstans, two on each side of the vessel, placed on (D) shelter deck aft. The engine for each capstan is placed in a separate house, and connected by shafting to the capstan, which is outside of same. These capstans are also by Messrs. Napier Brothers.

The steering gear is by Messrs. Brown Brothers, and is of their latest steam steering tiller type, with stand-by steering gear, the whole controlled by means of telemotor gear.

The electric lifts consist of one passenger lift, two lifts for stores, and two lifts for mails and baggage. These lifts are all supplied by Messrs. Waygood & Co., Ltd.

Four electric boat winches are provided for working boats, each driven by a 14 b.h.p. motor, supplied by Messrs. Boothroyd, Ltd.

A complete installation of submarine signalling by the Submarine Sound Signalling Company has been installed.

The boat equipment consists of 18 lifeboats and about 28 Englehardt decked boats, each capable of carrying about 50 passengers. These boats are arranged as indicated on the drawings, so as to be quickly lowered in case of emergency. The whole arrangement is in accordance with the latest requirements of the Board of Trade.

MACHINERY AND BOILERS.

The propelling machinery consists of Parsons' compound steam turbines arranged in series on four shafts, and includes one high-pressure, one intermediate, and two low-pressure turbines. Two astern turbines, each with impulse reaction blading, are incorporated with the low-pressure turbines, and the latter drive the inner lines of shafting. Direct steam from the boilers is led to each turbine, and by a suitable arrangement of pipes and valves any shaft may be operated independently of the others. With this arrangement of machinery more economy is expected than with the usual four-shaft parallel arrangement.

The casings are of cast iron, and all forgings, including drums, dummies, spindles, wheels and shafting are of specially forged steel made at the Parkhead works of the builders.

Forced lubrication is fitted throughout for the main bearings, adjusting blocks and plummer blocks, and the arrangement includes four Weir's lubricating oil pumps, and two Carruther's water service pumps with the necessary oil coolers, drain and reserve tanks.

The condensing plant is fitted in a separate watertight compartment immediately aft of the engine room, and consists of two main condensers of the Uniflux type, which, in conjunction with two Dual air pumps, are together capable of carrying and maintaining a high vacuum even in summer when the sea temperature approaches 75 deg. Fahr. Four centrifugal circulating pumps are provided for supplying the necessary water to the condensers. The air pumps discharge to filters of the gravitation type through which the feed water gravitates to large float control tanks. These control tanks are arranged about the middle line of the vessel, and suctions are provided for the main and auxiliary feed pumps.

A large feed heater of the surface type takes all the exhaust steam from the auxiliary machinery, including the turbine driven electric generators, and is drained to the float tanks through the filter. Any surplus exhaust steam may be passed to the turbines. With this utilisation of the exhaust steam for heating the feed water for the boilers great economy in working is expected.

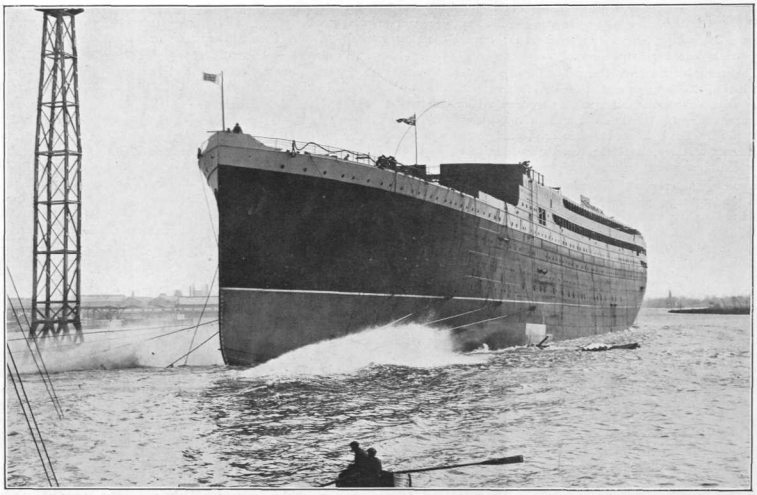
Other auxiliaries includes pumps for bilge, sanitary, ballast, hot and cold fresh water, hot and cold salt water, and ash ejector purposes. It should be noted that the sanitary pumps are of the rotary type driven by electric motors, thus eliminating noise and shocks.

Steam is supplied by six double-ended and four single-ended boilers of the cylindrical type, working under Howden's system for forced draught, and arranged in two compartments.

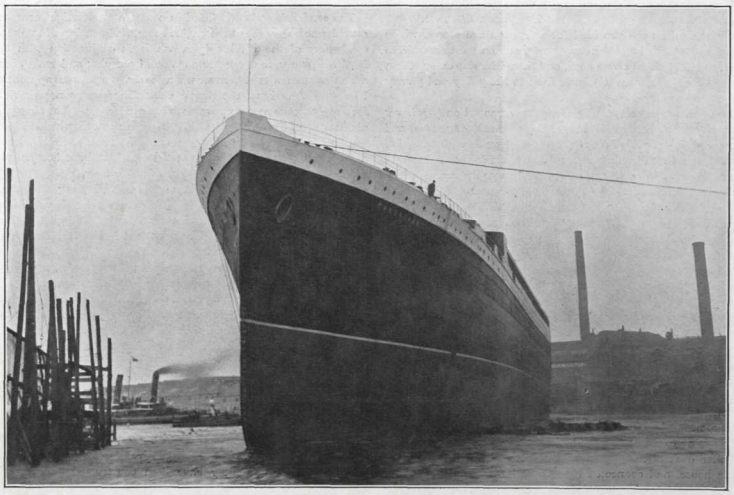
The forced draught fans are four in number placed on deck above the boilers, and are driven by electric motors.

Ash ejectors and ash hoists are fitted in each compartment, and special arrangements have been made for ventilation of boiler rooms by electric fans of the pressure type.

The hull and machinery have been constructed under special survey to meet the requirements of the Board of Trade and the British Corporation for the Registry of Shipping.

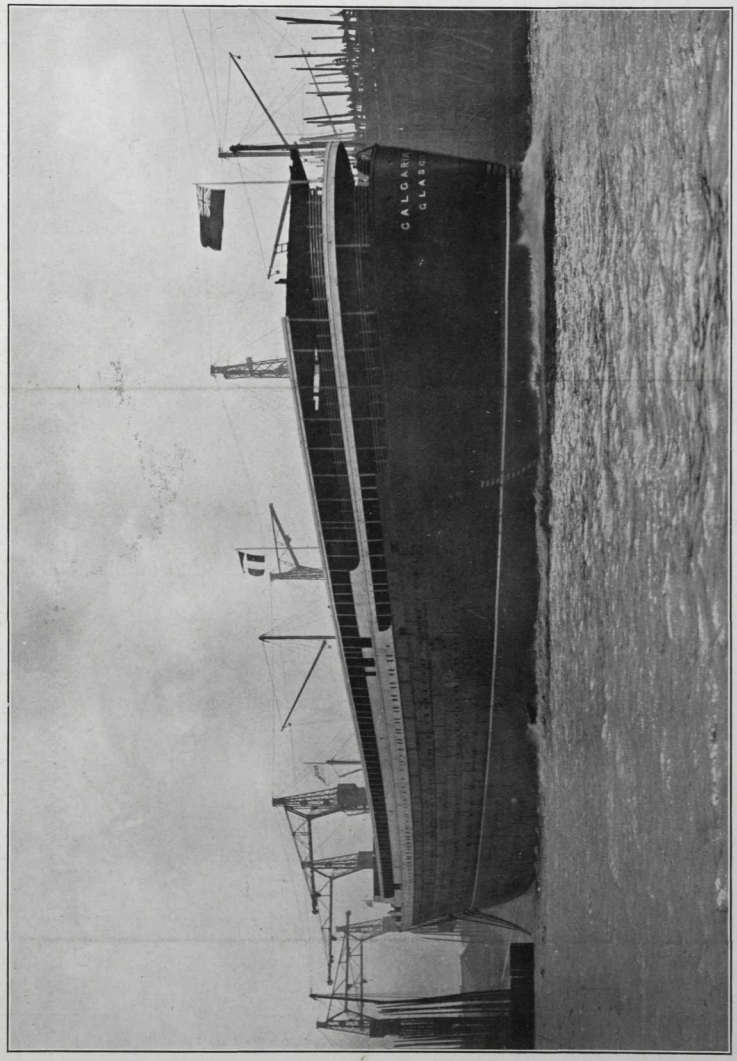


Allan Liner "Alsatian" taking the Water. (*See page* 467.)

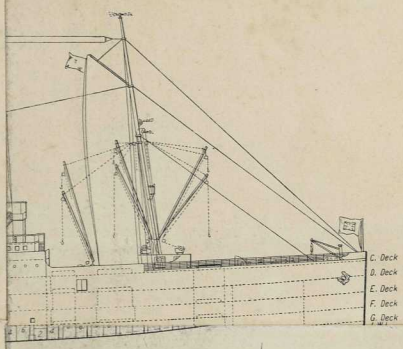


Allan Liner "Calgarian" off the Ways. (*See page* 467.)

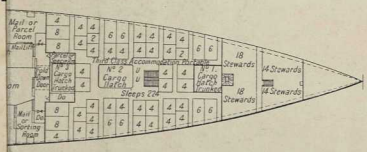
Q.S.S. "Alsatian," built by Wm. Beardmore & Co., Ltd., for the Allan Line. (*See page* 467.)



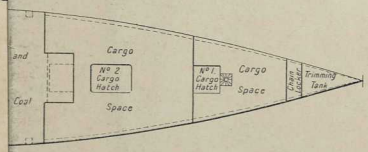
Q.S.S. "Calgarian," built by the Fairfield Shipbuilding & Engineering Co., Ltd., for the Allan Line. (See page 467.)



G. D



H. D



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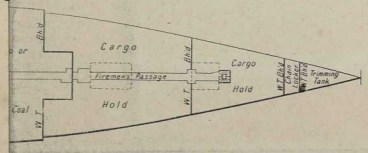
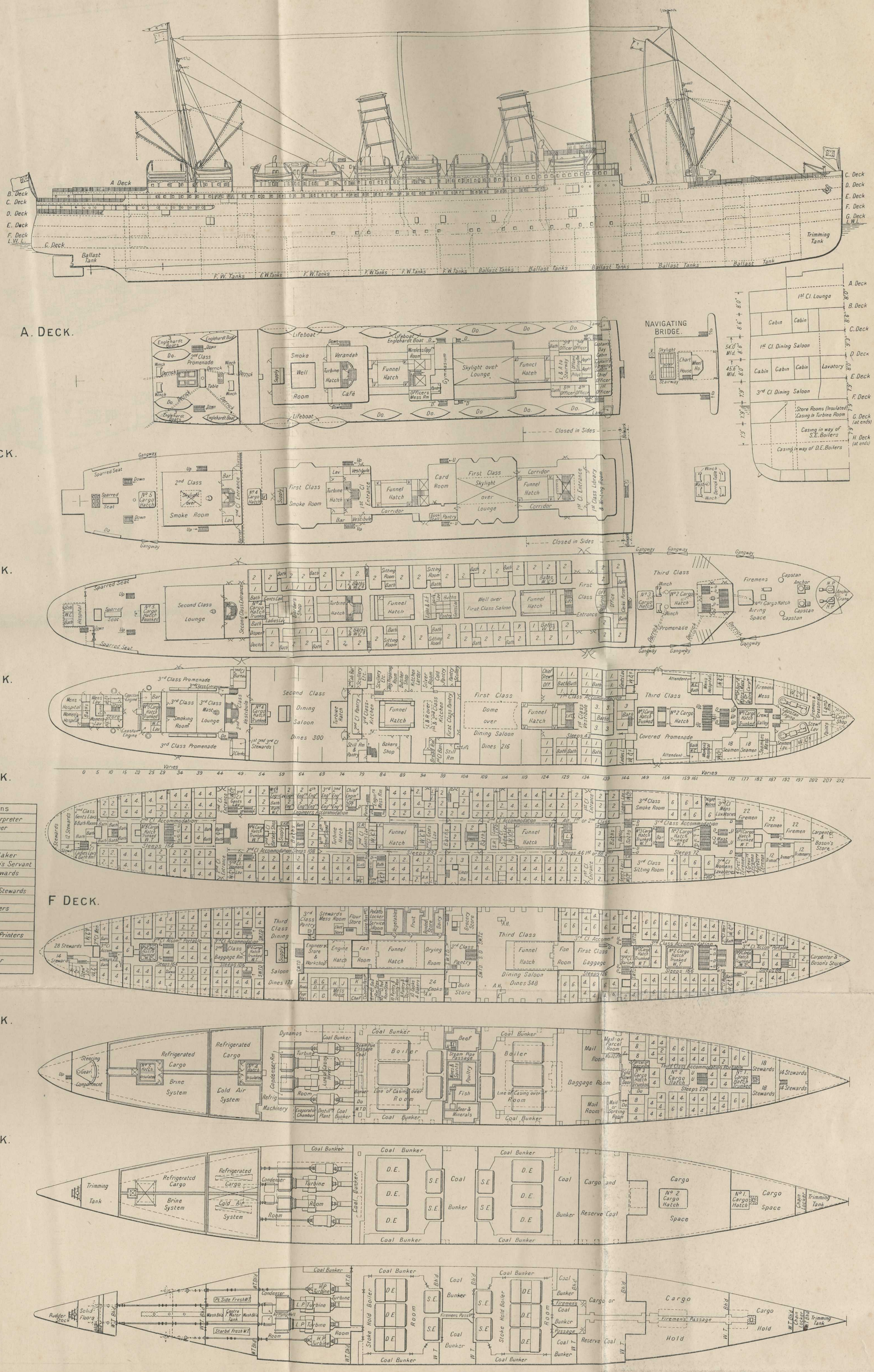


Qu

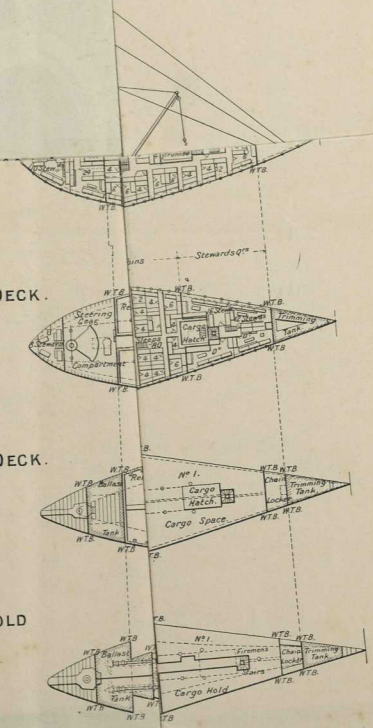
Allan Line. (*See pages* 467–472.)

Alstom / Calgarion - Launch photos - plans



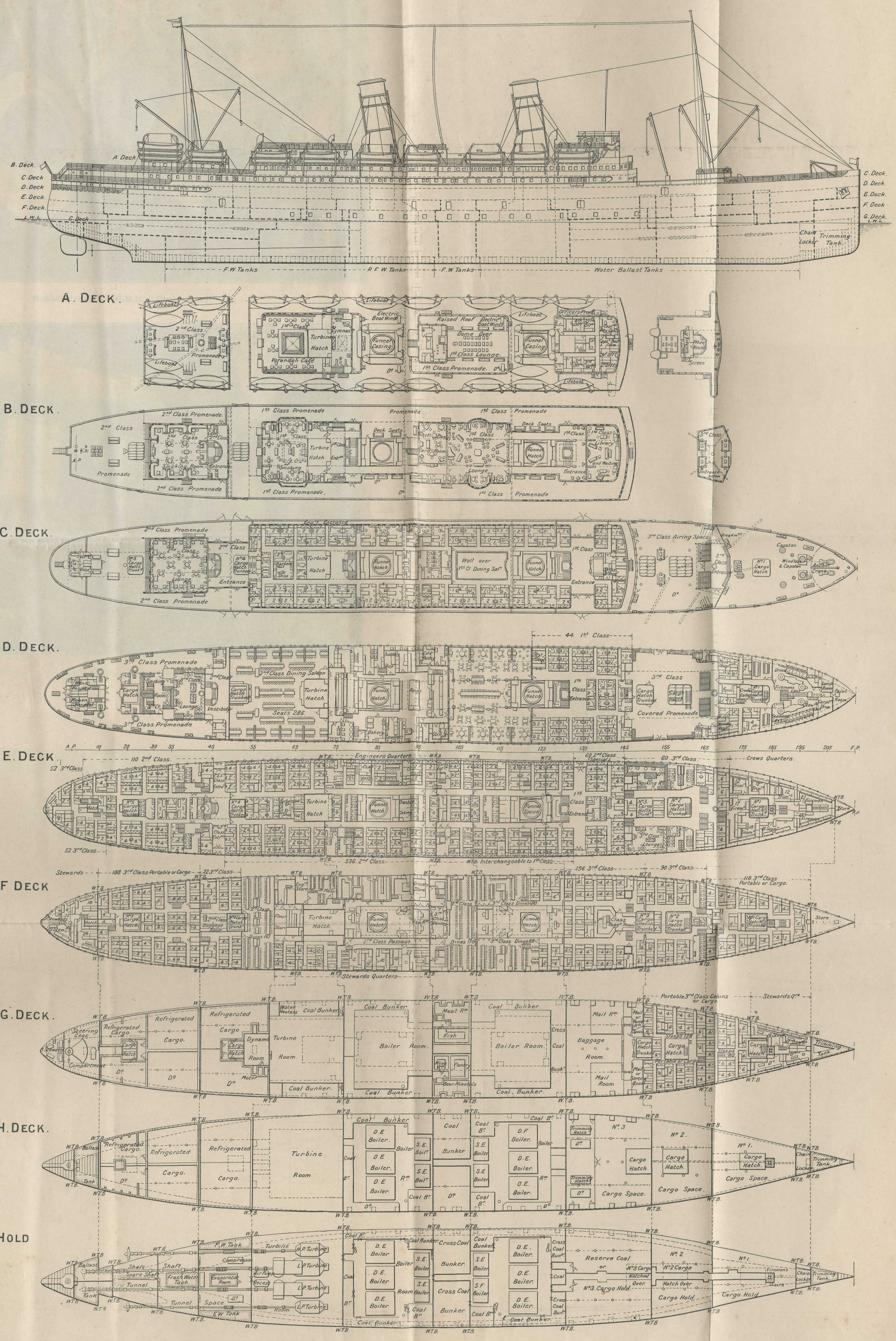
List of Abbreviations	
A.	Assistant 3rd Cl Steward, Interpreter Dispensary Steward, Bar Keeper
B.	Store Keeper and Assistant
C.	1st and 2nd Head Waiters
D.	3rd Class Chef and Head Baker
E.	Second Steward and Captain's Servant
F.	Two Deck and One Café Stewards and Lift Attendant
G.	Two Smoke Room and Two Lounge Stewards
H.	Butchers and Bugler
J.	2nd and 3rd Class Head Waiters and Butcher
K.	First and Second Barbers
L.	Plate Room Man. Librarian and Printers
LKR	Locker. S.R. Service Room
SWTD	Sliding Water Tight Door
A.H.	Ash Hoist. A.E. Ash Ejector
Stess	Stewardesses

Quadruple Screw Steamship "Alsatian," built by William Beardmore & Co., Ltd., Glasgow, for the Allan Line. (*See pages* 467–472.)



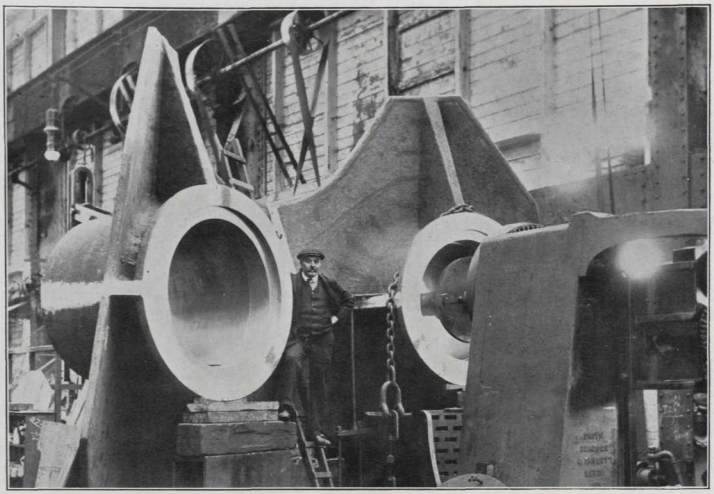
Quadruple Screw, for the Allan Line.

One

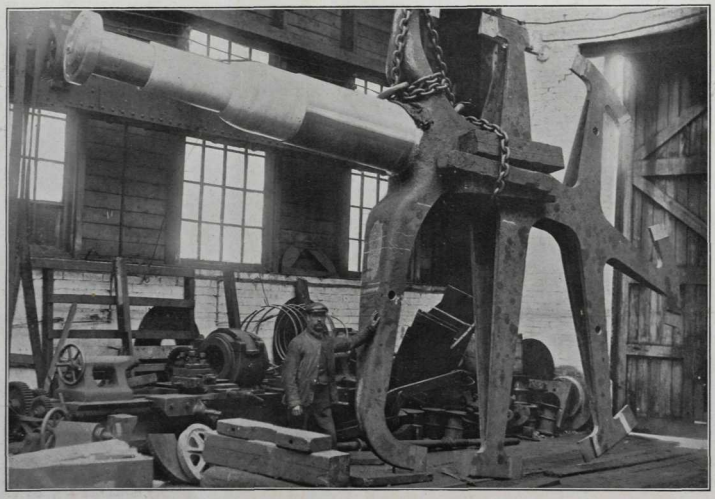


Quadruple Screw Steamship "Calgarian," built by the Fairfield Shipbuilding & Engineering Co., Ltd., Glasgow, for the Allan Line.

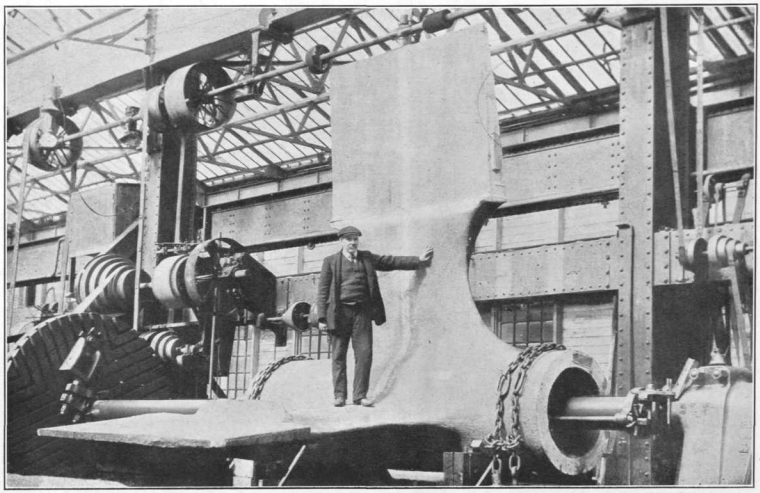
(*See pages* 467–472.)



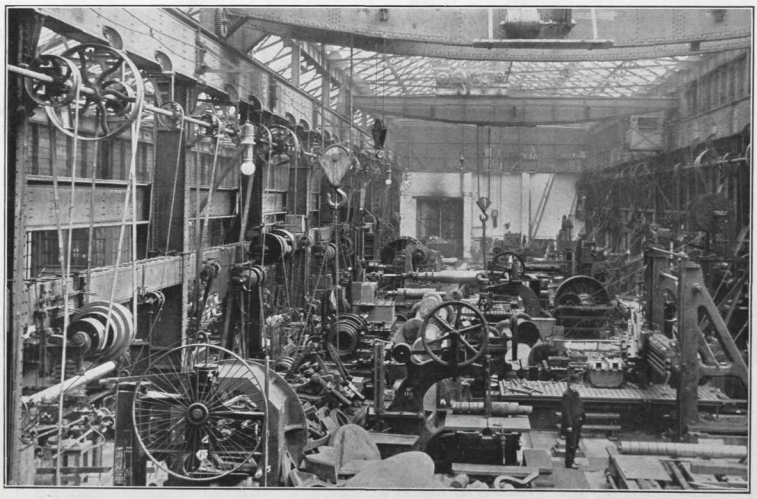
Rudder Trunk for H.M.S. "Queen Mary."



One of the two Rudder Frames for H.M.S. "Queen Mary."



One of the Propeller Struts of H.M.S. "Queen Mary."

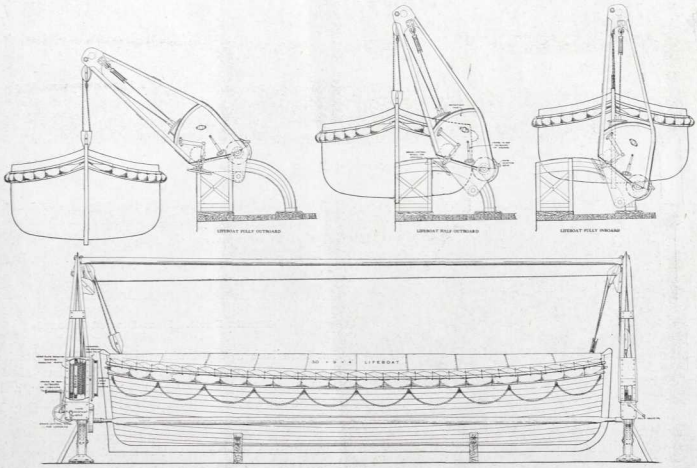


Machine Shop of J. Spencer & Sons, Ltd., Newburn Steel Works, showing Rudder Frame of H.M.S. "Queen Mary" on the Machine.

STEAMSHIP APPLIANCES.

THE MARTIN PATENT DAVIT.

With the advent of the Report of the Boats and Davits Committee and the recent publication of the standard regulations recommended by the Merchant Shipping Advisory Committee with regard to the launching, manning, and equipment of lifeboats, and the mustering of crews, there is opportunely published by the Martin Patent Davit Company, of Liverpool, a neatly printed catalogue describing and illustrating the three patented devices for handling lifeboats, which are specialised in by this firm, and which comprise the now widely approved Martin Patent Davit, the "Simplex" Davit, and the Martin Skids. It would only be paying to this Company the compliment that is due to it in observing that, since the lifeboat question became one of paramount interest to shipowners and the public alike, it has contributed most valuable solutions to many of the problems that have had to be faced, and what is more, they have withstood tests as to their reliability and efficiency, not merely on ships in port, but under actual service conditions at sea by the passenger carrying liners that have already been equipped with them. The missionary work necessary in these days with any new device that will involve any radical change in methods that are generally followed, even if they are known to be primitive and out of date, is great and exhausting, unless the effort can be sustained until success is attained at last. The Martin Patent Davit Company can truthfully be said to have got beyond this critical stage, and shipowners now realise, following events that have happened during the past year or so, that the old style of boat davit is no longer in keeping with the equipment of a modern steamer to-day. A serious objection to the old davits is the fact that it is almost impossible to launch a lifeboat from the boat-deck of a vessel having even a slight list or against a gale of wind. The Martin Patent Davit entirely overcomes these difficulties. It is built of steel angles and plates—combining lightness with strength. It is a practical adaptation of the crane and winch principle applied to the moving and handling of a loaded lifeboat. It therefore is readily understood and operated by the ship's crew. The working parts of the Martin Patent Davit are simply the same as those of a winch, and are enclosed in a watertight compartment which prevents snow and ice interfering with the efficiency of the davit. All bearings are self-lubricating so that the apparatus can be operated even in cases where it has been neglected. It has been designed not only to run outboard any size of lifeboat, but also, when fully loaded with passengers, to lower it with wire falls, quickly and safely on an even keel into the sea. With the Martin Patent Davit the method of lowering is such that both ends of a boat must descend in unison. When released there is no toppling over of the blocks, or twisting, or fouling of wire falls in bringing them back from the water level to handle more boats, as so frequently occurs when six part manila rope falls are used with their cumbersome triple blocks. Where boats are double banked or carried right across a vessel the Martin Patent Skid provides a simple and effective means of bringing these boats under the davits ready for launching. The skid consists of two trackways, and on each runs a carrier fitted with chocks to carry a lifeboat. These carriers are connected with a shaft, and by turning a crank which actuates a worm gear the shaft is revolved, and the boat is run out under the davit. The Martin Skid takes up no more deck room than is occupied by the boat itself, as the trackways are hinged so that a clear passageway is available



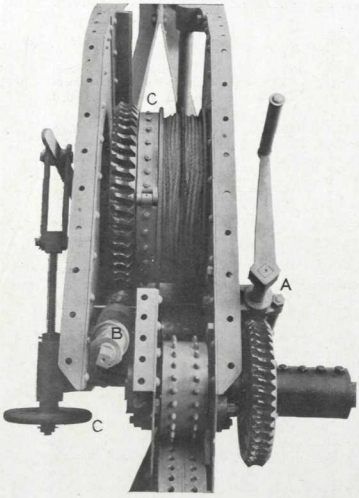
Martin Patent Davit. Arrangement for Handling Lifeboat, Stowed either Inboard or Half Outboard.

on either side of the inboard boat as desired. Only one man is required to run the largest lifeboat out under the davit, and being under worm-gear control it cannot take charge. This skid is also adaptable where it is desired to carry a row of lifeboats athwartship, so as to launch the boats from either side of the vessel. The "Simplex" Davit is simply the Martin Patent Davit without its lowering arrangement, and has been designed with a view to at least improving the means of running lifeboats outboard, the lowering being done with manila falls.

The illustrations below show the raising and lowering gear with the cover removed; A is the crank for running the lifeboat outboard or inboard, B the shaft for hoisting the lifeboat from the water and C the brake control for lowering the lifeboat.

Amongst the many advantages which the Martin Patent Davit is said to possess, the following may be mentioned:—

1. The ease, safety, and rapidity with which a lifeboat can be launched from any height above the sea.
2. The lifeboat is lowered both ends in unison.
3. The use of wire falls which are not affected by frost or other



Martin Patent Davit. Lowering and Raising Gear.

weather conditions, and which can be brought back without twisting or fouling where more than one boat is to be launched from the one set of davits.

4. A lifeboat can be easily launched even if a vessel has a severe list.
5. Only one man is necessary to lower the largest size lifeboat, fully loaded, into the water.
6. No handling of ropes.
7. The saving of work in connection with boat drills and inspections.
8. Being constructed of steel plates and angles, the "Martin Patent Davit" has great strength combined with lightness.
9. Wire falls are used which are guaranteed by the best English manufacturers to last at least five years. This does away with a very large yearly expense for the renewal of the old manila falls, which, in the case of the more important companies, amounts to many thousands of pounds in five years.

Sir W. G. Armstrong, Whitworth & Co., Ltd., are Sole Manufacturers in the United Kingdom of the Martin Patent Davit, Simplex Davit and Martin Skid, and Messrs. Ogilvy, Gillanders & Co., London and Liverpool, are the Sole Selling Representatives.

The illustrations in the book, from which we have quoted, are beautiful works of art, and include pictures of the following steamers

Martin Davit. Boat Stowed Inboard.

that have been equipped with the Martin Patent Davit:—The Lamport & Holt liner *Vestris*, the Brocklebank liner *Maidan*, the Pacific Steam Navigation Company's steamer *Orcoma*, and types of this davit which have been ordered for huge liners at present under construction.

THE TRADE OF IPSWICH.—The annual report presented to the Ipswich Dock Commissioners shows that 2,678 vessels entered the port, exclusive of those engaged in pleasure traffic, a decrease of 33 vessels, but an increase of 10,333 register tons. No steamers ordered to Ipswich were stopped at Harwich. In 1907 only 10 vessels of 300 ft. and upwards entered the port, while last year there were 29 such vessels. The average length of the large vessels entering was 340 ft., with a beam of 46 ft., a record for the port. The total summary receipts amounted to £28,461, which also constitutes a record for the port. The chairman stated that there had been a good deal of activity in the port during the year, but, of course, the high cost of raw materials which constituted their chief imports did not tell favourably towards the revenue of the port nor the position of the freight market. The Committee have instructed the clerk to look into the question of the desirability of the Commissioners framing a bye-law under Section 32 of the Pilotage Act, 1913, and report thereon to the next meeting of the Committee. The chairman said that question arose out of the Bill which had recently been passed in Parliament and which required specially looking into. There was no doubt the matter would be brought before them again.

INSTITUTION OF NAVAL ARCHITECTS—SUMMER MEETING AT GLASGOW.

Members of the Institution of Naval Architects who journeyed Clydewards this week to participate in the summer meeting, which commenced on Tuesday by the reading of papers, found that the General Reception Committee, of which the Right Hon. Lord Inverclyde is chairman, had put in a vast amount of work to ensure the smooth working of the proceedings, and great credit is due to this and the Executive Committee, and, of course, the Secretary, Mr. E. H. Parker, for the thoroughness with which they had discharged their task.

MONDAY'S PROCEEDINGS.

The proceedings opened on Monday evening with a reception at the Institution of Engineers and Shipbuilders in Scotland.

The members were received at half-past eight o'clock by Mr. E. Hall-Brown, President of the Scottish Institution, and Mrs. Hall-Brown, several of the ex-Presidents and leading members of Council, and cordially welcomed to the city. Among those present at the reception were:—

The Marquis of Bristol (President of the Institution of Naval Architects) and the Marchioness of Bristol, Prof. Sir John H. Biles and Lady Biles, Dr. S. J. P. Thearle, Prof. Mellanby and Mrs. Mellanby, Prof. W. Hovgaard, Mr. and Mrs. J. Avery, Mr. J. Brodie, Mr. and Mrs. G. H. Bottomley, Mr. H. C. Barnaby, Mr. James Bell, Mr. Ernest A. Chew, Mr. and Mrs. James A. Donald, Mr. and Mrs. W. H. Dick, Mr. T. Dickson, Mr. R. W. Dana, Mr. John Duncan, Mr. James Fernie, Mr. J. B. Hutchison, Mr. W. Hök, Mr. Percy A. Hillhouse, Mr. C. H. Jordan, Mr. J. R. Jack, Mr. and Mrs. Foster King, Mr. and Mrs. Henry Meehan, Mr. C. E. Morgan, Mr. J. D. Mares, Mr. George F. Mason, Mr. W. Monroe, Mr. and Mrs. Thomas Millar, Mr. H. R. Macdonald, Mr. T. Macdonald, Mr. W. M. McMillan, Com. S. Nonaka, Mr. W. E. Proctor, Mr. F. W. Powell, Mr. A. E. Rankin, Mr. and Mrs. T. A. Reed, Mr. Chas. T. Ramsay, Mr. J. R. Richmond, Mr. W. Spalding, Mr. A. W. Simpson, Mr. J. E. Scott, Mr. C. E. Stromeyer, Mr. A. L. Stephen, Mr. Benson Taylor, Mr. Harold E. Valling, Mr. Gerald Whiting, Mr. J. Bell White, Eng. Com. Winsom, Mr. Tom Westgarth, Mr. and Mrs. Wm. Weir, Mr. Harold E. Yarrow, Mr. J. Cameron Black, Mr. and Mrs. J. H. Biles, Mr. F. R. Blair, Prof. W. S. Abell, Mr. T. W. Fish, Mr. H. K. Fletcher, Mr. A. Hamilton, Mr. J. B. Kidston, Mr. L. Lambert, Mr. Ernest J. Muir, Mr. Geo. Nicol, Mr. John Nicol, Mr. G. M. Rutland, Mr. G. M. Shaw, Mr. John S. Samuel, Mr. M. Taylor, Eng. Com. W. H. Wood, Mr. A. A. Wilson, Mr. A. Scott Younger, Mr. Frank Somers, Mr. R. J. Butler, Mr. D. M. Gray, Mr. G. Holmes, Mr. W. H. Whiting, Mr. Anson Willett, Mr. Peter Duff, Mr. Robert Duncan, Mr. A. Dansie, Mr. A. Hall Brown, Mr. W. A. Mackie, Mr. John McMillan, Mr. A. M. Neilson, Mr. W. C. Reeder, Mr. E. Ringsted, Mr. H. W. Ridsdale, Mr. James Stewart, Mr. F. J. Stephen, Mr. Percy Goodyear, Mr. W. D. Archer, Mr. J. S. Carment, Mr. M. McIntyre, Mr. W. R. Outram, Mr. C. J. O. Saunders, Mr. J. Foudraine, Mr. Sinclair Couper and Mr. James Mollison.

The proceedings were very informal, there being no speeches whatever.

TUESDAY'S PROCEEDINGS.

The business proper of the Conference began on Tuesday when members met in the morning in the hall of the Institution of Engineers and Shipbuilders in Scotland.

Mr. E. Hall Brown, the President of the Scottish Institution, officially welcomed the visitors, and in the course of his observations drew attention to the necessity for close co-operation between the shipowner and the naval architect. The newer methods of ship propulsion had introduced fresh problems which had as yet been only partially solved. The re-introduction of mechanical gearing and the attempts being made to apply electrical and hydraulic transmission between the prime mover and the propeller were now attracting much attention.

Lord Bristol, President of the Institution of Naval Architects, n reply, referred to the action taken by Scottish naval architects on the occasion of the last Conference in Glasgow 12 years ago, which led to the subsidising of merchant steamers for Government service.

Signor Salvatore Orlando made the presentation of a gold meda from the President of the Italian Society of Naval Architects and Marine Engineers to the Institution of Naval Architects in recognition of services rendered by that institution to the science of naval architecture.

The first communication read was entitled—

Shipbuilding Contracts.

BY L. PESKETT.

It was the original intention of the author to deal in his paper with the question of "Ship design from the shipowner's point of view," and this title was given in the official programme of this meeting, but as the paper developed it was found desirable to limit its scope and to lay open for discussion the method usually adopted in making shipbuilding contracts.

The author deprecated any proposal for the formation or a combination among shipbuilders as being a system which is the antithesis of healthy trade. The maintenance of this country's shipowning and shipbuilding supremacies depends on the fundamental principle that the owner must only pay that price to the builder which is sufficient to assure him a fair and reasonable return.

He appealed for a standardised form for estimating the cost of constructing vessels, whereby the various tenders could be submitted on a standard basis. For example, all the items in connection with the cost of material and labour, establishment charges, profit and margin, could be scheduled, and a total sum defined as the maximum price which the owner would be required to pay. If the margin on direct outlay, the establishment charges and the net profit were agreed upon as a fixed sum, it would be an advantage to both owner and builder to keep the cost as low as possible. For since these items do not alter, the builder makes the same profit on a smaller turnover, while any reduction in the net cost of material and labour from the amount originally fixed reduces the cost of the vessel to the owner.

Such a system had been already carried out in practice by the Cunard Company in the case of the building of the *Franconia*, by Messrs. Swan, Hunter & Wigham Richardson, Ltd. When the contract was signed, it was suggested that the ship might be built on the principle outlined above, the price already quoted being considered to be the maximum sum payable by the owner. This course was agreed to, and the result of the experiment was that upon the completion of the contract the builders handed to the owners a rebate of £20,000 on the sum originally fixed. This gave satisfaction to all concerned, although to the uninitiated it might be imagined that it meant a loss to the builder. The reverse was actually the case, for the original profit named remained fixed and the rebate was accounted for in the savings on material and labour mutually agreed to during the construction of the ship.

In the accompanying table an attempt has been made to classify under convenient headings the total cost of building a ship. It will be noticed that the contract price has been divided into four general sections, namely: (1) Direct outlay; (2) establishment charges; (3) scheduled items; (4) builder's profit.

The contract price would generally include all the work under these four headings, although the decoration of the public rooms included in Section 3 might be made the subject of a separate contract, and entrusted to a firm of decorators and carried out in accordance with the designs of an architect. In addition to the contract price the incidental establishment charges incurred by the vner's staff in the performance of work connected solely with the

TOTAL ESTIMATED COST OF VENTURE.

Contract Price.

Direct Outlay.

Hull and Outfit,
Other than items for which a prime cost is scheduled.

Material.
Steel and iron—
Forgings.
Castings.
Plates.
Angles and sections.
Beams.
Rivets.
Smithy iron.
Brass castings.
Wood—
Carpenters'.
Joiners'.
Pattern.
Template.
Mould loft.
Sundries—
Anti-fouling.
Bitumen.
Bulkhead doors.
Cement and sand.
Galvanising.
Glass.
Packing.
Manhole doors.
Paints and oils.
Plumbers' material.
Polishers' material.
Store goods.

Wages.
Angle smiths.
Caulkers.
Cementers.
Carpenters.
Drillers and holeborers.
Draughtsmen.
Engineers.
Electricians.
Hammermen.
Helpers.
Joiners.
Labourers.
Loftsmen.
Liners off.
Mould makers.
Painters.
Pattern makers.
Platers.
Plumbers.
Polishers.
Red leaders.
Riggers.
Riveters.
Sheet-iron workers.
Sawmill workers.
Smiths.
Sparmakers.
Tracers.

Material destroyed in connection with the building and launching of the ship.
Coal and coke used on board by riveters and others; also in boilers.
Power used solely in connection with the building of the ship.
Water used on board.
Materials used in constructing the model of the ship.

Men working on machines while being used solely in connection with the construction of the ship.
Men employed in erecting and taking down staging directly employed in launching, and in the preparation of the ship's berth.
Foremen, under foremen, timekeepers, storekeepers and the like while employed solely on the construction of the ship.
Model makers.
Men employed in lifting and fitting up on board of all the scheduled items.

Equipment and Outfit.
Accommodation ladders.
Awnings, sails and canvas.
Blocks.
Deck machinery connection.
Derricks, steel.
Hoses and couplings.
Lightning conductors.
Netting and expanded metal.
Name plates.
Pumps.
Rigging.
Ropes.
Signal lamps.
Speaking tubes.
Sundries.

Machinery.

Engines.

Main.

Material.
Iron castings.
Steel castings.
Brass castings, rough.
Brass castings, finished.
Condenser structure.
Condenser tubes.
Condenser tube plates.
Condenser sundries.
Pump rods.
White metal.
Smithy forgings.
Pipes (all classes).
*Bushing material.
*Silver solder.
*Drums.
*Wheels.
*Spindles.
Shafting.
Propellers.
Plates and angles.
Pattern wood.
Tanks.
Store goods.

Labour.
Boiler makers.
Brass finishers.
Draughtsmen.
Fitters.
Labourers.
Machinemen.
Painters.
Pattern makers.

Auxiliary.

Material.
Circulating pumps.
Air pumps.
Feed pumps.
Feed heaters.
Hotwell pumps.
Fire and bilge pumps.
Ballast pumps.
Sanitary pumps.
Sundry pumps.
Filters.
Aux. condenser.
Fans and motors.
Evaporators.
Spare gear.
Ash hoists.
Ash expellers.

Labour.
Boilermakers.
Brass finishers.
Fitters.
Labourers.
Machinemen.
Painters.
Pattern makers.

Boilers.

Material.
Furnaces.
Plates.
Stay tubes.
Plain tubes.
Staybars.
Castings.
Manhole doors.
Rivets.
Fire bars, &c.
Mountings.
Covering.
Forced draught fittings.
Smoke boxes.
Uptakes.

Labour.
Boilermakers.
Brass finishers.
Fitters.
Labourers.
Machinemen.
Painters.
Pattern makers.

Fees and Expenses.

Arbiter's fees.
Board of Trade fees.
Classification fees.
Delivery.
Docking dues.
Dredging.
Insurance.
Launching.
Lightering.
River and harbour dues and fees.
Royalties on all patents.
Testing.
Towing.
Travelling expenses.
Trial trip expenses.

Establishment Charges.

Salaries and Wages.
Officials.
Clerks.
Works—
Enginemen.
Firemen.
Foremen.
Furnacemen.
Gatemen.
Hammershafters.
Ironworkers.
Labourers.
Machinemen.
Messengers.
Photographers.
Police.
Stocktakers.
Storekeepers.
Timekeepers.
W.C. attendants.
Watchmen.
Wagon weighers.
Weighmen.
Fire brigade.
Cooks.
Stewards.

Facilities.
Use, maintenance and depreciation of—
Berth.
Buildings.
Dock.
Gear.
Launching ways.
Machinery.
Plant.
Advertising.
Carriage and general haulage.
Cleaning.
Charities.
Drawing office materials.
Fire appliances.
Heating.
Insurances for establishment.
Lighting.
Photographic materials.
Power.
Purveying.
Rents.
Rates.
Stationery.
Taxes.
Telephones.
Telegrams.

Sundry Materials.
Candles.
Cleaning gear.
Machine shop consumables.
Oils, tallow, grease.
Water.
Waste.

Scheduled Items,

Concerning which the owner should indicate a prime cost value to be included by the builder in his tender. The owner should reserve the right to himself to purchase all or any of these items. The builder should allow for the cost of lifting and fitting up on board in his "direct outlay" estimate.

Anchors and cables.
Boats.
Capstans.
Collapsible gates.
Compasses and nautical instruments.
Davits.
Deck covering compositions.
Decoration of public rooms.
Disinfecting plant.
Electrical—
Generating plant.
Lamps and fittings.
Wiring.
Bells.
Clocks.
Telephones.
Motors and fans.
Filters.
Fire indicators.
Floor coverings.
Furniture.
Galley and pantry outfit.
Gymnasium outfit.
Hardware.
Laundry outfit.
Life jackets.
Lifts.
Mattresses.
Medical outfit.
Musical instruments.
Refrigerating installation.
Safes.
Sanitary outfit.
Steam heating.
Steering gear.
Submarine signalling.
Thermotanks.
Telegraphs (mechanical).
Ventilation, trunking and cowls.
Water services (hot).
Watertight door gear.
Winches.
Windlasses.
Windows and sidelights.
Wireless telegraphy.

Builders' Profit.

An agreed percentage of the sum of—
(i) Direct outlay estimate agreed upon between owners and builders. This amount to include a margin equal to (say) 5 per cent. of direct outlay estimate.
(ii) An agreed percentage of the above sum to cover the establishment charges.
(iii) The actual total sum allowed by the owners to cover the cost of the scheduled items.

Owners' Incidental Expenses.

Certain Consumable Stores

Excluded from the specification, which, by reason of their being of special design, or their being stock articles, the owner may prefer to supply himself. Should he desire these articles to be supplied by the builder, he would have a prime cost value assigned to each, and include them under the other scheduled items.

Examples.
Blankets.
Bolsters.
Charts.
Chronometers.
Crystal.
Cutlery.
Counterpanes.
Earthenware.
Flags.
Linen.
Mattresses.
Napkins.
Plated ware.
Sheets.
Silver, towels, and any similar items.

Salaries and Travelling Expenses

Incurred by the owners' staff of technical officers, inspectors, and others in connection with the design and construction of the ship.

* In the case of a turbine job.

Table illustrating Mr. Peskett's Paper on Shipbuilding Contracts.

building of the ship, such as salaries, travelling, office, and other expenses, as well as the cost of any items which the owners might themselves prefer to supply in order to complete either the equipment or outfit, would have to be added in order that the whole estimated cost of the undertaking could be ascertained.

The author also outlined a method whereby the cost of the steel work and such material can be determined, which is generally done on the basis of weight. Shell and deck plating would be dealt with first, and then such other plating as occurs throughout the structure. Thereafter, and in a systematic manner, the quantities of angle sections would be taken out. An estimate would be made for the weight of various classes of forgings and castings, based on previous experience with similar ships, and this, with all other quantities, would be subsequently revised when the items came to be weighed.

Both in computing the cost of steel work and carpenter's wood the cost of material is kept separate from the cost of wages. In some cases, as, for example, in the manufacture and erection of cabins and cabin framing, furniture, painting, and other work, it is a convenient and easy matter to lay down rates for combined material and labour. If furniture were to be included the owner could name a price for the various items, and samples could be subsequently discussed and the price amended to suit.

By following in the main his idea the author maintained that the whole cost of material alluded to under the heading "Direct Outlay" could be estimated, and a joint agreement come to with regard to the net sum involved. The amount due for wages would then be taken out on the basis customary in the district. A margin of 5 per cent. should be added for errors of computation when defining the cost of the "Direct Outlay."

A sum having been agreed upon as representing the estimated direct outlay upon the ship, the establishment charges can be settled. What percentage is actually to be taken must depend on the nature and amount of work to be performed. It would then be possible to sum the three following quantities, namely: (*a*) The estimated direct outlay; (*b*) the establishment charges (a percentage of the direct outlay); and (*c*) the sum assigned by the owners to cover the cost of certain scheduled items, which sum the builder has to include in his estimate. The builder's profit is defined as some agreed percentage of the sum of the three items above. The exact percentage having been agreed upon, the contract price is fully determined. The actual sum to be paid to the builders, as opposed to the contract price, will be the sum of the four following quantities: (A) The actual certified amount of the direct outlay, provided always that this amount is not greater than the estimated sum (*a*); (B) the actual sum named above to cover establishment charges, namely (*b*); (C) The actual certified cost of the scheduled items; and (D) the actual sum named as the builder's profit; and of these (B) and (D) will remain as originally arranged. The cost under heading (A) will be revised in agreement with the investigations of the auditor and the quantity surveyor, and if, after investigation, the sum of the costs under this heading (A) is found to be less than the amount of the original estimate, the balance would be returned as a rebate by the builder to the owner. Section (C) must be revised, and should the cost under this section exceed or be less than the scheduled amount, an adjustment would be made.

DISCUSSION.

Prof. Sir J. H. Biles said that while Mr. Peskett very wisely repudiated the complete elimination of competition amongst shipbuilders by anything in the nature of a Trust, the steps which he suggested in his paper were intended to eliminate very largely the conditions which were incidental to severe competition. The difficulty of eliminating competition did not seem to have been dealt with; but so far as he could understand the intention of the paper, it seemed to him that they would eliminate competition whenever they arranged a system for determining the prices of ships, as suggested by Mr. Peskett. The paper suggested that a price should be agreed upon by calculation between the owner and the builder. That practically pointed to the system which he had himself attempted to describe, the difference being that the shipbuilder made the estimate in the ordinary way and the shipowner took that estimate as the proper estimate from which to; make a start. With reference to "schedule items," it was exceedingly difficult to make sure how much these would amount to; how much, for instance, decorators would spend in carrying out their ideas. He thought it would be very much better that that part of the ship which was a matter of taste and fancy, that part which was determined completely by the shipowner, should be paid completely by the shipowner.

Mr. John Inglis, LL.D., said he thought they might dismiss from their minds all ideas of a combination of such an unwieldy body as the shipbuilders of this country would be, but there was such a thing as a combination of shipowners which met occasionally to arrange rates of freight and other matters. He thought there should be a good deal more in common among shipbuilders than there was at present without any disadvantage to trade. He happened to know of a good many offers from this country within the past two years to shipowning companies on the Continent, and he was not aware that one of these offers was successful. The whole of the work in question had been placed abroad, and the successful tenderers had been from 15 to 20 per cent. below the lowest from this country. In one case the successful tender was 50 per cent. below the highest. The builders in Germany and Holland were able to work cheaper because labour costs were lower, the men working longer hours for less wages. When the shipbuilding industry became less brisk than it was at present, some of these Continental builders would be found to be very severe competitors even for orders from British owners. With regard to the rebate on the price of the *Franconia* to which Mr. Peskett had referred, he knew a case of four vessels built on the Clyde, two by one firm and two by another. The maximum price was fixed, and any saving was to be handed back to the owners. Both firms acted in perfect good faith, but while one handed back £10,000, the other had nothing to give back, and did not make the expected profit. Establishment charges had a way of going on whether there was work in a yard or not, while he did not think that the whole cost of work could be determined on the basis of wages. The cost per ton of the whole work on a torpedo-boat destroyer was very different from that on a tramp steamer, or a Cunard liner. On one occasion his firm were paid their last instalment of the price of a yacht with a blank cheque. He hastened to assure the members that afterwards they built two vessels for the same owners.

Mr. W. H. Whiting, of the Admiralty, said there were two great ways of bringing into existence any great engineering production. They might design it before they set out to build, or they might design it bit by bit as they went along. In the first case the structure was really in existence before it was built. He understood that the second method was what Mr. Peskett offered them; if so, it seemed to him likely to lead to anything but successful engineering work. Of all types of engineering structures to which it was desirable to apply methods of that kind, the least desirable were big ships. In that case it was the least desirable to apply methods containing any looseness of design. If they must try experiments of that kind, let them not be tried on so great and colossal a scale. They should not do anything in that Institution to encourage looseness in design, which might have very serious results.

Lord Inverclyde said that, speaking as a shipowner, he agreed with Mr. Peskett in so far as his paper referred to the class of ships with which he (Mr. Peskett) had been associated. It was their experience in the Cunard Company that in building these large vessels it was impossible to fix prices unless the builder made a very large margin to safeguard himself against eventualities. In these vessels they were gaining experience all the time they were building,

and it was not possible at the date of the contract to foresee all that would be required and which would necessitate changes in the sub-division. He did not think, however, the system would be satisfactory in the case of tramp steamers or small vessels and when placing an order for a small steamer he always preferred to contract at a fixed sum.

Mr. A. Hillhouse, Naval Architect to the Fairfield Shipbuilding Company, said Mr. Peskett had ignored entirely the risks of the shipbuilder. If the shipbuilder succeeded, he made a certain profit, but if he failed he had to submit to penalties and possibly have the ship thrown on his hands. Mr. Peskett also ignored that region in which the cost exceeded the estimate. It would be quite fair to pay the shipbuilder a definite percentage. But this offered no inducement to keep down expenses. The higher the total cost, the higher the percentage. He would suggest that in the event of loss on a contract the loss should be shared to some extent by the builders and the owners.

Mr. Peskett, in replying to the discussion, said all the ships which were being built at present for the Cunard Company were designed by them and built on the system of which he had written. This, he thought, applied to most large shipowning firms.

The second communication was:—

On Safety of Life at Sea.

By Percy A. Hillhouse, B.Sc.

The author pointed out that it was by stranding, foundering, capsizing, or by collision that the greatest disasters arise. It was, therefore, the duty of the naval architect and shipowner to devise and adopt all the means in their power, firstly, to avoid such accidents, and secondly, to afford means of saving life should such accidents unhappily occur. Of all the cases of loss of shipping, that over which the naval architect can probably exercise the greatest control is that of foundering. Subdivision of the hull into separate watertight compartments is, in conjunction with the provision of a suitable freeboard, the most valuable safeguard.

Increased safety may be obtained by means of transverse and longitudinal bulkheads. Great care requires to be observed when introducing the latter as, on account of the fact that water admitted to one side of the ship only will produce a heeling tendency, which may have the effect of bringing the tops of the bulkheads upon that side nearer to the water surface than would be the case were both sides simultaneously open to the sea.

Whereas there are many objections to the fitting of an inner skin in mercantile vessels, wing bulkheads serve a useful purpose as bunker boundaries, and so do not add materially to the vessel's weight or cost. Watertight decks form an exceedingly valuable form of subdivision. Very little additional weight is involved, as the deck is already required for other purposes.

In the last resort the safety of life at sea depended upon the amount and nature of the "life-saving appliances" with which the vessel is equipped. "Boats for all" is excellent in theory but exceedingly difficult to realise in practice. The problem of finding deck space for large numbers of boats is one of great difficulty, exceeded only by that of devising satisfactory means of filling them with their proper complement of passengers, and thereafter lowering them safely into the water. He considered that the recent recommendations of the Boats and Davits Committee would go a long way in solving the problem.

Discussion.

Sir Archibald Denny, Bart., opened the discussion on Mr. Hillhouse's paper. Mr. Hillhouse, he said, had not expressed a very definite opinion about large boats. The problem of the large unsinkable lifeboat—unsinkable because decked all over—appealed to him very much. Mr. Hillhouse had said that on large vessels it was difficult to find space across the decks for large boats, but if the regulations were made they would have to find the space. The three great factors in safety at sea were wireless telegraphy, sub-division and boats. Were it not for the risk of fire, they might say that sub-division would provide for the safety of the passengers. But they always had the danger of fire, and they could not leave passengers to be roasted alive on board a ship. They must have boats for all; but there was no doubt that careful navigation was the prime factor in the safety of passengers at sea.

Dr. S. J. P. Thearle, while expressing his high appreciation of Mr. Hillhouse's paper, expressed his regret that he was prevented by circumstances from discussing it, and Mr. H. M. Napier, of Old Kilpatrick, referring to the fact that the *Aquitania* is to have 92 boats, said this was a ghastly state of things. What was to happen if all these boats had to be utilised? At present it was absolutely impossible to get large boats to the low side of a ship, or to get them launched from the high side, and ships nearly always had a list when anything happened to them at sea. It was absolutely essential that methods should be devised for shifting the boats from one side of the ship to the other.

Prof. W. Hovegaard, of Washington University, U.S.A., referred particularly to sub-division and the necessity for well-arranged bulkheads and water-tight decks, especially in the fore parts of ships. He also advocated wide bulkheads, about 6 or 7 ft. from the outside skin and without any doors.

Mr. Hillhouse, in his reply, said the problem of the large boat presented difficulties, but these would have to be faced and overcome. As to doorless wing bulkheads, there would be a great loss of space and a great temptation to reduce the width of the wing spaces until the bulkheads became almost inner skins and liable to damage along with the outer skin. With regard to other bulkheads, it was a question whether it would not be wise to accept in mercantile vessels the system of complete bulkheads adopted in war vessels.

Wednesday's Proceedings.

Wednesday was occupied mainly in the reading of six papers, the first three being read in the Rankine Hall and the others in the Naval Architecture Lecture Room of Glasgow University. We publish below abstracts of the papers, reserving until our next issue the report of the discussions.

Note on some cases of "Fatigue" in the Steel Material of Steamers.

By S. J. P. Thearle, D.Sc.

In this paper the author pointed out that evidences of what is known as the "fatigue of metals" have from time to time been disclosed when surveying steel vessels under repair, but during the last year or two certain phenomena of the kind have been observed which possess special features. In the first of these cases which came under notice a crack was observed in the shell plating on each side of a vessel a short distance forward of the collision bulkhead. These cracks extended right through the plating, and from the amount of wasting by corrosion which had taken place within the cracks it was evident that they were not of recent date. The cracks were of irregular form and did not break into rivet holes, nor were they near the edges of the plating. Soon afterwards another such case occurred, except that in this instance the cracks were at some short distance abaft the collision bulkhead. Then another and yet another case came under attention, so that surveyors at certain repairing ports began to look out for them when vessels came under survey. It was evident from the first to experienced surveyors that the symptoms were similar to those due to fatigue in the steel, such as had been observed at some other parts of vessels.

It was remembered that some 20 years ago similar cracks were

sometimes seen in margin plates of double bottoms at the backs of the angle-bar attachments of the frame heel brackets. Leaks in the margin plate had led to the removal of the attachment angles, and then it was found that cracks had developed in the margin plate at the backs of these bars, in the vicinity of the uppermost rivet and sometimes near the rivet next to it. Such cracks were rarely joined to the rivet hole, but generally they partially encircled it, and it may be mentioned that they were mostly confined to No. 1 cargo hold. Careful investigation showed that the cracks were the result of fatigue in the material of the margin plates, due to frequent alternating pull and push stresses brought upon the margin plate by the heels of the frames, and continued over a long period of time. The remedy was found in giving the frame heels a better connection to the double bottom, and this was effected by using double instead of single angle attachments at the margin plates, and by the more extensive use of gusset plates and angles

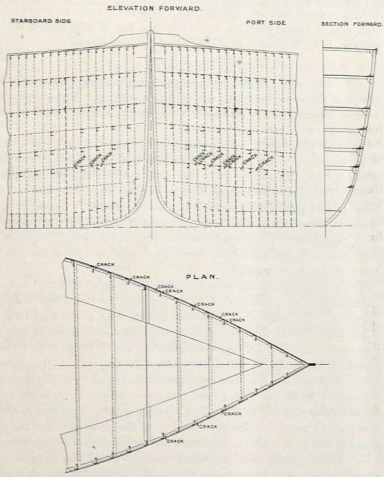


Fig. I. Showing Situation of Cracks.

in connecting the frames to the inner bottom plating. Instances of fatigue at this part of a vessel are not often seen at the present day, the remedies adopted having proved to be efficient for the purpose.

The cases in which the phenomena now under consideration had been observed were, therefore, analysed, and it then appeared that they had certain features in common which pointed to a common cause, and consequently suggested a common remedy. The author commented on about 29 vessels which had been found when under survey to have been affected in this way. These were all steamers, ranging from about 3,000 tons to about 5,000 tons gross register. Their ages, when they came under survey, ranged from 2 to 16 years, the average age being about 9 years. They were of all types, ranging from single-deck to three-deck, spar-deck, and shelter-deck vessels, and some had web framing, while others were framed with the deep frames, ordinarily adopted at the present day. There was nothing, therefore, as regards type of design or system of framing common to the vessels, but all of them were of steel. Moreover, they were the products of 13 different builders and 7 different building ports. The first figure shows the bow portion of the profile of one of the vessels, and the same figure shows a sectional view of the vessel in way of the cracks. There is also shown a part plan of the vessel in part profile and in section on the same figure. The second diagram shows some of the cracks on an enlarged scale, and on one of these is also shown a sectional view of a crack which has undergone some amount of wasting.

Certain features are common to all the cases, namely:—(1) The cracks are always found either in the fore peak or in the fore part of No. 1 cargo hold. (2) They always occur at the back or at the edge of a chock angle attachment of a side or panting stringer plate to the shell plating. (3) They always occur in close vicinity to a frame unsupported by a panting or other beam, and they never occur in the vicinity of a frame which is supported by beams. The primary cause was evidently slight local movement, frequently

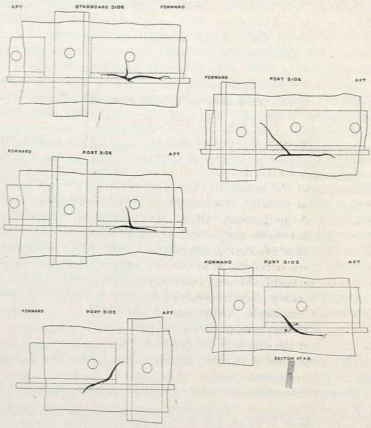


Fig. II. Showing some of the Cracks on an Enlarged Scale.

repeated and extending over a long period of time; and this slight local movement was also evidently due to something which distinguished the frame at which it occurred from the adjacent frames; that is to say, in being unsupported. There could not have been any panting in the structure itself, for the number of tiers of beams and panting stringers quite preclude such from taking place. The slight movement referred to has occurred only at the intermediate frames between those to which the beams are attached. In the case of margin plates, the crack occurs at the backs of the attachment angles, but not at the rivet holes. The fatigue in the plate resulting in a crack seems, therefore, due to a slight but frequently repeated movement in the plating at the chock angle attachment, suggesting the necessity for securing the intermediate frames to the panting stringer and for distributing the resistance to panting stresses over a larger surface of shell plating. By attaching the intermediate frames (unsupported by beams) to a wide stringer plate by means of substantial brackets, and by substituting double for the single chock angle attachments of the stringer to the shell

plating, it is hoped that an efficient remedy has been found for this trouble.

It may be added that both in the cases of fatigue at margin plates and in those described in this paper, tensile and other tests made upon material cut from the vicinity of the cracks do not show any abnormal conditions, but simply give the ordinary test results of good mild steel used for shipbuilding purposes, thereby showing that the effects of fatigue are practically limited to the small portion of the material which yields under its influence.

Effect of Form and Size on the Resistance of Ships.

By G. S. Baker and J. L. Kent.

The authors point out that this problem may be approached from the standpoint of stream lines in a perfect fluid, and on certain assumptions such stream lines may be obtained. The process adopted by the authors in doing this is that given by Mr. Taylor in a paper read before the Institute of Naval Architects in 1894, for flow in two dimensions. This consists of combining graphically a line of sources and sinks of varying magnitude with a parallel stream, the distribution of the magnitude of the sources and sinks being altered to produce the differently shaped stream forms.

In order to test these results the resistance experiments with some 215 models were examined. These vessels included broad and narrow, shallow and deep, fast and slow vessels, and covered a very extensive range of prismatic coefficients. The resistances of the models tested at the experiment tank are tabulated in the Froude constant form, which for present purposes may be regarded as $\frac{\text{resistance}}{(\text{velocity})^2}$. From typical constant curves it was seen that these were generally constant in ordinate value, but had humps of increasing value as the speed increases. These humps are succeeded in some cases by hollows and in others by a general flatness of the curve. With the exception of only one class of ship (which includes all vessels forced to a high speed for the form, such as destroyers, steam pinnaces, &c.) the change-over from this abnormal hump to the succeeding hollow has been found to occur at the natural speed of waves, whose length is equal to (P × L) where

P is the prismatic coefficient and

L is the length of the model in feet.

This speed is given by the formula:—$V = 1 \cdot 34 \sqrt{PL}$, V being the velocity in knots.

The speed at which the other and smaller humps occur can be found by substituting $\frac{L}{n}$ for L, n being an integer which takes account of the number of wave lengths between the two wave-making systems of the model. This invariably gives the correct speed for the flat portion of the hump, and it also gives the second and third of these points at lower speeds with fair accuracy when the ship is full enough to make them noticeable. At low speeds for the form the formula is not so trustworthy, as the pressure distribution changes a little with speed, but as the wave-making is then of little importance, this does not detract from the usefulness of the formula.

The author showed curves of the results of resistance experiments were plotted to abscissæ values

$$\frac{\frac{6080}{3600} \times V}{\sqrt{\frac{g\,P\,L}{2\,\pi}}} = \cdot 746 \frac{V}{\sqrt{P\,L}}$$

the ordinate value being equal to $2{,}983 \frac{R}{(\text{displacement})^{\frac{2}{3}}\,(\text{velocity})^2}$. The critical speeds of all the models correspond to—

$$= 1, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}},$$

&c., and there are flats or hollows in the resistance curves at these abscissæ values.

A model for the exceptional class mentioned above, tried at speeds ranging from 30 to 50 knots for a vessel of 250 ft., showed less transverse wave-making as the speed was increased to the upper limit. This was particularly noticeable to an observer stationed at the beach at the end of the tank waterway. Unfortunately the divergent waves increased continuously, and the percentage of resistance due to wave-making remained fairly constant at all the top speeds. The resistance records in this case were only taken up to 45 knots for ship, but in another case, the records were taken to 50 knots, and showed a continuous decrease in wave-making at the higher speeds.

A few of the model results were examined to see whether these show any tendency to higher skin friction values, when the prismatic coefficient is increased by the use of parallel body. Only the lowest speeds can be used for this purpose, in order to get away from possible wave resistance, and even then a small percentage of the resistance may be due to the divergent waves. Neglecting this, however, and considering the whole resistance as frictional, it has been found that for models having 50, 30 and 10 per cent. parallel body the value of the constant f in the formula—

$$R = f\,A\,V^{1 \cdot 825}$$

is ·21, ·135, and ·10 greater than the corresponding f values for a plank of the same length as the model considered. The above are average figures, as the results vary somewhat amongst themselves according to the form of the model.

In order to obtain a reliable figure of the effect of form upon the skin resistance at low speeds, advantage was taken of the formula given by Dr. Stanton in his paper read before the Institution in 1912. This formula enables one to predict the resistance of a form in one fluid from results obtained in another. Experiments made in water in the usual way with a 16-ft. model were compared with experiments in air made with a 3-ft. model, which was symmetrical in shape, each half being the same as the underwater body of the 16-ft. model.

The experiments in air were carried to a speed of 50 ft. sec., and corresponded to a velocity of 46 ft. per min. for the 16-ft. model in water. The resistance predicted in this way was found to be 9 per cent. higher than the skin friction calculated from Froude's constants, and to vary approximately as the 1·85 power of the speed. The results in water were about 10 per cent. higher than those obtained by Froude's constants, but fell away badly below a speed of 90 ft. per min.; and the above 10 per cent. holds for speeds somewhat above this when possibly a little divergent wave-making is present. This form had very fine lines, so that eddy-making was reduced to a minimum, the prismatic coefficient being ·77. These results lend considerable support to the suggestion already made, that owing to the stream-line motion the skin friction of the form is greater than that obtained by the use of Froude's coefficients, this increase depending upon the fulness of the form and being of the order mentioned above.

The practical value of the formula given in the paper, as a clue to the amount of parallel body which can be usefully associated with a given entrance and run, is shown in the following analysis of W. Froude's* series of experiments with varying parallel body.

The formula

$$\text{Ⓟ} = \cdot 746 \frac{V}{\sqrt{P\,L}}$$

may be written

$$(1)\ L_p = \frac{(\cdot 746\ V)^2}{\text{Ⓟ}^2} - \left(P_e\,l_e + P_r\,l_r\right)$$

where

P_e = prismatic of entrance. l_e = length of entrance.
P_r = prismatic of run. l_r = length of run.
L_p = length of parallel.

* Trans. INA 1877.

By its use in this form L_p can be found for any given velocity and (P) value. Determine the value of L_p for each velocity for which the resistance curves are given (1) when

(P) = 1; (2) when (P) = $\frac{1}{\sqrt{2}}$; when (P) = $\frac{1}{\sqrt{3}}$, and so on.

Square up from the abscissæ corresponding to these L_p values to the proper resistance curves. Draw curves $(P)_1$, $(P)_2$, $(P)_3$, &c., through the spots so obtained all the spots on each curve corresponding to the same (P) values.

Considering the resistance curve for one velocity (say, 14·43 knots), it can be shown that the spots corresponding to—

$$(P) = 1, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}},$$

for this velocity all lie approximately on a mean resistance line drawn parallel to the base. Such a straight line must be the measure of the wave resistance when the cosine term in the equation

$$R_w \propto \left(H_1^2 + H_2^2 2\,k H_1 H_2 \cos \frac{g\,m\,l}{2\,\pi}\right)$$

is zero. This is in accord with the statement in the body of the paper, viz., that the velocity given by the formula—

$$(P) = \cdot 746 \frac{V}{\sqrt{PL}}$$

is approximately the velocity at which the total transverse wave-making resistance is that due to the entrance alone, added to that due to the run alone.

From the position of the points p_1, p_2, p_3, &c., on his resistance curve, it was shown that when the speed and length of parallel body of a ship are connected by formula (1), then a small increase in the length of parallel body (associated with the same entrance and run) will be bad from a resistance point of view at this velocity, whilst a small decrease will be advantageous.

The hollows of this resistance curve occur approximately a quarter of the distance between two successive spots, to the right of the L_p value given by the formula. It is therefore possible to write down approximate lengths of parallel body at which the resistance is a minimum. Such lengths are given by—

$$L'_p = L_{p1} - \left(\frac{L_{p2} - L_{p1}}{4}\right) = \frac{3}{4}\left(\cdot 746\ V\right)^2 - \left(P_e\, l_e + P_r\, l_r\right),$$

$$L''_p = L_{p2}\left(\frac{L_{p2} - L_{p1}}{4}\right) = \frac{7}{4}\left(\cdot 746\ V\right)^2 - \left(P_e\, l_e + P_r\, l_r\right),$$

and so on.

In other words, the most economical speeds for a ship will be given *approximately* by—

$$V = \sqrt{\frac{4}{3}\left(\frac{1}{\cdot 746}\right)^2 PL} = 1\cdot 546\sqrt{PL} \text{ or } (P) = 1\cdot 1543 = \sqrt{\frac{4}{3}}$$

$$= \sqrt{\frac{4}{7}\left(\frac{1}{\cdot 746}\right)^2 PL} = 1\cdot 014\sqrt{PL} \text{ or } (P) = \cdot 756\ \sqrt{\frac{4}{7}}$$

$$= \sqrt{\frac{4}{11}\left(\frac{1}{\cdot 746}\right)^2 PL} = \cdot 807\sqrt{PL} \quad (P) = \cdot 602\ \sqrt{\frac{4}{11}},$$

and so on.

Any other form can be treated in exactly the same way, and bad transverse wave-making due to interference can be avoided by the proper choice of length and prismatic coefficient.

Experiments on "Suction" or Interaction between Passing Vessels.

BY PROF. A. H. GIBSON, D.Sc., and J. HANNAY THOMPSON, M.Sc.

The main portion of this communication had already been read before the British Association, Section "G" in September, 1912. The authors describe a series of experiments with two screw propelled vessels. One of these, the steam yacht *Princess Louise*, is 88·5 ft. in length, 13 ft. beam, 5·66 ft. mean draught, displacing approximately 96 tons. The second is a motor-driven launch, 29·33 ft. long, 6.75 ft. beam, 1·37 ft. mean draught, displacing approximately 2·6 tons. Each is driven by a single screw. The experiments were divided into two distinct sets. In the first the vessels were manœuvred until on sensibly parallel courses, heading for the same distant object; their lateral distances apart and speed being varied in different experiments. The courses having been satisfactorily fixed, with the helm of the motor boat amidships, this helm was lashed, the helm of the *Princess Louise* being afterwards manipulated so as to keep her on her original course. Two plane tables with alidades were mounted on the deck of the *Princess Louise*, distant 67 ft. 8 in. centre to centre, and the relative position of the motor boat was fixed at intervals of 15 seconds during each run by means of simultaneous sights taken from these. Both vessels were calibrated on the measured mile before the experiments, and speed-revolution curves were obtained from which, by counting the revolutions, the speed of each vessel could be ascertained or regulated.

The second series of experiments was carried out with a view of measuring the helm angle required to maintain the course of the smaller, when in the vicinity of the large vessel. In these experiments the relative positions of the two boats were obtained as before, the helm being adjusted as required to keep the head of the vessel on its original course. The helm angle was measured by means of a pointer fixed to the tiller, and working over a graduated sector, and was observed at intervals of 15 seconds. The rudder originally fitted to the motor boat was proportionately about three times as large as is fitted to the average sea-going steamship. This was replaced for the purpose of the experiments by a rudder of 144 sq. in. area, for which one of 75 sq. in. area was afterwards substituted, the latter representing approximately to scale the rudder fitted to the average large steamship. The results of control experiments using each rudder in turn are given at a later stage of the paper.

Owing to the risks involved in the collisions, the speed of the vessels was restricted to a maximum of about 5·75 knots which, in the case of the *Princess Louise*, corresponds to 18 knots in a vessel of the dimensions of the *Olympic* (882 ft. long). The minimum speed was about 3·5 knots. Owing to the local conditions it was found impracticable to carry out the experiments in shallow water of even approximately constant depth, and, except in two experiments, where the water was about 12 ft. deep, the depth actually ranged from 20 to 30 ft. Since this is from 12 to 20 times the mean draught of the smaller vessel, these are essentially deep water experiments, and, as is indicated both by theory and experiment, the forces involved are in general less than would be experienced in shallow water.

The first eight experiments, when the speed of the *Princess Louise* was 5·1 knots, showed repulsion when the smaller boat was ahead of the larger, gradually changing into an attraction as the latter boat drew abreast, and finally produced collision from a lateral distance of 3·4 lengths of the smaller boat.

Other experiments showed the same attraction occurring at different relative longitudinal positions of the vessels, with lateral distances ranging from 1·7 to 3·5 lengths of the smaller boat, while a further series demonstrated when the speed of the *Princess Louise* was 3·61 knots in spite of their close proximity, yet the resultant moment was approximately zero.

Another experiment, in which the *Princess Louise* was somewhat faster than the motor boat, showed repulsion when the smaller boat was slightly ahead, changing to attraction as the larger boat drew abreast, and terminating in collision from a distance of one and a half lengths. When the initial lateral distance was respectively $1\frac{1}{8}$ and $1\frac{3}{8}$ lengths, but the initial relative longitudinal positions different in the two cases, collision was produced. When the speed of the *Princess Louise* was 3·75 knots, while that of the

motor boat was respectively 3·9, 4·5, 5·1, and 5·4 knots, in each case the smaller boat was attracted.

The authors pointed out, that collision, when produced by attraction from a comparatively large distance, was of a much more direct, and consequently dangerous, nature than when the paths of the vessels are initially very close. In the former case the forces involved are operative for a sufficiently long time to produce a comparatively large angular deflection of the attacking vessel, the lateral component of whose own steaming speed becomes increasingly overative in increasing the velocity of approach. In the latter case the angular deflection, is comparatively small, the velocity of approach is largely due to the bodily inward drift, and and the vessels come together with a comparatively slight and innocuous broadside bump.

The general conclusions arrived at by the authors are that the greater the difference between the speeds of the vessels the smaller is the risk of collision, since such a difference reduces the time during which the mutual forces are operative; such an effect being much more marked when the smaller vessel is the faster. If the larger vessel is the faster, particularly if her speed be accelerated while passing the smaller, the attractive forces are increased to an extent which partially, and in some cases entirely, counterbalances the effect of the reduction in the time during which the vessels are in dangerous proximity. It follows that any attempt of the larger vessel to draw ahead of the smaller by increasing her speed, while in close proximity, greatly increases the risk of collision.

With vessels of the relative size used in these experiments, moving at speeds within 10 per cent. of each other, collision may be produced from a lateral distance as great as 3½ lengths of the smaller vessel, except in so far as prevented by helm action. The greater the draught of the attracted vessel, for a given displacement and length, the greater the probability of ultimate collision. The smaller the attracted vessel, within limits, the smaller is the angle of impact under given conditions, while the greater the lateral distance from which collision is produced, the more direct and dangerous is the resultant impact. On the whole, the results of the trials that show under certain circumstances interaction is a very real danger to navigation, even in deep and open waters.

With ordinary vessels of the relative sizes adopted for the experiments, if the possibility of interaction is realised from the very first, and if all initial swerve is prevented by an early application of the helm, there would appear to be little danger even at lateral distances so small as one half the length of the smaller vessel, but once such a swerve has been initiated a much greater helm angle is necessary to control the vessel, and, failing immediate control, collision occurs within comparatively few seconds.

Experimental determination of the Effect of Internal Loose Water upon the rolling of a Ship amongst a Regular Series of Waves.

By A. CANNON.

The author explained the theory and construction of the rolling machine as follows:—A B and C D (Fig. 1) are two radii that revolve about A and C respectively, and are always parallel to each other. A C is a vertical line. A rod E is pivoted at B to A B, and can slide through a sleeve D that is pivoted to C D. Then, if the values of r_1 and r_2 are correctly chosen, and A B and C D are revolved at a particular uniform speed, B will represent the orbit circle of a trochoidal wave of height $2r$, and B D will always lie in the direction of the normal to the wave slope at B. Thus the resultant force on any particle at B will, at this speed of rotation, always act along D B.

The lengths of r_1 and r_2 and the speed of rotation may be obtained as follows:—Let the machine represent a wave at a scale of $\frac{1}{n}$th the full size. Let l be the length of the actual wave and h its height.

Then—

$$r_1 = \frac{h}{2\,n}$$

$$\frac{R}{r_1} = \frac{R - d}{r_2}$$

or—

$$R = \frac{r_1 d}{r_1 - r_2}$$

and, therefore, if r_1, r_2 and d are fixed quantities, R is constant; that is, A C and B D always meet in the same point O. Thus, if we make r_2 of such a length that R is equal to the radius of the rolling circle of a trochoid of length l, and rotate the machine at the appropriate revolutions, B D will always represent the normal to the wave surface; as it is a property of the trochoidal wave that the line joining any point of its surface to a point vertically above its orbit centre at a distance equal to the radius of the rolling circle is a normal to the surface at that point.

Now—

$$R = \frac{l}{2\,\pi\,n}$$

and—

$$r_2 = r_1\left(1 - \frac{d}{R}\right)$$

$$\therefore\quad r_2 = \frac{h}{2\,n}\left(1 - \frac{2\,\pi\,nd}{l}\right).$$

The period of a wave of length l is

$$\sqrt{\frac{2\,\pi\,l}{g}},$$

and, therefore, the period of the machine will be—

$$\sqrt{\frac{2\,\pi\,l}{g\,n}}.$$

So that, in order to represent a wave of length l and height h,

$$r_1 = \frac{h}{2\,n},$$

$$r_2 = \frac{h}{2\,n}\left(1 - \frac{2\,\pi\,n\,d}{l}\right).$$

The machine is rotated at such a speed that its period is—

$$\sqrt{\frac{2\,\pi\,l}{g\,n}}.$$

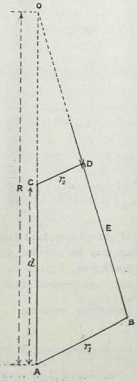


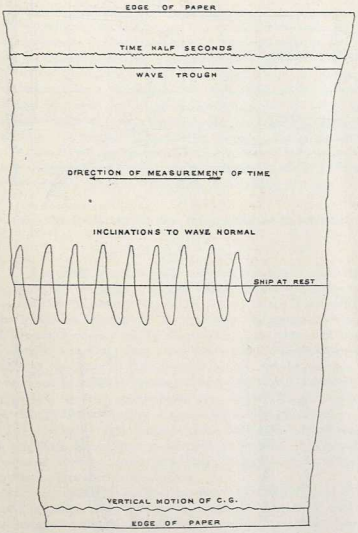
Fig. 1.

The method of construction adopted for the machine was shown in diagrams provided by the author. The main frame is of cast iron. The radii are formed of slotted steel levers, so that their lengths may be set to any values desired. The machine is driven by an electric d.c. shunt-wound motor with a speed control in the armature circuit for the low speeds and in the shunt circuit for the higher speeds. This is directly coupled to a worm driving as worm-wheel attached to the lower lever. The upper lever is driven from the lower one by means of a bicycle chain that passes over two equal chain wheels, one of which is fixed to each lever. In order to secure uniform rotation and to prevent the machine from stopping too suddenly when the current is cut off, a heavy flywheel is fixed between the motor and the worm. The speed of the machine can be varied from 15 to 40 revolutions per minute and the control resistances are very sensitive indeed, so that any desired rate of revolution can be obtained within the above limits. The machine

was originally intended to be transportable, so that the various parts were made as light as was deemed advisable. It was found, however, that a good deal of vibration was set up in the vertical standard when the motor was running. To remedy this a stay was taken from the top of the standard to an adjacent wall. It was also found that, owing to the great weight of the model—about 200 lb.—some means of balancing this was necessary to ensure a uniform rotation. This necessitated making a continuation of the worm-wheel shaft and supporting its other end upon an independent bearing. The whole stands upon a wooden base that is fixed to a specially prepared concrete floor.

The researches of the late W. Froude led to the conclusion that the law of resistance to the rolling of a ship in still water at small angles was given by $d\theta = a\,\theta + b\,\theta^2$, where θ is the angle of roll from

VESSEL ON WAVE 30' HIGH, 900' LONG. WITH 1·23% FREE WATER.



Specimen of Record: Vessel on Wave 30 ft. high, 900 ft. long, with 1·23 per cent. free water.

the vertical, and a and b are two coefficients that are constant for the same ship when under the same conditions of surface, displacement, and position of centre of gravity, but are different for different ships. From a consideration of the nature of the resistances to rolling that were likely to act upon a ship, he came to the conclusion that the a term in the equation for resistance was induced by a retarding couple whose moment was proportional to the angular velocity, and the b term was induced by a retarding couple of moment proportional to the square of the angular velocity. It was therefore considered that, if it were possible to apply to the model resistance couples varying as the angular velocity and the square of the angular velocity, together with means of varying each, independently of one another, the whole field of resistance could be dealt with. The first step, however, was to determine how much resistance was already acting as a result of pure mechanical friction and air resistance. At this time no suitable method had been devised of recording the angles of roll, so that the only means of determining the magnitude of the resistance was to heel the model to some known angle, and count the number of rolls before coming to rest. This was compared with all available data, and estimates were also made of the number of rolls that would be required under various resistances.

These experiments indicated that the mechanical friction of the machine was too great, and steps were taken to reduce this as far as possible.

In this way it was found possible to diminish the friction very materially. The problem of arranging the necessary additional resistances in the manner desired has not yet been solved.

It is, of course, possible to have recourse to the device of Colonel Russo. He produces a resistance by causing a wooden pulley to rub against a stretched elastic belt. The shape of the pulley has to be determined for each case. So far, however, the author's efforts have been confined to arranging some means by which a variation of resistance can be easily accomplished. With respect to the experiments referred to in this paper, he was of the opinion that it is unnecessary to aim at any very faithful reproduction of the resistance. The reasons for this are stated later.

In addition to the problem of how to produce the resistance, there is the question of the amount that is necessary. Very little data is available respecting the resistance to rolling of actual ships, and practically the whole of this refers to warships. And of what is available it is impossible to say from this what the resistance would be for a merchant type.

The Effect of Water Chambers on the Rolling of Ships.

By LLOYD WOOLLARD, R.C.N.C.

The theory of rolling founded by W. Froude has been followed in the investigations.

The most important factors affecting the angle of roll are—

(*a*) The magnitude of the forced oscillation, which governs also to some extent that of the free oscillation; and

(*b*) The coefficient of resistance K_1,* which determines the rate of degradation of the free oscillation.

In dealing with the rather different problem of the maximum roll in a non-synchronous wave, Mr. R. E. Froude, in a paper read before this Institution in 1896, combined these two factors, and obtained what was termed the criterion amplitude of roll. This, however, is inapplicable when two free oscillations appear simultaneously (as will be found when rolling under the action of the water tanks).

Curve I. shows the forced oscillation plotted for a ship without water chambers. The dotted curve by it is the corresponding curve for an unresisted ship. It is evident that the curves are almost identical except over a narrow range of wave periods where these nearly coincide with the ship's period. It appears from this that the forced roll does not, when taken alone, provide an accurate indication of the actual rolling in all conditions; *e.g.*, among comparatively short or long waves its amplitude is unchanged by any additional resistance (due, for instance, to enlarged bilge keels). The necessity for taking some account of the resistance coefficient K_1 (which greatly affects the free component of the roll) is illustrated.

In investigating the effect of the water chambers four cases were taken—(1) When the water in the tank is prevented from moving. (2) When the ship is stationary and the water is allowed to oscillate in the tank. (3) When the tank is in operation but the motion of the water and of the ship are absolutely unresisted. (4) When the tank is in operation, the ship and water are both subject to a resistance proportional to the velocity.

* Coefficient K_1 = ·05.

The "K" damping coefficients limit the rolling (apart from their influence on the forced oscillation) by their effect on the free term. The values of K_2 and K_4, the damping coefficients of the free oscillations, are therefore marked on the curves of forced roll (II., III., IV., V., Fig. 1) at points corresponding to their corresponding periods. Over a range of periods near these points, these coefficients correspond to the damping of the more powerful "free" term, and they indicate approximately the degree of damping to be expected. In condition V., for instance, the coefficient is ·21 near the lower peak of the curve, and ·09 near the higher peak; the "free" component oscillations would, therefore, be rapidly damped near the former position, *i.e.*, among waves of comparatively short period, while their degradation would be much lower among longer waves.

The amplitude of the forced oscillation and the various coefficients have been calculated; the former is plotted in the form of curves on a base of $\frac{\text{wave period}}{\text{ship's period}}$. The resistance of the water in the tank has been varied, but that of the ship is assumed constant (K_1 = ·05 giving a decremental "a" coefficient of ·157). In general the tank period is ·9 times that of the ship, but in one case it has been diminished to about ·7 times that of the ship.

Curves II., III., IV., V. (Fig. 1) indicate the effect of the tank. In II., where the tank resistance is low, the results already found for the condition without resistance are broadly confirmed. At the periods of the principal oscillations humps are formed, and the tank greatly enhances the rolling of the ship. When the ship and wave synchronise the rolling is enormously reduced. The damping coefficient is unaltered. In III. the water in the tank is throttled, so that its resistance is increased five-fold. The humps are now less pronounced, and the gain at synchronism is correspondingly reduced. The damping coefficient is greatly increased—to about ·15—so that the free component of the roll would be greatly diminished. In IV. the water is further throttled, so as to multiply its original resistance by 10. The curve now approaches curve I. with no tank, the humps previously situated at the principal periods have disappeared, and the hollow at synchronism with ship is replaced by a hump. The damping coefficient is again increased. Of the three conditions represented by curves II., III. and IV., probably III. is the most favourable as regards the reduction of rolling over the whole extent of the curve. When considering the application to a large ship it is evident, however, that the periods of the waves actually encountered by such a ship are usually less than that of the ship. For purposes of comparison the lengths of the waves are shown below the base, corresponding to a ship of 14 seconds double period, moving perpendicularly to the direction of wave advance. Although the apparent wave period may be increased for the same wave length if the ship is moving partly in their direction of propagation, this effect is probably limited, since pitching rather than rolling would result if the vessel's length made too great an angle with the line of crests. It follows that in rare cases only can the wave period exceed or even equal that of the ship. The initial portions of the curves are therefore of greater practical importance than the remainder, and in all the cases considered the forced roll has been increased under short period wave impulses.

In order to reduce the rolling under these shorter waves, advantage can be taken of the fact that the forced roll is a minimum when the wave period is slightly greater than that of the tank. In curve V.

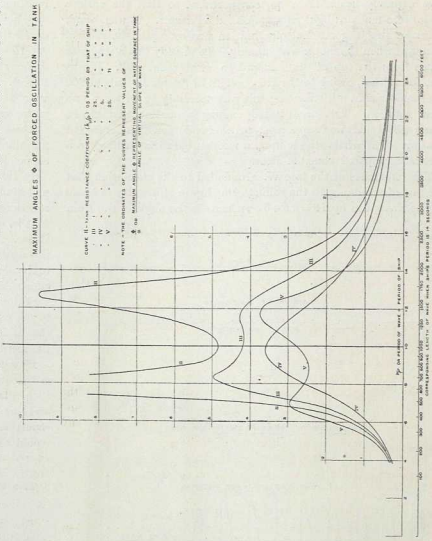


Fig. 2.

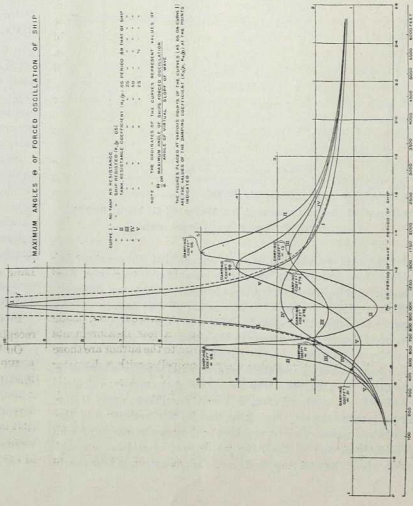


Fig. 1.

Diagrams illustrating Mr. Woollard's Paper on "The Effect of Water Chambers on the Rolling of Ships."

the tank period is lowered to about 70 per cent. of the ship's period, so as to render the installation useful under waves of reduced period and length. The resistance in the tank is the same as in curve III. This condition is that which would also be obtained if the metacentric height were increased by about 45 per cent. As compared with no tank, the forced roll is slightly increased for wave periods from ·55 to ·7 of the ship's period; but a big reduction results for ratios of from ·7 to 1·15. Actually the reduction of the free roll by the increased damping coefficient would widen the range of usefulness of the tank, probably sufficiently to render it of some service for all short wave periods.

The maximum angles taken by the water relative to the ship are shown (in terms of the wave angle) on Fig. 2, curves II., III., IV., V. The maximum angle is actually limited by the height of the side of the tank, and the height required may be determined by the aid of these curves.

The phase differences between ship, wave, and tank have not been investigated in detail; but it is of interest to note that the modification in the rolling caused by the tankwater is due not only to the direct gravitational and inertia effects of the water, but also to the different attitude of the ship relative to the waves. For instance, in the conditon when the tank is causing increased rolling, the waves are doing increased work on the ship, since energy is dissipated both in the tank and in the augmented resistance caused by the accelerated motion of the ship. The change in the work done on the ship by the waves is therefore of importance, and needs consideration when it is desired to ascertain the effect of any device whose object is the mitigation of the rolling of a ship.

On the Criterion for the Occurrence of Cavitation.

BY PROF. DR. L. GUMBEL.

When a screw propeller blade moves through the water, then the water on the influx or suction side of the blade can only be in contact with the latter as long as the velocity of the water, obtainable by the over-pressure of the atmosphere, as against the tension of a resulting cavity, and by the pressure of the column of liquid, is equal to or greater than the velocity actually required for the influx of the water to the propeller blade. If the number of revolutions is increased so that the possible velocity of influx is below that required, the propeller gets an insufficient supply of water, and the occurrence of cavitation is brought about.

The criterion of cavitation depends on the required rate of supply to the blade being equal to the possible velocity of this influx. The influx velocity to the propeller blade, as long as cavitation does not set in, is normal to the surface.

The most important result observable is that, as the speed of the vessel increases, the limit of slip which can take place without cavitation is reduced. Further cavitation will start on the tip of the blade.

An enormous influence is exercised by the form of the cross section of propeller blades and more especially by the angle at the emersion edge. The feather-edge angle should be as small as possible, and, hence, of forming a cross section of the blade as nearly as possible approaching the diagram given here.

A practical test of the results arrived at can only be made by actual experiment. Many observations have, indeed, been made of the phenomenon of cavitation, but only a few measurements are available. The only measurements known to the author are those of Mr. D. W. Taylor, who tested a screw propeller with a diameter of 16 in. and a pitch of 6·4 at three speeds of 5, 6, and 7 knots respectively, under various conditions of slip, from — 0·3 to — 0·4.

A comparison with Taylor's experiments shows that, as a matter of fact, one can take the setting in of cavitation for granted at the above speeds, with the slip values given.

The author concludes (1) that the setting in of cavitation in screw propellers is not dependent on the surface pressure on the blade area. (2) The finer the pitch of the screw propeller and the greater the angle formed by the feather-edge, and the greater the speed of advance, the less the slip should be to prevent the formation of cavities. (3) That cavitation sets in earlier in a rough sea, when air is mechanically mixed with the water.

A lesser angle at the emersion edge will be more easily obtained in broad-bladed propellers than in narrower ones. In this fact lies, the secret of the success that has been obtained with turbine screws with broad blades. Since, however, broad blades have a lower efficiency than narrower ones, in consequence of the increased

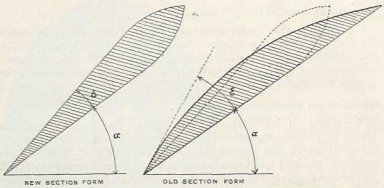


Diagram Showing Cross Sections of Propellers.

friction, an attempt should be made, by distributing the cross section in an appropriate manner as in the diagram, to construct as narrow propeller blades as possible, with as small a feather angle as is allowable at the emersion edge. Broad propeller blades should especially be avoided where, as in the case of merchantmen and battleships, the vessels' speed is kept below the limit at which, under ordinary circumstances, cavitation is not to be anticipated.

The criterion here put forward has of course nothing to do with the cavities caused by the narrowing of the through-passage section between two blades, the presence of which is often shown by the occurrence of erosion especially near the root on the thrust side of the blades. The occurrence of these cavities is worthy of special study.

THE SOCIAL SIDE.

In addition to the reading of the papers elaborate arrangements were provided for the enjoyment of those who wished to avail themselves to the full of the opportunities presented by a sojourn at the seat of the world's shipbuilding industry.

On Tuesday a visit was arranged to the works of Messrs. G. & J. Weir, Ltd. The party travelled by special tram cars to Cathcart, and after lunch made a tour of inspection of the works. Afternoon tea was then served, and the party returned about 6 p.m. An afternoon excursion was arranged to the works of Messrs. David Colville & Sons and the Lanarkshire Steel Company. Here the visitors were hospitably received and were shown the various stages of steel and iron manufacture and the products thereof. Another afternoon excursion was to the works of Messrs. John Lang & Sons, engineers and machine tool makers, and from thence to the works of Messrs. Thomas Shanks & Company, engineers and tool makers.

In the evening the Lord Provost (Mr. D. M. Stevenson) held a reception in the City Chambers.

On Wednesday a large party visited the works of Messrs. Babcock & Wilcox, Renfrew, while other excursions included visits to the Port Dundas and Pinkston Power Stations, the Albion Motor Car Company, and the Singer Manufacturing Company.

In the evening the dinner was held at the Grosvenor Restaurant, Glasgow, at the invitation of the Institute of Engineers and Shipbuilders in Scotland. A full account of these proceedings will appear in our issue of next week.

PARLIAMENTARY AND LEGAL.

Merchant Shipping (Certificates) Bill.

The Earl of Granard, on behalf of the Board of Trade, on June 23, introduced the Merchant Shipping (Certificates) Bill in the House of Lords.

The Crinan Canal.

An application was made in 1911 for a grant from the Development Fund for the purpose of modernising the Crinan Canal. Mr. Masterman has informed Mr. Mackinder that the Commissioners did not see their way to recommend such a grant. Consequently the Treasury were precluded from granting the application.

The Japanese Coasting Trade.

Mr. Acland, the Under Secretary for Foreign Affairs, informed Sir J. D. Rees, on June 23, that the question of British-Indian ships participating in the Japanese coasting trade was still under consideration, and he was not in a position to make any statement on the matter at present.

Seamen on Foreign-going Ships.

According to information furnished by the President of the Board of Trade, 556,493 seamen were engaged on British Foreign-going ships in the United Kingdom in 1911; of these 13,264 failed to join, and 1,198 continuous discharge books were suspended. In 1912 the corresponding figures were 570,916 seamen, 15,046 men failing to join, and 1,178 books suspended.

Canadian Navy Bill.

On June 9, Mr. Churchill informed Sir W. Byles that he was advised that the additional expense to provide for the acceleration in shipbuilding would be about half a million this year and about a quarter of a million next year, with corresponding reductions in the two following years. But everything depended on the progress made and the earning powers of the contractors.

Dockyard Wages.

The wages paid to dockyard workmen were discussed at some length in committee of Supply on Navy Estimates recently in the House of Commons. Dr. Macnamara announced that an annual charge of something like £104,000 had been this year added to the wages sheet. The shipwrights and the engineers had got their standard rate increased—the hired men by 2s., the established men by 1s. 6d., and the unskilled labourers 1s.

Irish Cattle Trade.

Complaints have been made by certain Irish agricultural societies of the 12 hours' detention of Irish stock, particularly lambs, at ports of landing in Great Britain. It was urged that the animals deteriorated in the lairages. In the House of Commons, recently, Mr. Runciman stated that, at the invitation of the Board of Agriculture, two members of one of the societies visited Birkenhead. The Secretary of the society afterwards wrote that the arrangements were perfectly satisfactory. Reports from inspectors at Birkenhead and Glasgow showed that the lambs had left the lairages in a much better condition than they entered them. Subsequently Mr. Runciman announced that the period of detention would be reduced to 10 hours.

Lynn Well Lightship.

Mr. Buxton stated, in reply to Mr. Ingleby, in the House of Commons, that he was informed by the Trinity House that they decided to move the Lynn Well Lightship in January last, and they understood that the Boston Harbour Trust and the King's Lynn Conservancy concurred in that action, which was calculated to benefit vessels navigating the Wash. In the case of two of the casualties which had occurred, the master of the vessel in each instance stated that he was unaware that the lightship had been moved. He understood that there was a general agreement among shippers and traders locally that the removal of the lightship to its new position was an advantage, but that representations had been made to the Trinity House as to the necessity for placing a lighted buoy off the Hook of the Long Sand. The Trinity House were of opinion that such a buoy was unnecessary having regard to the positions of the Lynn Well Lightvessel and the Roaring Middle Lightvessel, and that if a buoy were placed there the cost should be borne by the local authorities.

The Control of the Clyde.

Mr. J. M. Robertson informed Mr. Holt, on June 19, that the President of the Board of Trade proposed to consult the Secretary for Scotland and the various authorities concerned, with a view to considering the desirability of instituting a public inquiry whether the best interests of the trade of the Clyde would be furthered by putting the river under a single control.

Mr. Holt has given notice that on the motion for the Second Reading of the Greenock Port and Harbours Bill, he will propose an amendment to the effect that the House of Commons "declines to proceed with any measure for reconstituting the Greenock Harbour Trust until an inquiry has been held as to the desirability of placing the harbours and conservancy on the Clyde under a single control."

A Time Charter Party Action.

In the King's Bench Division, London, last week, Mr. Justice Atkin had before him the case of the Watson Steamship Company, of Manchester *v.* Merryweather & Co., of West Hartlepool. The matter came before the Court on a special case stated by an umpire. The question for his Lordship arose on a time charter party, and the point at issue was whether the charterers of the ss. *Hugin* (Messrs. Merryweather) were found to pay hire for a period of 20 days beyond the time of the charter party at the charter rate or at the current rate. The umpire held that the amount to be paid was £190 or the current rate, and from that the charterers appealed. His Lordship said he thought there had been a breach by the non-delivery of the vessel, and the umpire was accordingly right when he awarded the respondents the amount in question. The appeal was accordingly dismissed.

The Loss of the "Titanic."

Litigation has arisen out of the loss of the *Titanic*. In the King's Bench Division of the High Court on June 20, the hearing was begun of an action in which Thomas Ryan, a man of 70, resident in County Cork, sued the Oceanic Steamship Company to recover damages for the death of his son Patrick Ryan who was drowned on the *Titanic*. The basis of the action is an allegation of negligence on the part of the Company's servants. If no such allegation were made, the Court could not entertain the action, and therefore during the first three days of the hearing evidence was brought first to establish this plea, and later to refute it. The whole story of the night on which the vessel was lost was gone into in detail—the wireless messages, the proximity of ice, the watch, and the collision with the iceberg. Expert evidence was also given as to the navigation of ships on the Atlantic. The Company did not rely entirely on the refutation of the alleged negligence. They stated in their reply in the alternative that the deceased was carried as a passenger under the terms of a contract, as evidenced by the ticket which exempted them from liability for the negligence of their servants. The plaintiff disputed this construction of the terms of the contract.

The Drake Appeal.

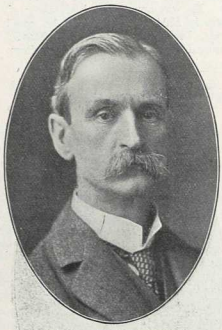
Before the Right Hon. Sir Samuel Evans, President, and Mr. Justice Bargrave Deane, sitting as a Divisional Court, the owners of the vessel *Coal Trader* appealed against a decision of Judge Sir Sherston Baker, sitting at Great Grimsby, whereby he held that a collision which took place between the *Coal Trader*—a coal hulk which was being towed to Grimsby—and the defendants' steam trawler *Drake* outside the piers of the Fish Dock, Grimsby, during a dense fog on the early morning of October 10 last, was the result of an inevitable accident. The learned President, in the course of his judgment, said that the main charge made against the trawler was that in addition to stopping her engines, which it was admitted she did, she ought to have reversed them on hearing the first, or certainly the second, whistle from the plaintiffs' tug. His Lordship was not at all sure that it would not have been better seamanship to have reversed at once, but the Court could not say the seamanship was sufficiently bad to cast blame on the trawler. It was well known that it sometimes caused danger to reverse the engines in a fog, as it to some extent altered the vessel's heading. Therefore, after some hesitation, his Lordship was of opinion that on the only point on which they were now asked to say the trawler was to blame, the Court could not so find, and as it was admitted that the plaintiffs were to blame, judgment must be entered for the defendants, with costs here and below. Mr. Justice Bargrave Deane delivered judgment to the like effect.

GENERAL NEWS SECTION.

PERSONAL.

Lord Inverclyde, the Chairman of the Reception Committee who have performed such arduous duties in connection with the visit of the naval architects to Glasgow, is one of the most prominent figures in the Clyde district, and is personally and financially interested in shipping and shipbuilding. He was President of the Chamber of Shipping of the United Kingdom in 1899 and has been Chairman of the Glasgow Shipowners' Association since 1900. He was a director of Messrs. G. & J. Burns, Ltd., a director of the Cunard Steamship Company, Ltd., the Clydesdale Bank, Ltd., and the Clyde Steamship Owners' Association, and a member of the Committee of Management of *Lloyd's Register*. He is Lord-Lieutenant of Dumbartonshire and a Justice of the Peace for several of the neighbouring counties. His Lordship takes a keen interest in the welfare of the Clyde and has done much to assist local yachting progress in that district.

The Rt. Hon. Lord Inverclyde.



Mr. D. M. Stevenson,
Lord Provost of Glasgow.

Lord Provost Daniel Macaulay Stevenson, who is having a busy time in connection with the reception of members of the National Institution of Naval Architects, now meeting in Glasgow, is a native of Glasgow, having been born there in 1851. He is head of the business of Messrs. D. M. Stevenson & Co., coal exporters, and his firm have branches in Leith, Newcastle and Hull. That it is the largest coal exporting concern in Scotland is the best possible testimony to Mr. Stevenson's commercial capacity and enterprise. He has been a member of the Glasgow Town Council since 1892, and was elected Lord Provost in November, 1911. He holds advanced social opinions, being President of the Glasgow Fabian Society and taking an active part in many social reform enterprises.

Captain A. H. F. Young.

Commander Evans.

Capt. A. H. F. Young, R.N.R., who took the chair at the Annual Dinner of "Old Worcesters" last week, was born at Lincoln, the fourth son of the organist of the Cathedral there. After being educated at Lincoln Grammar School, he joined the *Worcester* Training Ship in 1872 and went to sea as apprentice with the firm of Rankin, Gilmour, Strang & Co. in 1874. He was subsequently with the Persian Gulf Steamship Company, the West Indian Steamship Company, and on Messrs. Lane & Mackandrew's petroleum steamships. He entered the Board of Trade service as Surveyor in 1891, and in 1904 was appointed Principal Officer of the Emigration Department, Liverpool. He was transferred to Whitehall in 1911, and is Professional Adviser to the Board in succession to Sir Alfred Chalmers. He has been President of the Old Boys' Worcester Association for some years.

We give photographs of two "Old Worcesters" who were special guests at the dinner last week. Commander E. G. R. Evans, C.B., R.N., joined the *Worcester* in 1895, when in his 15th year. He obtained the prize awarded by Lord Brassy for an essay on "The Conduct of British Overseas Trade," and in 1896 obtained a naval cadetship in competition with the *Conway* cadets, being third in order of merit. In 1902 he was appointed to the Antarctic relief ship *Morning* to go in search of the *Recovery*, and in 1910 was appointed second in command of the *Terra Nova*. Of his Antarctic achievements little need here be said as the whole world has heard about him during the past months. Lieut. W. M. Bruce joined the *Worcester* in 1887 at the age of 13 years, and left in 1890. He sailed as apprentice in the sailing ship *Port Jackson*, and his last venture was as a member of Scott's Antarctic Expedition. Commander Evans is naturally a "service" man, Lieut. Bruce is essentially a "mercantile" man, and at the dinner was loud in his praises of the members of the crew of the *Terra Nova* who had been drafted from the merchant service.

Mr. Richard Murray, of Harrogate, a Director of the Durham Steam Shipping Company, left estate, as far as at present can be ascertained, of the gross value of £558,263, of which the net personalty has been sworn at £509,966.

Mr. Samuel Reid, of Braebuster, Orkney, merchant and shipowner, for several years chairman of Orkney Harbour Commissioners, who died on August 25 last, left, in addition to considerable real estate, personal estate in the United Kingdom valued at £5,256.

Capt. Terrick Charles Fitz Hugh, M.V.O., the Chief Commissioner in the Far East, recently appointed by the British Engineers' Association, left London for Peking, via Siberia, on Saturday, June 21, accompanied by his Technical Secretary, Mr. L. B. Stevens, M.A.

Capt. Langdon, of Bristol, who has held the position of Secretary to the United Kingdom Pilot's Association since its formation 26 years ago, has resigned office. Mr. Joseph Browne, of Bristol, has been elected to fill the vacancy. The Vice-Presidency rendered vacant by Mr. Browne's acceptance of this office has been filled by Mr. E. C. Rowlands, of Bristol.

Capt. W. T. Turner, of the Cunarder *Mauretania*, has had the exceptional honour conferred upon him by the Admiralty of an honorary Commander in the Royal Naval Reserve. Capt. Turner was born in Liverpool, and joined the Cunard service in 1877 as third officer of the *Cherbourg*. He was appointed chief officer of the *Aleppo* in 1892, and master in 1904. Subsequently he commanded the *Carpathia*, *Ivernia*, *Umbria*, *Caronia* and *Lusitania*. His appointment to the command of the *Mauretania* dates from January, 1910.

The Liverpool Shipwreck and Humane Society has awarded Lieut. David Blair, R.N.R., a silver medal, with appropriate certificate, for conspicuous gallantry at sea. Lieut. Blair, who is first officer of the White Star Royal Mail steamer *Majestic*, jumped overboard during fog on May 6, when the liner was in mid-ocean, to the rescue of a trimmer, who was eventually rescued. Lieut. Blair is a Scotsman, and served his apprenticeship with Messrs. Henry Fernie & Sons, of Liverpool, joining the White Star Line as junior officer in 1902.

Lieut. W. M. Bruce.

We regret to record the death, at Gibraltar, of Capt. Hugh Williams, R.N.R., of the Liverpool Salvage Association. Capt. Williams never recovered from the effect of inhaling poisonous gases during the recent successful salvage operations on the liner *Agadir*, near Mazagan. He joined the Liverpool Salvage Association at the time of the salvage of H.M.S. *Montagu* in 1906, and also shared, as assistant to Capt. Young, in the salvage of the *Gladiator*. He was then appointed Assistant Marine Surveyor to the Mersey Docks and Harbour Board. Two years later he rejoined the Liverpool Salvage Association. The most important work he undertook after rejoining the salvage association, and before proceeding on the *Agadir* expedition, was the successful salvage of the ss. *Nero*, which went ashore on Rum Island, in September, while bound from Christiania for Manchester.

Mr. Henry John Farmer Atkinson, of Woodcote Place, Epsom, Surrey, a member of the firm of Messrs. Brown Atkinson & Co., Ltd., Merchants and Shipowners, of Hull, member of the Committee of *Lloyd's Register*, Mexican Vice-Consul, Consular Agent for the United States and Prussian Vice-Consul at Hull, Vice-President of the Associated Chambers of Commerce, who died March 1 last, aged 84 years, left estate of the gross value of £41,012, of which £39,770 is net personalty.

Mr. Walter Farrant, who recently retired after 34 years' service from his post as chief "Crier" at Lloyd's, and who was presented with a cheque for £550 by the Members and Brokers, was one of the most popular figures in the "Room." His splendid tact and suavity of manner was always tinged with a suspicion of light humour. It was his boast that he had "been to Eton"—where he started life as a hall porter, whilst, consequent upon his duties as a City toastmaster, he has at one time and another spoken to seven crowned heads, and the youthful "policy pusher" who asked too abruptly for a certain name, invariably received the reply, "When the King speaks to me he says 'please.'" Mr. Farrant's voice was marvellous for its clarity, and he had remarkable control over it. This, coupled with an infallible memory, enabled him to utter a special "cry" for practically every name in the "Room," and the habitué at Lloyd's knew when he was being called, as much by the intonation which Farrant gave the call, as by the actual sound of his name. His retirement is regretted all over Lloyd's, whose appreciation of his services are reflected in the act of the Committee granting him a pension of £200 a year.

THE FREIGHT MARKETS.

London.

The improvement noted in our last report has, generally, been maintained. The Plate was well in evidence for prompt boats of medium size, 17s. 6d. being paid, but for vessels in the neighbourhood of 5,000 tons and more, 17s. was the maximum offered. India remains steady for July, in anticipation of a shortage of tonnages there next month, and rates have an upward tendency. Karachi-Antwerp has been done at 16s. 9d. and Karachi-London direct at 17s. Rice for Saigon was done on the basis of 26s. 6d., and this reflects a retrograde tendency. America is somewhat dead and possibly easier rates will prevail for the near future. Grain from Montreal has commanded business at 2s. 6d. Avonmouth or Rotterdam for July-August and 2s. 7½d. Hull. The Black Sea shows a decline with South Russian business at about 8s. to 8s. 3d., and Azoff nominal at 9s. 3d.

Glasgow.

There have been very few alterations on rates in the Glasgow market during the past few days. For Monte Video and Buenos Ayres 19s. was paid outwards from Wales and 17s. for Rio de Janeiro, while homewards from the River Plate was steady at about 17s. Quotations for the Black Sea trade fluctuated slightly, but there were comparatively few inquiries. Owing to absence of business there was also an easier feeling in the Eastern trade early this week, and a time-charter for one round trip, delivery Amsterdam, re-delivery United Kingdom–Continent via Java, 4s. 6d., was reported. Transatlantic trade, 6s. 6d. one trip; Baltimore to United Kingdom or Continent, 4s. 2d. one round trip, delivery and re-delivery the United Kingdom or Continent.

Liverpool.

The firm tone in the outward freight market for prompt boats has been fairly well maintained, and only for forward loading in some trades is there any weakness indicated. Mediterranean ports command recent rates and a moderate business is passing, but only for handy boats. Business done further East is also satisfactory, Clyde and Mersey to Bombay paying 22s. 3d., July. River Plate was weaker at 20s. and to Rio 17s. North America quiet and easy. Homewards, Australia is quiet and rather weaker at 31s. 3d., and eastern steady at 16s. 6d. one port and 17s. two ports from Marachi. Baltic quieter, but prospect more hopeful as the season advances. River Plate fairly active and paying 17s. for up-river.

Humber.

In the Baltic market suitable tonnage for Cronstadt has been scarce. Up to 5s. 9d. has been paid for Cronstadt for loading at the end of June. For St. Petersburg 5s. 7½d. was paid. Riga was done from Hull at 5s. 1½d., and Reval 5s. 6d. In the Mediterranean direction the tone of the market was firmer, and Genoa was done at 10s. 3d.; whilst Alexandria fetched 10s. 6d., and Venice was chartered at 11s. 3d. To the River Plate 20s. was paid for a large carrier to Buenos Ayres. In the coasting market rates were also stiffer, and St. Brieve realised 5s. 10½d., Rouen 5s. 3d., and in the coastwise branch London from Hull fetched 4s.

Cardiff.

The market opened with a firm tone, but closed with an easier tendency, tonnage being more plentiful. Recent fixtures for the Mediterranean have been on the basis of:—Genoa, 9s. 6d. to 10s.; Port Said, 9s. 10½d. to 10s. 6d.; Algiers, 10½ fr. to 11 fr.; Constantinople, 12s. 6d.; Venice, 11s. 3d.; and Tarragona, 10s. 6d. For the Bay and Coast chartering has been active. The South American and Brazilian sections have been quieter. The Baltic market has responded to the higher rates obtainable for other directions, and up to 6s. 6d. has been conceded for Cronstadt, which is an advance of 6d.

FROM OUR CORRESPONDENTS.

CLYDE AND DISTRICT.

(FROM OUR OWN CORRESPONDENT.)

Glasgow.

At their meeting on Tuesday next the Clyde Trustees will have an opportunity of considering for the first time the new dock extension scheme which it is proposed to carry out at Shieldhall. This subject has been considered by a committee of the Trust, but so far the whole body of the Trustees have not yet had an opportunity of going into the matter. The scheme provides for the construction of five new basins, but it is probable that only two, or at most three, will be proceeded with immediately after Parliamentary powers are obtained for the work, and that the other basins and quays will be completed according to the demands of the trade. It is expected that an important pronouncement will be made shortly by Sir Thomas Mason with regard to new developments at Glasgow Harbour. No start has yet been made with the large graving dock, for which Parliamentary powers were obtained nearly two years ago, but this, I am assured, is solely on account of the high cost of material, particularly cement, at the present time, and also owing to the difficulty which would be experienced in securing a sufficient number of labourers to carry on such an extensive work at a time when labour of all kinds is scarce in the district.

REPAIR WORK.

Ship-repairers are busier this week than they have been for some time past, and some of the jobs in hand will take a month or two to complete. Messrs. D. & W. Henderson are giving a big overhaul to the Glasgow steamer *Kirklee*. They had this vessel in their graving dock a few days ago, but this week she has been shifted to Meadowside Wharf. In the Kelvin they are giving an overhaul to Waverley Shipping Company's steamer *Chelston* Two Clan liners are at present in the hands of repairers. These are the *Clan Chisholm*, to which reference was made in this column recently, and the *Clan Gordon*, which is being fitted with new boilers. I understand that another Clan liner—the *Clan Macdonald*—will arrive at Glasgow shortly for repairs. Messrs. Raeburn & Verel's *Highland Monarch* is at present in dry dock at Elderslie for overhaul, and Messrs. Whimster's *Neto* is undergoing some slight repairs at Yorkhill.

AN EXPERIMENTAL TANK.

At the luncheon in connection with the graduation ceremony on Friday last, Dr. Robert Caird, of Greenock, took the opportunity of raising a question of vital importance to all interested in the training of naval architects on the Clyde. He said he considered it a lamentable defect in the equipment of the University of Glasgow that there was no experimental tank attached to the department of Naval Architecture. The provision of a tank is a matter which Prof. Sir John H. Biles has advocated for many years. There are at present only three experimental tanks on the Clyde, all in private establishments. One is at Messrs. Wm. Denny & Bros., Dumbarton, another at Messrs. John Brown & Co.'s, Clydebank, and the third at Messrs. A. Stephen & Sons', Linthouse. The provision of a thoroughly well-equipped tank at the University would be invaluable for teaching purposes. Dr. Caird remarked that he hoped his suggestion would be taken up by shipbuilders and shipowners on the Clyde and by all who were interested in the welfare of the University.

THE HARBOUR TUNNEL.

Owing to the unexpected difficulties which have been met with it has been found impossible to re-open the Harbour Tunnel on the date at first arranged—July 1. After the tunnel was closed some five or six years ago, it was allowed to fill up with water and this had, of course, a rather bad effect on the passages and entrances. It is expected that the tunnel will be ready for traffic in the course of two weeks. It will be interesting to see what effect the opening of this new passage across the river will have on the ferries of the Clyde Trust which ply at this, the busiest part of the harbour. The closing of the tunnel in 1907 was due to the competition of the ferry-boats, which carried vehicles at a cheaper rate than was profitable for the Company to impose. It is now proposed to carry passengers free and vehicles at a nominal rate.

After a period of 20 years the Russian Steam Navigation & Trading Company have again come to the Clyde for additions to their fleet, and last year they placed orders with Clyde shipbuilders for four large passenger and cargo steamers. Two of these vessels are being built by Messrs. John Brown & Co., Ltd., Clydebank, and two by Messrs. William Denny & Brothers, Dumbarton. The first of the four was launched at Clydebank last week. A good deal of speculation surrounded the placing of the contracts for these vessels. It was generally reported that they were to be fitted with oil engines, a statement which was denied by the builders. Probably this denial led some people to think that the boats were not placed on the Clyde at all. In any case the building of the ships has not been unduly hurried forward as the orders were reported to have been given out in April of last year.

Reference was made in this column last week to the new vessels—now building on the Clyde—which are to be fitted with geared turbines. I am informed that the turbines for the 14,000-ton liner which Messrs. Alexander Stephen & Sons, Ltd., are building for the Anchor Line at Glasgow, are being supplied by the builders and not by Messrs Parson's Marine Steam Turbines Company, Ltd., as was stated here.

NORTH-EAST COAST.

(FROM OUR OWN CORRESPONDENT.)

Newcastle-on-Tyne.

This being "Race week," business in shipbuilding circles on the Tyne and district is practically at a standstill.

A change is shortly to be effected in the old-established private engineering and shipbuilding business of Messrs. J. P. Rennoldson & Son, of South Shields. Mr. Charles Rennoldson, the junior partner in the old firm, has now withdrawn, and has acquired upon lease the site at the Lowe, at one time occupied by Messrs. John Readhead & Son, shipbuilders, who is now at the West Docks, South Shields. The present concern will be carried on by Mr. J. M. Rennoldson, the remaining partner, Mr. Charles Rennoldson commencing a new business.

A further addition to the number of new graving docks now under construction on Tyneside will shortly be made by Messrs. Baird Brothers, who are constructing a new dock, 150 ft. long, with a width of entrance of 45 ft., in close proximity to their Bull Ring Engine Works, North Shields. The dock will have a river frontage of about 72 ft.

In delivering to the Admiralty the torpedo-boat destroyer *Contest* (an illustration of which appeared in a recent issue) Messrs. R. & W. Hawthorn, Leslie & Co., Ltd., achieved the distinction of being the first firm to complete their order received under the 1911-12 programme. It is not without interest to recall the fact that Messrs. Hawthorn delivered the *Christopher*, the first of three sister vessels, some considerable time before any other vessel of the class.

LIVERPOOL SHIPPING.

(FROM OUR OWN CORRESPONDENT.)

Liverpool.

Messrs. Cammell Laird & Co., Ltd., Birkenhead have, in addition to the two P. and O. vessels which I noted last week, booked further orders for new tonnage, namely, a large passenger and cargo steamer for Messrs. Embiqicos, Greece, and two high-class passenger vessels for Messrs. Mikanovich & Company's service of Rio de Janeiro between Buenos Ayres and Monte Video. The firm have besides, just secured contracts for two complete sets of engines and boilers for new cruisers now being built in H.M. Dockyards.

Messrs. H. & C. Grayson, Ltd., delivered on Friday, to the owners, the single-screw steam barge they have built at their Garston shipyard for the Bishop Wharf Carrying Company, Ltd., of Warrington. She will trade between Warrington and Liverpool, and her dimensions are 85 ft. by 20 ft. by 8 ft. 9 in., with a gross tonnage of 115 tons, and 165 tons d.w. on 7 ft. 6 in. loaded draught. Compound surface condensing engines are fitted with cylinders 11 in. by 22 in. by 16 in. stroke, and a horizontal cylindrical return tube boiler 8 ft. 6 in. by 8 ft. 6 in. She was launched on May 12, and was named *Evona* by the Lady Mayoress of Liverpool.

LABOUR TROUBLES.

Unless the Mersey Docks and Harbour Board give way, there is every prospect of a strike taking place at the end of this month among the members of the engineering trades employed throughout the Mersey Docks estate. The grievance of the men employed as hydraulic workers, crane drivers, electricians, gas engine workers,

pump attendants and others in charge of machinery, is that the Docks Board have refused to adopt the rate of payment and conditions of labour accepted by other employers in the district. At the present time a ballot, the result of which will be made known on June 30, is being taken among the several societies which comprise the National Amalgamated Union, and if it is in favour of a strike, there will be an immediate stoppage both at Liverpool and Birkenhead. This step has already been approved by the Transport Worker's Federation with which the Union is affiliated.

The death took place at Gibraltar on Thursday of Lieut. Hugh Williams, Chief Assistant Wreck Officer of the Liverpool Marine Salvage Association, and formerly assistant Marine Surveyor to the Mersey Docks Board. He was superintending work in connection with the salvage of the *Agadir* of the Royal Mail Steam Packet Company, when he was attacked with gas poisoning, and other ailments which supervened.

The new joint service of the White Star and Lamport & Holt Lines between Manchester and New York, direct was inaugurated on Friday by the White Star steamer *Memphian*. The service will be a three-weekly one, both outward and homeward, and is additional to the fortnightly service between New York and Manchester which has been carried on by the Lamport & Holt Line for many years.

SOUTH WALES NOTES.

(From Our Own Correspondent.)

Cardiff.

A couple of heavy "jobs" which will assure activity in the local ship-repairing yards for the next few weeks have just been placed with South Wales ship-repairing companies. The most notable of these is the extensive damage jobs on the ss. *Llandudno, Olivania, Katina* and *Northfield*. The Mountstuart Dry Docks, Ltd., in open competition, secured the contract to repair the *Llandudno*. The *Northfield*, which is in Messrs. Mordey & Carney's Newport dock, is having between 60 and 70 bottom plates fitted, and the work, it is expected, will take about six weeks to complete. The *Northfield* sustained her damage through going ashore near Coverack, Cornwall. The *Katina*, which went ashore near Hartland Point, and was successfully salved by the Cornish Salvage Association, has been docked in the Ocean Dry Dock, Swansea. Other work of particular interest is the repairs to the *Broderick*, by C. H. Bailey & Company. This vessel, it will be remembered, was heavily damaged recently by a fire in the engine-room, the whole of the refrigerating machinery being destroyed. The Barry Graving Dock & Engineering Company, Ltd., have also been well employed, and one of the best jobs of late was the repairs to the Greek ss. *Asimina*, which received extensive damage in a gale at Piræus. While in the Graving Dock she was fitted with a new stern post and rudder, while all the stern plates above water on one side had to be renewed, besides a number of shell plates and deck plates. Another job put in the hands of the same Company was the fitting of a number of plates to the *Queen Margaret*. A number of plates were fitted to this vessel in America, but they were condemned.

At Swansea business has been brisker than for some time past, and most of the docks have been well employed.

The Coal Market.

Business continues slow on the coal market, and with production heavy prices were again on the easy side for prompt shipments, best Admiralty's being worth about 20s. 6d., and best smalls 10s. 6d. For forward loading sellers were quoting prices appreciable in excess of current quotations.

NOTES FROM THE CONTINENT.

(From Our Own Correspondent.)

Hamburg.

Following the example of other important shipping concerns the Hamburg-Südamerikanische Dampfschiffahrt Ges. are going to own their own sheds, and work has begun on them at 6, Oswald Quay.

The works in connection with the deepening of the Elbe, for which a sum of £240,000 has been set aside, are proceeding very slowly. This is attributed to the inefficiency of the bucket-dredgers employed, especially between Hamburg and Brunshausen, where the bottom of the river is very hard. It has, therefore, been decided to buy a new type of dredger, at a cost of £5,250.

At Hamburg work is still proceeding for the purpose of providing a suitable anchorage for the *Imperator*. It is said that the most suitable place is on the left bank of the Elbe, facing Freiburg.

The Hamburg-Amerika Line, the Hamburg-Südamerikanische Dampfschiffahrt Ges. and the Booth Steamship Company, Ltd., are said to have come to an understanding regarding their services to North Brazil. The arrangements are to come into force next September and will tend to economise the working of the steamers, as well as cheapen and simplify the despatch of the vessels in the different harbours. It is said that the Hamburg Lines will represent the English companies on the Continent, with the exception of a portion of France and Portugal, whilst the Booth Company will take over the agencies for the Hamburg Companies at Havre, Oporto, Lisbon and a few harbours in North Brazil.

The late Dr. Schlick, the famous inventor and authority on the vibration of ships, has left a large sum to the city of Hamburg for the formation of a Hamburg shipbuilding testing institution. It is proposed to acquire a strip of State property in the Barmbeck district and to allocate a sum of £500,000 for that purpose.

On June 18 the keel was laid of the new yacht for the Kaiser the *Ersatz Hohenzollern*. The new vessel will be propelled by turbines and be of 7,000 tons displacement.

The *Bahia Laura*, built by the Bremer-Vulkan Shipbuilding and Engineering Works to the order of the Hamburg-Südamerikanische Dampfschiffahrt Ges., which went successfully through her trial trips on Monday, is the fifth steamer delivered this year from the above company, who also supply the machinery. There are still under construction in the same yard 15 other steamers, of a total tonnage of 125,000 reg. tons, so that the yard and works will be fully occupied with these orders alone until far into the year 1915.

Labour Troubles.

The German dock strike of 1910 resulted in a partial victory for the men in so far as they obtained an average rise in wages amounting to 15 per cent., and had their working hours shortened. This settlement, however, has never been accepted as final by the men, and so there have been constant strikes and lock-outs ever since. Now Hamburg is the centre of an agitation and the workers' demands have been formulated and handed in to the Union of German Shipbuilding Yards. The men, or rather the Metal Workers' and Dock Workers' Unions, justify the demand of the men for a rise in wages on account of the increased cost of living. In addition to the demands mentioned in my letter last week, they ask that all tools shall be supplied by the employers, and that the men should have an annual holiday, with pay. It is not likely that the shipbuilding concerns will entertain such demands. The position of the German yards, as we have shown in our articles on "Some Economical Problems in the German Shipbuilding Industry," is far from being so rosy as the men make out. No doubt the yards are busy; they are provided with plenty of orders; but they are unprofitable, as the contracts were made at a time when shipbuilding business was slack and the cost of materials lower. Reports from Bremen, Bremerhaven, Flensburg and other centres point to united action on the part of all the men employed in German yards.

Antwerp.

In a previous report I stated that the City of Antwerp was calling for tenders for the supply and erection of four big floating pneumatic grain elevators. The specification contains two paragraphs which have been severely criticised and commented upon by engineers and elevator builders. Article 19 stipulates that "should the elevator supplied be incapable of dealing with the amount of tons to be discharged per hour as provided by the contract, a penalty of 1,000 fr. will be inflicted for each ton in deficiency. On the other hand, no bonus will be paid if the output should exceed the stipulated total." Paragraph 22 says: "A penalty of 200 fr. will be imposed for each working day and for each elevator should the latter not be installed within the time stipulated. No bonus whatever will be paid if the elevators are ready for service before the time-limit." Engineering people rightly point out that it is hardly fair to impose a penalty on the one side without offering a bonus on the other, and that this system of heavy penalties without adequate compensation only would tend to increase quite unnecessarily the prices demanded by the tendering contractors.

On the occasion of the German Emperor's Jubilee, Capt. Ilgen, Inspector of the Hamburg-Amerika Line at Antwerp, has been decorated with the Order of the Red Eagle.

The Deputation Permanente of the Port of Antwerp has now finally decided to use electric light for the lighting of the existing dry docks, and has placed a contract with an Antwerp firm to effect the necessary installations.

NEWS PARAGRAPHS.

The Unlaunched Cruiser.—A second attempt to launch the German cruiser *Derfflinger*, which remained immovable on the stocks on the last occasion, was made on June 19. This, however, also failed.

Tender for the "Imperator."—The Hamburg-Amerika Line of the new German leviathan *Imperator*, have purchased a large paddle steamer, the *St. Tudno*, for tender service in Southampton water. The *St. Tudno* is a fine vessel and much larger than any of the steamers ordinarily employed in tender work at Southampton.

New Shipping Company.—The Hamburg-Amerika Line, in conjunction with the Kosmos-Line, has just founded at Hambourg the Agensia Maritima Kosmos G.m.b.H., with a capital of one million marks. This new company will represent the interests of the two big Hambourg steamship companies on the West Coast of America, undertake the loading discharge of their vessels, provide and maintain lighters, tugs, &c.

The Board of Trade Sight Tests.—Mr. Basil E. Peto, M.P., Chairman of the Parliamentary Committee of the Imperial Merchant Service Guild, has presented to the President of the Board of Trade, at the House of Commons, an appeal against both the present and proposed Board of Trade sight tests. The petition, which was organised by the Imperial Merchant Service Guild, was signed by over 10,000 captains and officers of the merchant service.

Prospects of Shipping Business.—Interviewed on the prospects of shipping, the Bremen Steamship Company Argo announces that the results obtained so far by the company are quite satisfactory and that it is expected that this state of affairs will continue. The Hamburg-Sudamerikanische Dampfschiffahrts Gesellschaft declares that it is too early yet to make any predictions but that its results since beginning of the year have been quite up to those of last year.

More Armoured Liners.—The Aberdeen liner *Themistocles*, which left the Royal Albert Docks on June 18, was the first steamship to leave the Port of London armed, two 4·7-in. guns having been placed on board by arrangement with the Admiralty. Other companies to adopt the Admiralty proposal are the New Zealand Shipping Company, Ltd., and the Federal Steam Navigation Company, Ltd., who have fitted the steamers *Rotorua* and *Wiltshire* respectively with 4·7-in. guns.

Imperial Merchant Service Guild.—Lord Muskerry, on Tuesday, at Hull, opened a new Humber agency of the Imperial Merchant Service Guild, comprising well furnished premises, which will be found very useful to members of the Guild visiting the Third Port. At the opening ceremony Capt. T. V Walker (Chairman of the Guild) presided, supported by a large civic, commercial and nautical gathering, including several brethren of the Hull Trinity House. A luncheon followed the opening, and in submitting the toast of "The Imperial Merchant Service Guild," Lord Muskerry spoke with some weight on the subject of the eyesight tests enforced by the Board of Trade, which he held were unfair, as a man who could not see certain letters at a distance of 16 ft. (not half the beam of some ships) could very often see objects at a distance very easily indeed. The committee to deal with this matter formed of the members of the Royal Society, were not practical men for the business, although he had a great respect for their scientific attainments. The committee had no practical knowledge of conditions prevailing at sea. The other day a man in the Royal Naval Reserve tried to pass as a second mate, but he failed to pass the colour test though he had passed the naval test. Either the naval or the Board of Trade test was wrong, and if the naval mode of testing was correct, then the officers of the merchant service were being given an unfair and unjust test. The Guild were not going to let this matter drop, but were going to go into it. The speaker suggested that the brethren of the Trinity House would form a practical committee to deal with it. Lord Muskerry added that there were 25,000 members of the Guild. Capt. A. B. Toons (Vice Chairman of the Guild) said they had a fighting fund of £34,000. Capt. Walker was presented with a dressing-case and a sovereign purse, and Mr. T. W. Moore (General Secretary of the Guild) with a rose bowl subscribed for by officers of the Wilson Line as a token of their esteem of the services they recently rendered in connection with the amicable readjustment of the wages of the mates of the Wilson Line at Hull.

German Shipping.—German shipping circles regard from an optimistic point of view the present state of business. Traffic to the Indies shows no decrease whatever, compared with the same period of last year. Outward freight rates are maintaining their high level, and homeward rates may be considered satisfactory. On the other hand, business towards the German Colonies in Africa has lost some of its importance, as railway material in the colonies is lacking. Rates have shown a certain diminution. The lines engaged in the Canadian traffic are fully occupied owing to the large increase in the number of emigrants; the cargo traffic, however, has not been quite up to expectations. According to the North German Lloyd, the present situation is excellent. The results of the Hansa Line, of Bremen, for the first five months of this year are equal to those obtained during the same period of 1912. The lines engaged in the Australian traffic report good business, outward freight rates mark a rising tendency, but homeward rates have declined somewhat. German exporters declare that an increase of the business towards the Indies may shortly be expected.

An Overloaded Ship.—At Ayr Sheriff Court recently—before Sheriff Shairp—Alexander Gordon, Master of the ss. *Benshaw*, of Liverpool, and now in Ayr Harbour, was charged with a contravention of the Merchant Shipping Act by allowing his ship while on a voyage from Salta Caballo, Spain, to the River Tees, and while moored at the mouth of the River Tees, to be so loaded as to submerge the centre of the disc indicating the load line applicable to the ship and to the voyage. Respondent pleaded guilty, and explained that the weather was so boisterous in the open roadstead in which he loaded that it was absolutely impossible to calculate correctly when the load line was reached, and he had thought he was on the safe side. The surveyors reported that the over-submersion was 4 in., equivalent to 80 tons cargo in excess when the ship arrived at the Tees. Making allowances for coal consumed, it was considered that on the commencement of the voyage the over-submersion would be 7 in., equivalent to 170 tons. The Board of Trade (continued the Fiscal) thought advantage might be taken of this case to draw attention to some such arrangement as Brewer's internal tube and float, which when fitted on a vessel would enable the master to ascertain in a reliable manner, quite independently of the draught of water forward and aft, the position of the water line amidships with reference to the centre of the disc, as if the vessel were floating on still water, although actually at the time of observation she might be rising and falling in the swell, in an open roadstead. The Sheriff said he did not treat the case as an aggravated one, and imposed a fine of £8.

Institute of Marine Engineers.—On June 14, a large party from the Institute of Marine Engineers, visited the Chelmsford Works of Messrs. Marconi's Wireless Telegraph Company, Ltd. The works were orginally established in 1898, but the rapid increase in business necessitated extensions, until, ultimately, a new site comprising about 10 acres was secured, on part of which were erected, in the early part of 1912, workshops to accommodate the 700 persons employed, and of dimensions which give an idea of the extent to which this new industry has been developed. The workshops occupy a space about 460 ft. long by 150 ft. wide. For protection against fire, water sprinklers are fitted throughout, and by an ingenious arrangement the doors connecting the various departments are automatically closed through the rise in temperature. All the machines are electrically driven, the power being obtained from the works power station, which is equipped with De Laval turbines. The two steel masts for the aerials, 470 ft. in height, are a conspicuous feature of the works. They are 4 ft. 6 in. in diameter up to a height of 450 ft., and are made of ½ in. pressed steel in sections of 15 ft., the distance between them being 700 ft. Demonstrations and explanations were given of the various instruments under working conditions, including a ½ kw. set as used on cargo vessels. Ships' installations are supplied up to the 15 kw. sets used on the large passenger liners. In one of the silence boxes in the instrument room, a number of the party had an opportunity of hearing messages transmitted from vessels at sea and from other stations. The visitors were hospitably entertained to tea, and afterwards a very hearty vote of thanks was accorded to the Company and to the various assistants whose explanations had assisted in making the visit ot such an interesting nature.

The Mid-Scotland Ship Canal Scheme.—The fourth annual general meeting of the Mid-Scotland Ship Canal National Association was held recently at the Royal United Service Institution, London. Lord Cassilis occupied the chair, and there was a very small attendance. The annual report contained the following passages:—

"It cannot be said that much progress has been made during the year in popularising the idea of the Mid-Scotland Canal. Efforts have been made to interest the Admiralty in the project, and the disposition of the Fleet in the North Sea made the moment opportune. The Secretary for Scotland agreed to receive a deputation in London of all interests represented by the Canal, but received a deputation in Glasgow instead, and has since expressed the opinion that a deputation in London should be postponed till there is some degree of unanimity with regard to route. Until our rulers and people wake up to the enormous advantage both to the power and to the commerce of the Empire which a short cut across the island suitable for the largest vessels will realise, not much progress is possible." The Secretary, Dr. Chapple, M.P., said that if it could be shown that the proposed canal was worth so much as a commercial enterprise, then the Government might be asked to contribute the difference between that commercial value and the actual cost of the scheme. The time was now opportune for taking a forward step in the matter. He believed if they had a close estimate of the cost of the direct route and all the necessary data, it would be found that the canal was not going to cost anything like the estimates that had been placed before them. The report was adopted and the following resolution was also passed:—"This meeting approves of the application to His Majesty's Development Commissioners of May 21, 1913, for a grant to defray the expense of employing eminent engineers to make surveys and estimates to establish the feasibility and cost of a canal by the direct route, and resolves to support the application by a deputation to the Secretary for Scotland if necessary."

An Unfenced Winch.—At the Hull Police Court recently the Carrington Steam Shipping Company, Ltd., of Cardiff, were summoned under the Factory and Workshop Act for neglecting to have a winch aboard their steamship *Lady Carrington* fenced contrary to the dock regulation provisions of the Act. The Court found that at the time of the accident the winch was in the occupation of the owners, and came within the meaning of the provision of the Factory and Workshop Act. The Court was of opinion that the winch was not properly fenced, and defendants were fined £10 and costs.

Wallesley Dock Improvement Scheme.—At the Mersey Docks and Harbour Board recently the proceedings of the Works Committee included a recommendation to widen the passage to the Wallesey Dock, &c., at an estimated cost of £25,000. The consideration of the proposal was postponed to the next meeting. Mr. J. W. Hughes said this question had occupied the Works Committee for a very long time, and it was only deferred on account of the great cost of the previous schemes. The present passage was 50 ft. wide, and it had been proposed to increase it to 100. Subsequently it was found the passage could be increased to 85 ft. at the comparatively small cost of £25,000.

Shipping Losses in May.—The Liverpool Underwriters' Association have issued the following returns showing the number and total gross tonnage of vessels lost during the past month, and in May of 1912 and 1911:—

		1913. No.	1913. Tonnage.	1912. No.	1912. Tonnage.	1911. No.	1911. Tonnage.
British	Sail ...	2	4,047	—	—	1	1,762
	Steam...	6	18,648	6	18,116	2	5,591
Totals ...		8	22,695	6	18,116	3	7,353
Foreign	Sail ...	2	3,387	2	1,685	3	2,115
	Steam...	5	13,122	5	8,030	9	21,551
Totals ...		7	16,509	7	9,715	12	23,666
Grand totals		15	39,204	13	27,831	15	31,019

Distribution of Traffic to the Transvaal.—H.M. Trade Commissioner for South Africa has forwarded a statement showing the distribution of traffic to the Transvaal area through the several ports of South Africa in 1911 and 1912, as follows:—

	1911. Tons.	1911. Per cent.	1912. Tons.	1912. Per cent.
Cape Ports ...	66,186	12·13	65,674	13·56
Durban	152,822	28·02	150,196	31·01
Lourenço Marques	326,468	59·85	268,436	55·43
Total	545,476	—	6484,30	—

New Austrian Dreadnoughts.—The *Zeit* states that the Austro-Hungarian Admiralty intends to ask the delegations at the autumn session for a credit to provide for the construction of a new division of Dreadnoughts to replace vessels of the antiquated *Monarch* class. If the credit is granted the construction will begin early in 1914, about 18 months sooner than has been hitherto expected.

British Shipping at Patras.—According to the official report of the British Consul at Patras (Greece) for 1912, the number of British vessels which entered the port during the last four years is as follows:—

	Vessels.	Tonnage.
1909 ...	84	121,421
1910 ...	88	138,744
1911 ...	85	132,952
1912 ...	76	173,218

The Skelmorlie Run.—A letter has been received by the Clyde Lighthouse Trustees from the Board of Trade in reference to a draft prepared by the Admiralty showing an alternative course for the measured mile at Skelmorlie. The Admiralty have approved of this course, but the engineers to the Lighthouse Trustees report that, while there is no strong objection to the proposal of the Admiralty, it has two disadvantages. The course proposed is nearer the shore at Knock Castle than the new course which they (the engineers) suggested, and at the north end the course proposed by the Admiralty is further west. The result of these arrangements is that with loops of the same radius for turning purposes at the ends, the course lies about a cable's length further out into the main, channel of the Clyde. The opinions of the engineers have been communicated to the Board of Trade, whose further reply is now awaited. The present measured mile at Skelmorlie provides a run of deep water close inshore, but there have been complaints about the wash from high-speed vessels striking the foreshores with excessive force.

A Charter Party Action.—On June 20, at Newcastle, Judge Greenwell heard an action in which Messrs. Peter Brown & Company, coal-exporters, North Shields, claimed damages from Messrs. Walter Scott & Company, shipowners, West Hartlepool, for refusal to carry out a charter party verbally arranged between the plaintiffs and Messrs. Speeding, Marshall & Company, defendants' agents. For the plaintiff it was urged that on April 4, Mr. Brown wished to charter a vessel from Blyth to Memel, and he offered 4s. 1½d. freight. Mr. Marshall offered a vessel at 4s. 3d. but they failed to come to an agreement on 'Change. Later, however, Mr. Marshall offered by telephone to take 4s. 1½d., and the charter was fixed at that figure. A dispute eventually arose on formal matters connected with the charter. The first matter in dispute was the clause as to the extra loading time to be allowed, and that was stated in the charter as not to exceed 48 hours. It was plaintiffs' case that it was the unvariable practice to fill in 48 hours unless the subject was specially mentioned between the parties. Defendants refused to carry out the charter unless the 48 was altered to 24 hours. The second point in dispute was as to demurrage, and he would show that 16s. 8d. was the rate universally adopted on the absence of special circumstances. The charter was filled in and sent to Mr. Marshall, but on the following day he refused to sign it, and plaintiffs had to re-charter at 4s. 3d. For the defence it was stated that there was no evidence of custom, obligatory definite and binding on everybody. His Honour gave judgment for plaintiffs for the amount claimed with costs.

Two Years' Shipping at Mazatlan.—The British Consul at Mazatlan, Mexico, states that the number of vessels entering that port during the years 1910-12 was as follows:—

Nationality.	1910. Vessels.	1911. Vessels.	1912. Vessels.
German ...	27	18	10
United States ...	85	60	31
French ...	3	2	—
Mexican ...	294	350	341
Norwegian	33	9	8
British ...	14	10	5
Total	456	449	395

The Consul adds: "The decrease in the number of British vessels entering here is, I understand, owing to better freight rates prevailing in other parts. The decrease in the number of American vessels entering here is explained by the Pacific Mail Steamship Company calling but once a month in place of weekly as heretofore. Mazatlan is the first port of call of the Pacific Mail after leaving San Francisco, and the last on the trip from Panama to San Francisco. On the southern trip the steamers touch at San Blas, Manzanillo, Acapulco and Salina Cruz, Mexico; at Guatemalan, Nicaraguan and Salvadorean also Costa Rican ports. The Naviera del Pacifico (a Mexican company) run a steamer between here and San Diego, United States, every 20 days, touching at ports of Lower

California. This company also makes one or more trips a week between Guaymas, Mazatlan and other Mexican ports as far south as Salina Cruz. The German Kosmos Line, from Hamburg to Vancouver, touch here going north and also south about once a month. The Jepson Line also make a monthly trip between Mazatlan and San Francisco. Up-to-date boats will be needed when the Canal is opened to traffic."

The Life-Saving Appliances of the "Imperator."—The *Imperator* has in all 83 lifeboats, or enough to save all. Not only are these lifeboats of a type equal to the ordinary type of lifeboat, but they are so arranged that they can be very quickly lowered into the water from davits within easy reach of the boats, and that no muddle or difficulty is likely to arise in connection with their lowering. The whole of the lifeboats are within reach of Welin patent davits, and of these three different types are fitted. Firstly, the old-fashioned single acting type in places where there is only one lifeboat in line on the upper deck; secondly, a double acting type, which is fitted mostly in conjunction with one lifeboat under davits and two nested lifeboats lying parallel with the first. By means of the double acting davit, the Welin patent non-toppling block and the patent lowering control, these three lifeboats can be quickly lowered into the water one after another. Instead of hemp ropes, steel wire ropes are used, and these are wound around a drum fitted with a brake for lowering and an electric motor for raising. As soon as the first boat which is hung under davits has been lowered, the tackle is raised again by means of the electric motor and the non-toppling blocks; the first of the nested boats is then attached to the blocks and swung out-board by means of the double acting davits; the same takes place in regard to the second nested boat. Besides the boats on the upper deck, a number of boats have also been fitted on one of the lower decks, the system being described in our issue of May 15, pp. 248 and 259. It should here be mentioned that the Emigration Authorities in Hamburg put the life-saving installation of the *Imperator* through the severest tests for several consecutive days, and it is reported that they one and all expressed enthusiastic gratification with the various Welin devices which have been adopted on board and which all worked with absolute reliability, and must be a source of satisfaction to Mr. Welin, who has brought eminent engineering talents to bear on this subject.

The "Old Worcesters'" Dinner.—"Worcester" as a prandial embellishment has a world-wide reputation, but the "Worcester" flavour at the 20th annual dinner of the "Worcester" Association of Old Boys held at the Holborn Restaurant, London, on June 19, had a piquancy and salinity far surpassing the humbler domestic condiment. Captain A. H. F. Young, R.N.R., a president of many years standing, was Chairman, and the three chief guests were two "Old Worcesters" Commander E. G. R. Evans, C.B., and Lieut. W. M. Bruce and Mr. Griffiths Taylor, three names which are indelibly associated with antarctic exploration. After the loyal toasts, Capt. Povah proposed H.M.S. *Worcester*, to which Commander D. Wilson-Barker responded. The Chairman in proposing the toast "Old Worcesters," observed that this included, not only those present, but the old boys in all parts of the Globe. The *Worcester's* boys when officers, raised the tone of the merchant service, and it needed officers of calibre for the huge structures that carried such huge cargoes of living freight. The record of such men as Commander Evans and Lieut. Bruce was an incentive to Worcesters of the future. Commander Houghton in a speech redolent of ozone and breezes replied, as did also the Rev. A. Wardroper. Capt. O. P. Marshall in proposing "The Guests" introduced the names of the three Antarctic explorers who were the "lions" of the feast. Commander Evans, in response, thanked them for the way the toast had been received. It was his regret that Bowers, as an "old Worcester" was not present. But they all knew why. He was the youngest of the members of the Southern Party and no less gallant than his leader Capt. Scott. He had earned his place in the expedition as the most meritorious sailor in the expedition, and Scott gave him the credit of locating the South Pole. He had the honour of flying the white ensign at the Pole, and the letter that Scott wrote Bower's mother—when the leader was the last survivor of the party, weak, emaciated and dying of starvation—he gave the finest testimonial one seaman has ever given another; and that was to a *Worcester* boy. Mr. Griffiths Taylor, Mr. Seagrave and Lieut. Bruce also replied. Mr. Thimn proposed "The Chairman," who, in reply urged every member to impart new life into the Association. The singing of Auld Lang Syne marked the conclusion of a pleasant function.

COMPANY MEETINGS.

Marconi International Marine Communication Company, Limited.—The 13th ordinary general meeting of the Marconi International Marine Communication Company, Limited, was held on Monday at Marconi House, Strand, Mr. Godfrey Charles Isaacs, the Managing Director, presiding.

The Chairman, in moving the adoption of the report, said that last year there was a very substantial increase in the receipts and in the number of ships equipped; consequently the net profit showed a proportionate increase, amounting to between £9,000 and £10,000 over that of the preceding year. One of the items of particular interest was that of the ships' telegrams traffic and subsidies, &c., the revenue from which during the past year exceeded £100,000. The number of ships equipped up to the end of last year was 580, and to date it has reached 686, and is still continuing to increase in much the same ratio. They were conducting a business which had an immenes organisation, and which served a very valuable purpose to the mercantile marine. He did not know that there was another industrial business which played a more important part in the world than does wireless telegraphy on ships at sea. During the past 12 months there were a very large number of instances where it is more than probable, in past times, when there was not wireless telegraphy, that many ships would have sailed from their ports and would never again have been heard of. In practically all cases where wireless telegraphy had been employed not only had all the passengers been saved, but the ships themselves. He did not know yet what part wireless telegraphy might play in reducing the cost of insurance to ship owners. It seemed self-evident, however, that it would do so, for whereas in the past a number of ships would have been total losses, in very many instances—in fact, in every instance where a ship had been fitted with wireless telegraphy during the past year—both ships and cargo had been saved. There had been a considerable amount of legislation during the past year in nearly all countries which had a mercantile marine providing that ships should be fitted with wireless telegraphy. There had been a certain limit to which this law applied. In most cases it touched only ships carrying 50 persons or more, whether they be passengers and crew or crew alone. He thought that this would be likely only to be a beginning of such legislation, and that as time went on the law would be made to apply to every ship that sailed from a port. Personally, he could not see why it should not be so, for whether there be 50 persons on a vessel, or 25 or less, if there be a means of safeguarding the lives of those who leave port, it should be applied in every instance. In this country they were expecting similar legislation. Exactly what line it would take he was not yet in a position to say, but he thought it would go rather further than that which had so far been enacted in other countries. Mr. Henry Spearman Saunders seconded the motion, which was adopted.

Chadburn's (Ship) Telegraph Company, Ltd.—The fifteenth annual general meeting was held at Liverpool on June 18, Mr. William Chadburn, the Chairman, presiding. The Chairman, in moving the adoption of the report and accounts, said: It is always a great pleasure for me to meet you, and I trust that this, our fifteenth, report will prove satisfactory. I do not think I need go through the accounts in detail, as they are in the usual form. You will notice, however, that there is a slight reduction in the profits, and this is due to a variety of causes. For one thing, the price of metal was very much higher during the year under review and, like other employers of labour, we have had to pay increased wages to our men, and, in addition, have had to bear the extra burden laid on us by the National Insurance Act. A further reason for the shrinkage in the profits is that in many of the large shipyards, as the result of strikes and other causes, there was considerable delay in the completion of Government vessels and consequently the builders were not ready for our telegraph installations. That, however, as I have explained to you on previous occasions, is one of the conditions we must accept and I trust will not be repeated this year. The volume of work put through and actually invoiced in the 12 months covered by our annual accounts is always liable to fluctuation; and, with regard to the future, I am glad to be able to inform you that the contracts secured and the amount of work we have in hand at the present time is quite satisfactory. Mr. T. R. Pennington seconded the motion. Mr. Burgess referred to the reduction in the profits as compared with the previous year, and suggested that the directors might consider the matter of workmen's

insurance. The trade in which the company was involved did not involve great risks, and it might be to the advantage of the company to undertake their own workmen's insurance. Insurance companies, he said, were fond of imposing an all-round rate, and he mentioned the case of a company of which he had knowledge which, after paying some £900 in insurance premiums, had itself undertaken its own insurance risks, with the result that the payment of compensation did not average more than £250 a year. The resolution was carried unanimously and the retiring directors were reappointed.

FINANCE AND INSURANCE.

The Norfolk & North American Steam Shipping Company.—The profit for last year, after providing for expenses and debenture interest, amounted to £45,232, and £1,304 was brought forward. The directors place £32,500 to depreciation account, and after paying 7½ per cent. on amounts paid up on the ordinary shares carry forward £2,897. Last year the dividend was 6 per cent., and for the three previous years nothing at all was paid.

S. P. Austin & Son, Ltd.—The report for the year ended April 30 shows a further improvement in earnings, trading profit having increased by £1,400 as compared with that of the previous year, to £22,400; while net profit, after allowing for depreciation and debenture interest, was £1,100 up at £16,300. The ordinary share dividend is unchanged at 10 per cent., but £3,000, as against nothing last year, is appropriated for writing down goodwill, and the carry forward is raised from £17,300 to £20,000.

James Keith & Blackman Company, Ltd.—The report states that the amount of business done during the past year exceeded that of any previous year. After providing for debenture interest and making allowance for depreciation and reserves against doubtful debts, the accounts show a net profit of £22,624, and this sum, with the balance brought forward, makes a total of £26,056. A dividend on the ordinary shares at the rate of 10 per cent. per annum, tax free, absorbs £6,801, the sum of £9,000 is transferred to reserve account, and £3,550 is carried forward.

International Marine Insurance.—There has been increasing uneasiness in ocean-trafficking circles on the question whether a marine insurance effected in a foreign country would remain in force should the country of the insured go to war with the country in which the insurance took place. It was hoped that an international understanding would be arrived at, at the recent Copenhagen Conference. However, judging from opinions freely expressed in the Continental Press, the result has been most unsatisfactory, leaving things more or less as they were. The discussions showed at once the existence of two views diametrically opposed to each other and absolutely irreconcilable, viz., the British and American on the one hand, and the Continental view on the other. According to the latter, seeing that war is waged against a State and not against private property, an insurance policy taken out in the country of an enemy should remain in force, the Insurance Company being liable—as in times of peace—for any covered losses. As is well known, the law in this country lays it down, and Americans uphold the very opposite view, that underwriters shall not pay for covered losses during time of war, considering such policies as lapsed by the very fact of the declaration of war. Notwithstanding the explicit statement made by the Chairman of Lloyd's at the Copenhagen Conference, a section of the German Press, possibly inspired, has not ceased to point out the exact legal interpretation of the law in this country to the utter disregard of the long-established practice, whereby claims of this character have always been met. Contemporaries who are less severe in their strictures assert that the qualification of Sir Edward Beauchamp is no guarantee against the possibility of non-payment, seeing that the State is always at liberty to interfere. If, they say, the law is obsolete, why not abolish it, for a contestable security is no security at all!

Nederlandsche Sheepvaart Unie.—The report for 1912 is highly interesting. Last year the Sheepvaart Unie took over 2,000,000 fl. shares of each of the following companies: Rotterdamsche Lloyd, Koninkl. Paketvaart Mij and Nederland, issuing itself at the same time, 6,000,000 fl. of ordinary shares. Although the fleets of those companies were constantly increased, no new capital was needed. An opportunity to exchange the shares of the three companies for the ordinary shares of the Sheepvaart Unie came in June, 1912. As the dividends for 1911 of the three companies were not payable on the same date the exchange of share had to be abandoned temporarily after April 1. A nominal capital of 173,000 fl. of each of the three companies being exchanged since the beginning of this operation, the Sheepvaart Unie's interest in the three companies amounts now to 7,673,000 fl. The dividends of the three companies to be distributed amounts to 2,225,170 fl., against 1,375,000 fl. the previous year, hence the Sheepvaart Unie proposes to pay a dividend of 4 per cent. on the preferential shares and of 10·3 per cent. (against 9¼ per cent. last year) on the ordinary shares. On May 26 last, the fleet of the Stoomvaart Mij. Nederland consisted of 28 steamers, totalling 155,944 tons; the Rotterdamsche Lloyd also owned 28 steamers, of 145,127 tons, and the Koninklijke Paketvaart were owners of 80 vessels, of a total tonnage of 127,812 tons, bringing the grand total of the three companies up to 136 vessels, of 428,883 tons. At that date the three companies had under construction 11, 4 and 12 steamers respectively, of a tonnage of 89,300, 28,500 and 29,800 tons respectively, or a grand total of 27 vessels, of 147,600 tons. The capital of the three companies on May 26 was of 16, 15 and 16 millions of florins respectively, being a total of 47 millions, and the debenture capital amount to 7,489,000, 860,000 and 7,117,000 fl. respectively; a total of 15,406,000 fl. Reserves: 6,505,991, 3,433,632 and 4,670,690 fl. respectively; total, 14,610,313 fl. The balance sheet, closed on December 31, of the Sheepvaart Unie shows the following figures:—Credit: Ordinary shares at bank, 21,918,000 fl.; preferential shares in hand, 100,000 fl.; capital invested in the three companies, 23,019,000 fl.; debtors, 186,079 fl.; deposits, 150,000 fl.; cash in hand, 5,999 fl.; dividends to be received for 1912, 2,225,170 fl. Debit: Ordinary share capital, 50,000,000 fl.; preferential share capital, 250,000 fl.; unclaimed dividends, 30,500 fl.; creditors, 150,000 fl.

MANUFACTURING AND INDUSTRIAL NOTES.

An example of efficient fire-proof insulating material was proved recently when the *Macedonia* was completely burnt out, with the exception of the silicate cotton insulation of the steel framing. The fire was the result of the vessel having been shelled by a Turkish gunboat off Syra, and the fire lasted for two days. The *Macedonia* is owned by the National Steam Navigation Company, Ltd., of Greece.

Special attention has been given to the culinary arrangements on the *Empress of Asia*, which left Liverpool on June 14, and on her sister ship the *Empress of Russia*, each vessel being equipped by Messrs. Henry Wilson & Co., Cornhill Works, Liverpool, with all the latest hygienic and labour-saving devices necessary for effectively serving passengers in each of the three classes. The Liverpool Refrigeration Company have supplied the refrigerating plant, which is in duplicate, whilst the Regulator Furness Bridge Company, Liverpool, have equipped all the furnaces with their patent furnace bridge, which are worked under Howden's system of forced draught. The pumps are fitted with Thomas Donnie's patent dead light valves, whilst the steamers are also equipped with the Willett Bruce automatic steamship whistle control.

Messrs. David Colville & Sons, Ltd., of the Dalzell Steel and Iron Works, Motherwell, report that the current prices of steel plates, &c., are as follows:—

	£	s.	d.
Siemens steel plates—			
Marine boiler quality...	9	12	6
Land boiler quality	9	7	6
Ship quality	8	7	6
Siemens steel bars—			
Boiler quality	9	10	0
Ship quality	9	0	0
Siemens steel angles	8	0	0
Iron bars—			
Dalzell quality	8	10	0
,, best	8	17	6
,, best horse shoe	9	0	0
,, angle	8	10	0
,, best angle	8	17	6
,, best best	9	5	0
,, extra best	9	12	6

OFFICIAL NOTICES AND SHIPS FOR SALE.

STEAMERS FOR SALE.

Folio 8380.—NEW STEAMER. BUILDING. ONE DECK AND SHELTER DECK. 8,500 TONS ON 25 Fr. 4 In. Speed about 11 knots.

Folio 6939.—STEEL. BUILT 1907. SINGLE DECK. 6,600 TONS ON 23 Fr. 4 In. 9/9½ knots on 23 tons. Passed Special Survey, 1911.

Folio 8415.—STEEL. BUILT 1902. SINGLE DECK. 4,800 TONS ON 20 Fr. 2 In. 8⅜ knots on 16/17 tons. Passed Special Survey, 1911.

Folio 8386—STEEL. BUILT 1893. ONE DECK AND PART AWNING DECK. 4,600 TONS ON 22 Fr. 6 In. 9 knots on 16/17 tons. Passed Special Survey, 1911.

Folio 3038.—STEEL. BUILT 1900. SINGLE DECK. 2,730 TONS ON 17 Fr. 10 In. 8½/9 knots on 14 tons. Passed Special Survey, 1912.

For further particulars, plans, prices, &c., apply to :—

THOS. PINKNEY & SONS,
Steamship Sale Brokers,
Sunderland.

Telegraphic Address:
"Spardeck."

FOR SALE.

NEW STEAMER BUILDING.

6,600 tons d.w. on 21½ ft.; single deck; poop, bridge and forecastle; 100 A.1; five large hatches; seven steam winches; 1,100 tons water ballast; co-efficient ·78; triple expansion engines 24 in., 40 in. and 65 in. × 45 in.; three boilers 5,400 sq. ft. heating surface, 180 lb. pressure. Ready shortly.

Dimensions, 355 × 50 × 26½ ft. moulded.

For further particulars apply to

H. E. MOSS & CO.,
18, Chapel Street,
Liverpool.

Official Notices and Ships for Sale.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Wednesday. All advertisements should be addressed to :—*Shipbuilding and Shipping Record*, Queen Anne's Chambers, Westminster, London, S.W.

WANTED, by Naval Architect, with 20 years' experience, appointment as representative of marine motor firm, manager, or supervisor of small yard. Apply, *Shipbuilding and Shipping Record*.

A COMMERCIAL STUDY OF THE SHIPPING TRADE AND FREIGHTS.

"THE OCEAN CARRIER."

By J. RUSSELL SMITH, Ph.D.

33 excellent photographs of characteristic ships.

5 ocean route maps. Price 7s. 6d. net.

This is, so far as we know, the first book ever written which deals with the economics of shipping in a manner really full and satisfactory. There have been books without number describing the development of the ocean steamship as a machine, but Dr. Smith describes its commercial development as a carrier.

FOR SALE BY

SHIPBUILDING AND SHIPPING RECORD,
Queen Anne's Chambers,
Westminster, London, S.W.

SHIP SALES.

The ss. *Sperber*, 594 net registered tonnage, built in 1869 in Sunderland, owned by the L. F. Mathies Co., Hamburg, has been sold to Belgian buyers.

The iron paddle passenger tug boat *Clumy Castle*, owned by Mr. W. Small, Wrexham, has been sold to Mr. A. Marsh, Manchester, for about £450. Built at Glasgow in 1873. Dimensions: 104·6 ft. by 19·4 ft. by 9·4 ft.

The iron screw steamer *Princess Thrya* has been purchased by Greeks from Messrs. J. & P. Hutchinson, Glasgow, for about £3,000. She is 646 tons gross register, and was built at Blackwood & Gordon, Port-Glasgow, in 1863. Her engines were by D. Rowan & Company, Glasgow.

The iron screw steamer *Princess Alexandra*, owned by Messrs. J. & P. Hutchinson, Manchester, has been sold to Greeks for about £3,000. She is 646 tons gross register, and carries 850 tons d.w. Built at Port-Glasgow in 1863 by Messrs. Blackwood & Gordon. Classed A1 at Lloyd's. Compound engines. Dimensions 212·5 ft. by 27·5 ft. by 15·3 ft.

The Philadelphia Transportation & Lighterage Company has purchased the lighter *Nellie T. Graham*, built at Milford, Del. It will be used for the transportation of merchandise in the harbour and the Delaware and Schuylkill Rivers.

The London steamer *Kingsway*, of 3,647 tons gross, has been sold to Messrs. P. Evans & Company, Bristol. She was built at Sunderland in 1907, with dimensions 346·5 ft. by 50·8 ft. by 22·9 ft., and was owned by Mr. H. W. Dillon, London.

The ss. *Europa*, 923 net registered tonnage, formerly owned by T H. A. Dabelstein, Hamburg, and built in 1879, has been sold to a firm in Stettin.

The ss. *Dingwall*, of 2,128 tons gross and 1,366 tons net register, is stated to have been sold. She was built at Blyth in 1892, with dimensions 275·5 ft. by 37·6 ft. by 18·5 ft. She formerly belonged to Messrs. Arthur Mawson & Co., Cardiff.

The ss. *Ioannis Th. Sifneo*, of 2,899 tons gross and 1,854 tons net register, has been sold. She was built at Newcastle in 1892, with dimensions 312 ft. by 41 ft. by 20·5 ft., and was Grecian-owned.

The ss. *Parklands* has been sold by Messrs. R. Hardy & Co., of West Hartlepool, to the China Steam Navigation Company. She was built at West Hartlepool, and is of 2,929 tons gross.

The ss. *Tjomo*, of 1452 tons gross and 899 tons net register, has been sold for about £8,500. She was built at Newcastle in 1892, with dimensions 250 ft. by 35 ft. by 15·4 ft. Her late owners were Messrs. Hjalmar, Roed & Co., Tonsberg.

The Knight Line, Ltd. (Messrs. Greenshields, Cowie & Co.) have disposed of their steamer *Knight Errant*, of 4,779 net tons, built in 1898 at Glasgow. The price is about £46,000, and the purchasers are the European & Brazilian Shipping Company, Ltd. The sale was effected through Messrs. H. E. Moss & Co.

ORDERS PLACED.

Messrs. Lehrarder & Wrede, tug owners, Hamburg, have placed an order for a tug and salvage steamer with Messrs. Janssen & Schmilinsky, Hamburg.

Messrs. Cammell Laird & Co., Ltd., have received an order from the Cia. Argentina de Navegacion, Ltd., to build two passenger vessels about 350 ft. long, to have a speed of 18 knots.

The contract for the construction of the United States destroyer tender *Melville* (No. 2) has been awarded to the New York Shipbuilding Company, Camden, N.J., at $1,310,000 under class 1a of the specifications, bidder's design of machinery, steam turbines and reduction gear. The vessel will have a displacement of 7,150 tons, a speed of 15 knots, and is to be completed in 24 months.

Sir William Arrol & Co., Dalmarnock Iron Works, Glasgow, have secured the contract for the erection of the new framing sheds, moulding lofts, and other shipyard buildings which Messrs. Harland & Wolff, Belfast, are adding to their works at Govan. The new buildings will cover an area of about six acres, divided from their present shipyard by a street leading to one of the Clyde vehicular ferries. The structure will be two storeys in height, and will be constructed of steel, brickwork and glass. When Messrs. Mackie & Thomson shift to the new works which are being laid out for them at Irvine, Messrs. Harland & Wolff will take over their site.

TENDERS INVITED.

With reference to the tenders invited for the new floating pneumatic grain elevators required for the port of Antwerp, the offers will be considered on July 18, and a sum of 1,800,000 francs has been set aside for them, the number to be ordered being four. They are each to be capable of discharging 200 tons an hour from ships' holds into lighters. Tenders must indicate the date at which the appliances will be delivered in working order in the Northern Basins at Antwerp.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF LAUNCHES.

Date of Launch.	Name of Vessel.	Owners.	Builders.	Principal Dimensions. Length.	Breadth.	Depth.	Propelling Machinery.	Builders of Machinery.	Remarks.
—	ss. *Shiyo Maru*	Toyo Kisen Kaisha, Tokio	Russell & Co., Port-Glasgow ...	ft. in. 495 0	ft. in. 52 3	ft. in. 30 0	—	Rankin & Blackmore, Greenock	6,300 tons gross.
June 4	Submarine torpedo *H* 2 ...	U.S. Government	Union Iron Works, San Francisco	—	—	—	—	—	Speed, 14 knots.
June 5	ss. *Santa Clara*...	W. R. Grace & Co., New York ...	W. Cramp & Sons, Philadelphia ...	420 0	54 0	30 6	—	—	d.w. capacity, 10,000 tons.
June 18... ...	Submarine *A.E.* 2	Australian Commonwealth Government	Vickers Ltd., Barrow in Furness ...	176 0	22 6	—	2 sets heavy oil engines	Vickers Ltd.	800 tons displacement.
June 18... ...	ss. *Cabo Santa Maria*... ...	Hamburg South American SS. Co., Hamburg	A. & J. Inglis, Ltd., Glasgow ...	320 0	72 0	29 0	—	A. & J. Inglis, Ltd.	River Plate Service.
June 18... ...	ss. *Glavian*	Great Central Co-op. Engrg. & Ship Repairing Co., Ltd., Grimsby	Cochrane & Sons, Ltd., Selby ...	120 0	21 6	12 3	Tr. Exp.	Owners	Trawler.
June 18... ...	ss. *Maronian*	Ellerman Lines, Ltd., Liverpool ...	Earle's Shipbuilding & Engineering Co., Ltd., Hull	318 9	42 2½	26 9	Tr. Exp. 20½, 35¼, 60 × 42	—	Cruiser stern.
June 18... ...	ss. *Moto*	Pelton Steamship Co., Ltd., Newcastle	S. P. Austin & Son, Ltd., Sunderland	—	—	—	—	G. Clark, Ltd., Sunderland ...	Steam collier, 2,750 tons d.w.
June 18... ...	ss. *Norinda*	Burns, Philp & Co., London ...	Greenock & Grangemouth Dockyard, Co., Ltd.	260 0 b.p.	38 0	18 2	Tr. Exp.	Dunsmuir & Jackson, Ltd., Govan	d.w. capacity 1,800 tons on 17 ft. mean draft at 10½ knots.
June 18... ...	ss. *Waldorf*	Letten, Grant & Windeatt, Grimsby	Cochrane & Sons, Ltd., Selby ...	133 4	23 0	13 1	Tr. Exp.	C. D. Holmes & Co., Ltd., Hull	Trawler.
June 19... ...	ss. *Darley Chine*	H. G. Harper & Co., London ...	Osbourne, Graham & Co., Sunderland	290 0	40 1½	20 8	Tr. Exp. 20½, 33, 56 × 36	G. Clark, Ltd., Sunderland ...	3,300 tons, d.w.
June 19... ...	ss. *Fergus*	North of Scotland & Orkney & Shetland S.N. Co., Aberdeen	Hawthorns & Co., Ltd., Leith ...	150 0	24 0	11 0	Tr. Exp. 450 h.p.	—	—
June 19... ...	ss. *Frimley*	Houlder, Middleton & Co., London	Northumberland Shipbuilding Co., Ltd., Howdon-on-Tyne	415 0	53 1	29 2	Tr. Exp. 26, 42, 72 × 48	Richardsons, Westgarth & Co., Ltd., Sunderland	d.w. capacity, 8,300 tons.
June 19... ...	Tug and passenger tender *Gladstone*	Alexander Towing Co., Ltd., Liverpool	John Cran & Co., Leith	—	—	—	900 i.h.p.	John Cran & Co.	—
June 19... ...	Motor-coaster *Innisjura* ...	Coasting Motor Shipping Co., Glasgow	A. Jeffrey & Co., Alloa	73 6	18 9	9 6	Tuxham crude oil. 86 b.h.p.	—	170 tons capacity.
June 19... ...	ss. *Mardinian*	Ellerman Lines, Ltd., Liverpool ...	W. Harkness & Son, Ltd., Middlesbrough	313 0	42 5	26 9½	Tr. Exp. 20½, 35¼, 60 × 42	Richardsons, Westgarth & Co., Ltd.	d.w. capacity, 5,000 tons.
June 20... ...	Hopper Steamer	Russian Government	W. Simons & Co., Ltd., Renfrew ...	—	—	—	Compound surface condensing	W. Simons & Co., Ltd.	700 tons.
June 22... ...	ss. *Thornfield*	Zillah Shipping & Carrying Co., Ltd.	Ramage & Ferguson, Ltd., Leith ...	160 0	26 0	12 6	Compound surface condensing	Ramage & Ferguson, Ltd. ...	—

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF TRIAL TRIPS.

Date of Trial Trip.	Name of Vessel.	Owners.	Builders.	Principal Dimensions. Length. ft. in.	Principal Dimensions. Breadth. ft. in.	Principal Dimensions. Depth. ft. in.	Propelling Machinery.	Builders of Machinery.	Remarks.
—	H.M.S. *Spitfire*	Admiralty	Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne	260 0	27 0	—	Parsons' impulse-reaction turbines.	Wallsend Slipway & Engineering Co., Ltd.	Torpedo destroyer.
June 18... ...	ss. *Onega*	Deutsch Amerikanische Petroleum Ges., Hamburg	Palmers Shipbuilding & Iron Co., Ltd., Hebburn-on-Tyne	380 0	—	—	Quad. Exp., 20½, 29½, 42½, 48 × 48	Palmers Shipbuilding & Iron Co., Ltd.	d.w. capacity, 7,300 tons, oil tanker.
June 20... ..	ss. *Evangelos*	Anhalatelo Bros., London	Robert Thompson & Sons, Ltd., Southwick-on-Wear	387 6	51 6	25 0	—	John Dickinson & Sons, Ltd., Sunderland	11 knots.
June 23... ...	ss. *Dalia Laura*	Hamburg Sudamerikanische Dampfs. Ges., Hamburg	Bremer "Vulkan," Vegesack ...	510 0	59 3	38 4	Tr. Exp....	Bremer "Vulkan"	Passenger accommodation, 2,400 steerage and 200 cabin.
June 23... ...	ss. *Tregarthen*	Edward Hain & Son, St. Ives, Cornwall	John Readhead & Sons, Ltd., South Shields	381 0	51 0	27 8½	Tr. Exp., 26, 42, 69 × 48	John Readhead & Sons, Ltd....	7,850 tons d.w.

PORT NOTES.

Fowey.—The Harbour Commissioners give notice that dredging operations have now commenced in Mixton Reach.

Bourgas.—The Foreign Office has received a telegram from the British Minister at Sofia reporting that the port of Bourgas is open to shipping, and that the mines which had been laid there have been removed.

Aden.—Several improvements have been carried out recently facilitating the commerce of the Port of Aden, chief among them being the erection of sheds on the Maala Wharves, which were badly needed; and further building is still necessary to cope with the demand for space and protection of goods from weather in the rainy month.

St. Thomas, W.I.—The harbour is land-locked and one of the best in the West Indies; the middle part has been dredged to a depth of 30 ft., this operation having been completed this year. It is much made use of by the steamship lines running there, being the West Indian headquarters of the Hamburg-Amerika Line and of the East Asiatic Company of Copenhagen.

Newport Dock Extension.—It is stated that extensions to the Newport Docks, which will form the largest dock in the world held in by gates, will be completed early next year. The water has been let in the dock, and the dam, which separates the extensions from the other docks, is being removed. This, with the construction of the outer piers and the dredging of the deep water entrance will take some months.

Kenitra.—The port of Kenitra, a river port on the estuary of the Sebou, and about 2 km. higher up the stream than Mehedia, will be open to international commerce in August and September next. At the present time the only accommodation for steamers consists of a wooden mole installed by the French military and naval authorities, but it is stated that steps will be taken to continue the necessary works as occasion may arise.

Port Talbot.—The Port Talbot Dock Company have decided to extend the south breakwater, and by putting down new locks, the carrying out of which will cost about £350,000, provide a dock that will accommodate large ships which will be able to leave and enter the dock at any state of the tide. Dredging operations are being actively continued, and the next step will be to convert a portion of the present float into the dock which will be the largest deep-water single area in the Bristol Channel. New coal loading appliances, which will provide for 750,000 tons per annum have also been contracted for.

Roscoff Harbour.—Important improvements are taking place in Roscoff Harbour. A new pier is being constructed to the north-east of the existing pier, which will provide a quay length of 1,387 ft. A channel, 164 to 295 ft. wide and increasing the present depth of the entrance by 4 ft., is being dredged in the rock bed running parallel with the new pier. This work commenced on April 1, 1912, and will be completed early in 1915. A railway line can then be constructed, running the length of the quay, where vessels moored alongside will have a minimum depth of 14 ft. of water. At present vessels are only able to enter and leave the port at high tide.

Vladivostok.—Accommodation is to be provided for not less than 25 ocean-going steamers. In addition to the wharves already existing, there will be one for berthing five steamers on the western side of Golden Horn Bay, with a mole for another four steamers. On the southern side of the bay there are to be constructed two new wharves, one for loading and discharging coal and the other for timber. A branch railway line will leave the main line at Pervaya Ryetchka—the first station out of Vladivostok—and, passing round the eastern extremity of Golden Horn Bay, will go as far as Cape Tchurkin and thus supply communication with the coal and timber wharves. The cost of the harbour extensions will be approximately 6,000,000 r., exclusive of the railway, which will be in the neighbourhood of 3,500,000 r., and the period of construction probably five years. A complete project had been drawn up for thoroughly equipping the port with cranes, elevators, repairing shops, godowns, refrigerating plant and electric installations, but this is not being adopted, it being now decided to proceed with equipment of the port gradually as necessity arises. In the meantime 150,000 r. have been allotted for building an electrical power station. The work on the harbour extension will be let out at public auction to private contractors.

SHIPPING, SHIPBUILDING, ENGINEERING AND MARINE INSURANCE SHARE LIST.

SHIPPING AND DOCKS.

Name.	Share and paid.	Extreme quotations, 1912.	Last ann. dividend % or per share.	Yield %	Quotation.
	£				
African SS.	20	20¾—19¾	7½	6½	19—21
Allan Line ... ... Deb.	100	94—91	4	4½	93—95
Anchor Line ... Cum. pref.	10	10¼—9¾	5⅜	5⅛	9½—10¾
Do. ... ... Deb.	Stk.	102—100	4¾	4¾	101—104
Argentine Nav. Cum. pref.	1	29/9—26/3	10	7½	11½—11⅞
Do. ... ... Deb.	Bds.	104¾—104¾	6	5⅞	101⅛—103⅛
Australasian Un. S. Nav. Deb.	Stk.	82—81½	4	4¾	85—86
Belfast Steam ... "A."	10 (5 pd.)	5½—4¾	5	4¾	4¾—5½
Booth SS. ... ... Deb.	Stk.	102⅝—99	4½	4½	99—103
British & African Nav. Deb.	Stk.	101—98½	4½	4⅞	101—103
British India Nav. ... Deb.	Stk.	103¾—99¾	4½	4¾	102—104
Buckmall SS. ... Cum. pref.	2	39/4—28/9	5½	5½	96—100
Cairn Line ... ... Deb.	Bds.	101—98	5	5	99—101
Clan Line ... ... Ord.	10	12½—6¾	8	6⅝	11½—11⅞
Cunard SS. ... ... Ord.	1	38—25⅝	10	6½	11—11⅛
Do. ... Cum. pref.	Stk.	103¾—96	5	4¾	100—102
Do. ... ... Deb.	Stk.	104½—101	4½	4⅛	100—102
Elder Line ... ... Deb.	Stk.	102¾—102	4½	4½	99—102
Elder Dempster ... Cum. pref.	1	20/—18/6	5½	5⅛	3½—1⅛
Do. ... ... Deb.	Stk.	104—99½	5	4¾	101—103
Ellerman Lines ... ... Ord.	10	15½—12½	12	7½	16—17
Do. ... Cum. pref.	10	9⅞—9⅛	4½	4⅞	8⅞—9½
France Fenwick ... Cum. pref.	5	97/6—91/10	5½	5½	4¾—4¾
Do. ... ... Deb.	Stk.	102—97	4½	4⅞	97—99
Furness, Withy ... Ord.	1	37/3—23/6	10	6⅛	1½—1⅜
Do. ... Cum. pref.	10	10¼—9½	5	5¼	9—9½
General Steam Nav. ...	⅞	7—6½	6	7⅛	6½—6¾
Do. ... ... Pref.	8	8½—7⅞	6	6⅝	7½—7⅞
Houlder Line ... Cum. pref.	5	51—45	Nil.	Nil.	3½—4
Do. ... ... Deb.	Stk.	90—82	4½	5⅛	85—85
Houlder Bros. ... Cum. pref.	5	4¾—4	5½	5½	4½—4¾
Do. ... ... Deb.	Stk.	85—80	4½	5½	83—88
India Gen. Nav. & Rly. Ord.	10	7⅞—6¾	7	8½	7½—8½
Do. ... Cum. pref.	10	7¾—7⅛	5	5⅛	8—9
Indo-China N. ... Cum. pref.	5	5⅛—17/6	6	5½	4½—5½
Irrawaddy Flotilla	40	116—102	10	3⅛	114—116
Khedivial Mail SS.	1	13/6—8/-	Nil.	Nil.	1½—1½
King Line	10	9½—6½	6	6½	8½—9½
La Guaira Harbour ... Deb.	Stk.	85½—81	5	5⅛	85—87
Leyland (F.) ... Cum. pref.	10	10⅞—9/6	10/-	5	10—10½
Do. ... ... Deb.	100	102—88	4	4⅛	97½—99½
Manchester Liners ... Deb.	100	101—95	4½	4½	95—97
Mercantile SS. ... ... Ord.	5	8—5½	25	16½	6½—7½
Do. ... ... Pref.	1	18/9—16/3	5	5	1—1
Moor Line	10	12—8½	15	12½	11½—12½
National SS. ... ... Pref.	8 (5 pd.)	1⅞—1½	Nil.	Nil.	½—1⅛
Nelson Steam Nav. ... Deb.	100	101¾—98½	5	4¾	100—102
New Zealand ... ... Ord.	8	19—12½	8	4½	15½—16½
Do. ... ... Deb.	Stk.	94½—91½	4	4⅛	92—94
Nitrate Producers SS. Ord.	5	8 1/16—5½	12½	7½	7⅞—8½
Do. ... Cum. pref.	5	5⅛	5	5	4⅞—5⅛
Oceanic Steam. Nav. ... Deb.	100	101½—95¾	4½	4¾	96—98
Orient.Stm.Nav.Co. Cum. pref.	10	10—9½	5	5	9½—10½
Do. ... ... Deb.	100	99¾—96½	4½	4½	95—97
P. & O. S.N. ... Cum. pref.	100	131—112	5	4½	107—112
Do. ... ... Deb.	100	422—246	15	5½	270—290
Do. ... ... Deb.	Stk.	90½—87½	3½	4⅛	84—87
Prince Line	1	24/—22/3	10	8	1½—1½
R.M.S.P. ... ... Ord.	100	155—97	6	5½	107—112
Do. ... ... Pref.	Stk.	101—93½	5	5½	97—99
Do. ... ... Deb.	Stk.	105½—99½	4½	4½	102—104
Shaw, Savill & Alb. Cum. pref.	5	5¼—5⅛	5	5	4⅞—5½
Shell Transport ... Ord.	1	6½—79/6	20	3⅛	5½—5⅞
Do. ... Cum. pref.	10	11½—10½	5	4½	10½—10¾
Union-Castle SS. Cum. pref.	10	10½—9½	4½	4½	9½—10
Do. ... ... Deb.	Stk.	98—94½	4	4¼	94—96
Union SS. of N.Z. ...	1	65/—37/6	1/9½	4½	1½—2½
Do. ... ... Deb.	Stk.	96½—95	4	4½	91—93
West Hartlepool ... Pref.	10	90/—23/9	Nil.	Nil.	3¾—4½

IRON AND STEEL.

Name.	Share and paid.	Extreme quotations, 1912.	Last ann. dividend % or per share.	Yield. %	Quotation.
Babcock & Wilcox ... Ord.	1	7—59/4	16	5½	2⅞—3
Do. ... Cum. pref.	1	31/9—28/-	6	4½	1½—1½
Baldwins ... Cum. pref.	1	1⅞—1⅛	5¾	4½	1 1/16—1 3/16
Do. ... ... Deb.	Stk.	105—100	4½	4¼	99—101
Bayliss, Jones ... Cum. pref.	5	3½—1½	Nil.	Nil.	3½—4½
Bell Bros. ... Cum. pref.	10	11½—11⅛	6	5⅛	11½—11¾
Do. ... ... Deb.	Stk.	97½—97½	4	4½	97—99
Bessemer (Henry) ... Ord.	1	1½—1⅜	7½	6	1½—1½
Do. ... Pref.	10	9¼—8½	5	5½	8½—9½
Bolckow Vaughan ... Ord.	1	22/6—19/9	5	5	1½—1 1/16
Do. ... Cum. pref.	20	21½—21½	5	4⅞	21—22
Cargo Fleet Iron ... Ord.	1	13/3—7/6	Nil.	Nil.	1½—1½
Do. ... Deb.	100	90½—84	4½	5¼	86—89
Consett Iron Co. ... Ord.	10 (7½ pd.)	39½—36	48¾	9⅞	39—40
Do. ... Cum. pref.	⅝	9½—8½	8	4½	8½—8¾
Dominion Iron & Steel ...	Bds.	103¾—94½	5	5¼	95—97
Dorman, Long ... Ord.	1	22/6—18/-	7½	8½	5—1½
Do. ... Deb.	Stk.	91½—88¾	4	4½	87—90
Ebbw Vale Steel & Iron ...	13	10½—8½	3	3½	10⅛—11½
Do.	13 (10 pd.)	9½—6¾	3	3½	9—9½
Guest, Keen & Nettefolds Ord.	1	67/9—57/9	15	4½	3⅛—3⅞
Do. ... Cum. pref.	5	6¼—5½	5	4⅞	5⅞—5½
Do. ... Deb.	Stk.	104½—100	4	4⅛	98—100

IRON AND STEEL.—*Continued.*

Name.	Share and paid.	Extreme quotations, 1912.	Last ann. dividend % or per share.	Yield. %	Quotation.
	£				
Hadfield's Steel Foundry Ord.	1	65/—56/10	20	7	21½—21½
Do. ... Cum. pref.	10	10¼—9½	4½	4½	10—10½
Hawthorn (R. & W.) Leslie Deb.	Stk.	95—92	4½	4½	91—93
Ibbotson Bros.	5 (4 pd.)	6½—5¾	10	6½	6½—6¾
Jessop (W.) & Sons	5 (4 pd.)	6¾—5⅞	12½	8½	6¼—6¾
Do. ... ... Deb.	100	102—98	4½	4½	98—100
Lanarkshire Steel Cum. pref.	10	7½—6¾	5	7	6⅞—7½
Lysaght (J.) ... Cum. pref.	1	1⅝—1⅛	6	4½	1—1⅛
Do. ... ... Deb.	Stk.	106½—104½	4½	4⅛	106½—108½
MacLellan (P. & W.) Cum. pref.	10	10½—9½	6	6⅞	9½—9¾
Manganese Bronze ... Ord.	1	11/6—9	6	9½	⅞—⅞
Do. ... Cum. pref.	1	17/—16/-	6	6½	⅞—⅞
North-Eastern Steel ... Deb.	Stk.	86—86	4½	5	87—89
Palmer's Ship & Iron "A"	1	⅞—⅞	Nil.	Nil.	⅞—⅞
Do. ... Cum. pref.	1	⅞—⅞	Nil.	Nil.	⅞—⅞
Do. ... ... Deb.	Stk.	96—88	5	6½	85—87
Scott (Walter) ... ... Ord.	1	11/3—8/9	Nil.	Nil.	1½—1½
Do. ... Cum. pref.	1	1⅞—⅞	6	6½	1½—1½
Do. ... ... Deb.	Stk.	85—77	4	4½	84—86
Sheffield Forge	1	1½—1 7/16	10	5½	1½—1½
Shelton Iron & Steel... Deb.	100	96—90	5	5¼	93—97
S. Durham Steel & Iron Ord.	1	33/—20/-	25	5	11½—11½
Do. ... Cum. pref.	1	21/—18/9	6	5½	1½—1 1/16
Do. ... ... Deb.	Stk.	94—86	4½	4½	92—95
Steel Co. of Scotland... Ord.	Stk.	111⅝—106	10	8½	11½—11¾
Do. ... ... Deb.	10	12½—10½	5	4⅞	10—11
Stewart's & Lloyd's Pref. ord.	10	21½—20½	10	4½	20½—20¾
Do. ... Cum. pref.	10	14¾—13¾	6	4⅞	13¾—14
Do. ... ... Deb.	Stk.	97—91¾	3½	3¾	94—96
Stone (J.) ... Cum. pref.	10	10—8½	5	6½	8½—9
United States Steel ... Ord.	100$	82½—40	5	8½	61—62½
Do. ... Cum. pref.	100$	120—110	7	6½	108½—109½
Vickers Ltd. ... ... Ord.	1	44—38½	10	5½	13½—14½
Do. ... ... Pref.	Stk.	111—102	5	4½	101—105
Do. ... ... Deb.	Stk.	103—98	4	4½	91—93
Weardale Steel ... Def. ord.	1	1⅛—1½	6	6½	⅞—1⅛
Do. ... Cum. pref.	1	21/—14½	6	6½	3½—3¾
Do. ... ... Deb.	Stk.	84—74	5	5½	74—76
Workington Iron & Steel Ord.	1	3½—11/-	2½	3½	1½—2
Do. ... Cum. pref.	1	21/4—19/6	6	5¼	1—1 1/16

SHIPBUILDING AND MARINE ENGINEERING.

Name.	Share and paid.	Extreme quotations, 1912.	Last ann. dividend % or per share.	Yield. %	Quotation.
Armstrong, Whitworth Ord.	1	48/4—2⅞	12½	6½	13½—2⅞
Do. ... Cum. pref.	5	5—4½	4	4½	4½—4¾
Do. ... ... Deb.	Stk.	102½—96¾	4	4½	96—98
Beardmore (W.)	100	99½—93	4½	4½	94—96
Brown (John) ... ... Ord.	1 (15s. pd.)	1½—1⅛	7½	5	1½—1½
Do. ... Cum. pref.	10	10½—9½	5	4½	9½—10½
Cammell Laird ... ... Ord.	5	5½—2½	Nil.	Nil.	3—3½
Do. ... Cum. pref.	5	5⅝—4 7/16	10*	5	3¾—4½
Do. ... ... Deb.	100	99—91	4½	5¼	87—89
Dunlop (Jas.) ... ... Ord.	1	1⅜—⅞	10	12½	⅞—⅞
Do. ... Cum. pref.	1	1⅜—⅞	6	5⅞	⅞—⅞
Fairfield Shpbldg. Cum. pref.	10	10—9⅞	6	6½	9—10
Do. ... ... Deb.	Stk.	99—83	4½	5	88—91
Gray (Wm.) ... ... Deb.	100	103½—100	4½	4⅞	100—103
Henderson (D. & W.) Cum. pref.	1	1⅜—⅞	5½		⅞—⅞
Richardsons Westgarth Ord.	1	4½—⅞	Nil.	Nil.	⅞—⅞
Do. ... Cum. pref.	1	1⅜—⅞	Nil.	Nil.	⅞—⅞
Do. ... ... Deb.	Stk.	72½—67	4½	7	62—65
Simons (W.) ... Cum. pref.	10	10½—10¼	5	4½	10½—10¾
Stephenson (R.) ... Ord.	1	5⅞—⅞	Nil.	Nil.	⅞—⅞
Do. ... Pref.	1	1⅜—⅞	Nil.	Nil.	⅞—⅞
Do. ... ... Deb.	Stk.	79—48	Nil.	Nil.	64—69
Swan, Hunter & W. Richardson Ord.	1	1—1⅜	7½	8½	⅞—⅞
Do. ... Cum. pref.	1	1—⅞	5	5½	⅞—⅞
Do. ... ... Deb.	Stk.	91—88	4½	4½	88—92
Thornycroft (John I.) Ord.	1	1⅜—⅞	6	8	⅞—⅞
Do. ... Cum. pref.	1	1⅜—⅞	6	8	⅞—⅞
Do. ... ... Deb.	100	100—89	5	5½	94—98
Wallsend Slipway ... Ord.	1	1 5/16—1 1/16	8½	6½	1 1/16—1 3/16
Do. ... Cum. pref.	1	1⅛—1⅛	5	5	1⅛—1⅛

INSURANCE.

Name.	Share and paid.	Extreme quotations, 1912.	Last ann. dividend % or per share.	Yield. %	Quotation.
Alliance	20 (2·4 pd.)	11½—10¾	12/-	4½	11½—12½
Do. (new shares) ...	1	14½—13½	12/-	4⅞	13½—14½
Indem. Mutual Marine	15 (3 pd.)	10—8¾	16½	5	9½—10
London Assurance ...	25 (12½ pd.)	55½—48	20	5	48—52
Marine Insurance ...	10 (1 pd.)		45/-	5½	37—38½
Maritime Insurance ...	10 (2 pd.)	5 9/16—4½	10	4½	4½—4½
Merchants' Marine Insurance ...	10 (2 pd.)	7½—2½	7½	5¼	3—3½
N. British & Mercantile Ord.	25 (6 pd.)	41—28	40/-	5⅞	38½—39½
Do. ... Pref.	Stk.	104—98	4	4½	95—97 xd
Reliance Marine	10 (2 pd.)	6¾—5⅞	15	4	6¾—7
Royal Exchange Assurance ...	Stk.	218½—190	10	4½	200—205
Sea Insurance	10 (2 pd.)	19—17½	16/-	4½	18—19 xd
World Marine, Limited ...	5 (2 pd.)	1⅞—1⅛	5	6½	1⅛—1⅛

* With arrears.

NOTE.—Notifications for entry in this table should be received on Tuesday morning.

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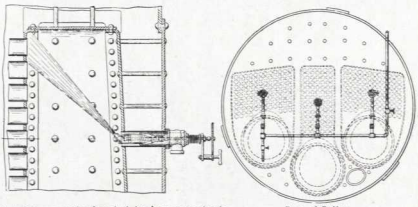

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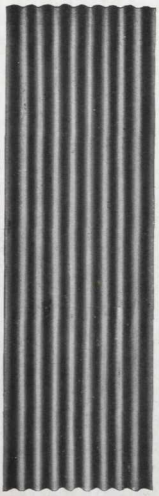

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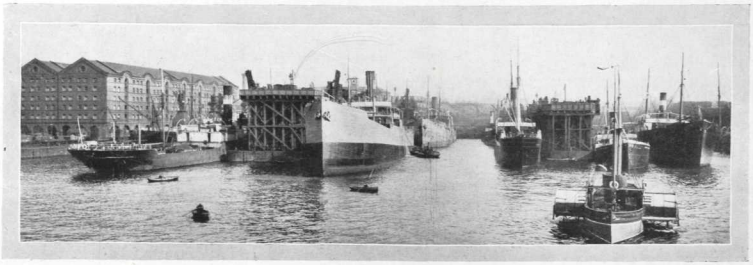

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b ORIANA	8,099	,, 10	La Rochelle Pallice, Spain, Portugal, Canary Is., St. Vincent, Brazil, Uruguay, Chile & Peru.
ARLANZA	15,044	,, 11	Cherbourg, Spain, Portugal, Madeira, Brazil, Uruguay & Argentina.
AMAZON	10,037	,, 18	Cherbourg, Spain, Portugal, Madeira, Brazil, Uruguay & Argentina.
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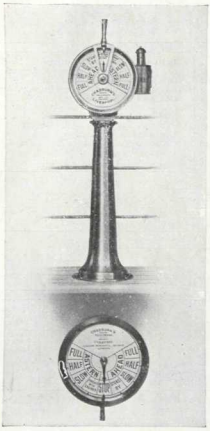

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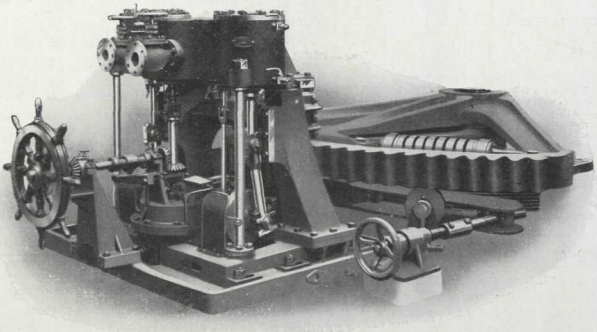

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Liskleter's Patent Ship Fittings Co., 20, Percy Street, Tynemouth.

AERIAL ROPEWAYS—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

AIR COMPRESSORS—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

AIR PUMPS—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.
Weir, G. & J., Ltd., Cathcart, Glasgow.

ALUMINIUM GOODS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

ALUMINIUM PAINT—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

ANCHORS—
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.
Sykes, Richard, & Son, Ltd., Cradley Heath.
Taylor, Samuel, & Sons, Brierley Hill, Staffs.

ANTI-CORROSIVE PAINTS—
Briggs, W., & Sons, Ltd., Dundee.
Wailes, Dove & Co., Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

ANTI-FRICTION METALS—
Billington & Newton, Ltd., Longport, Staffs.
Bowran, Robt., & Co., Ltd., Newcastle-on-Tyne.

ARMOUR PLATES—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Openshaw Works, Manchester.

ASBESTOS FITTINGS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ASBESTOS GOODS—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

ASH BAGS—
Speeding, James, & Co., Sail Works, Sunderland.

ASH BINS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

ASH DISCHARGING APPLIANCES—
Trewent & Proctor, F. J., Ltd., 43, Billiter Buildings, E.C.

AWNINGS—
Speeding, James, & Co., Sail Works, Sunderland.

BARROWS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

BARROWS (Cargo)—
Edina Manufacturing Co., 19b, Broad Wynd, Leith.

BEDDING & NAPERY CONTRACTORS—
Stewart, Archibald & Co., 40-48, Union Street, Glasgow.

BEMAL CONDENSER TUBES—
The Yorkshire Copper Works, Ltd., Leeds.

"BITUMASTIC" ENAMEL MANUFACTURERS—
Wailes, Dove & Co., Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

BLINDS—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.
Peters, G. D., & Co., Ltd., Moorfields, London, E.C.

BLOCKS—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Higginson & Co., 7, Hurst Street, Liverpool.

BLOWERS—
Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

BLOW LAMPS—
Seelisch, Meyer & Co., 75, Southwark Street, London, S.E.

BOATS—
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Rodger, Robert, & Co., Boatbuilders, Greenock.

BOILERS—
Howden, James, & Co., Ltd., Scotland Street, Glasgow.

BOILERS (Water Tube)—
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

BOILER CIRCULATORS—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

BOILER CLEANER—
Diamond Blower Co., 75b, Queen Victoria Street, London, E.C
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

BOILER COMPOSITION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

BOILER COVERING—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

BOILER MOUNTINGS—
Diamond Blower Co., 75b, Queen Victoria Street, London, E.C.
Hannan & Buchanan, 75, Robertson Street, Glasgow.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

BOILERPLATES (Steel)—
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.

BOILER TUBES—
The Yorkshire Copper Works, Ltd., Leeds.

BOILER TUBE CLEANERS—
Diamond Blower Co., 75b, Queen Victoria Street, London, E.C.
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

BOLTS AND NUTS—
Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton.
Coventry Chain Co., Ltd., Coventry.

BOOKS—
Fraser, Asher & Co., Ltd., 164, Howara Street, Glasgow.

BORING MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.

BRASS & COPPER FITTINGS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

BRASS & COPPER RODS—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

BRASS & COPPER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

BRASS FOUNDERS—
Billington & Newton, Ltd., Longport, Staffs.
Chambers, John, Engineer and Shipbuilder, Lowestoft.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

BRASS TUBES—
The Yorkshire Copper Works, Ltd., Leeds.

BRASSWORK—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.
Peters, G. D., & Co., Ltd., Moorfields, London, E.C.

BUCKETS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

BUOYANT DECK SEATS—
Liskleter's Patent Ship Fittings Co., 20, Percy Street, Tynemouth.

BUOYS—
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.

CABINET MAKERS—
Stewart Archibald & Co., 40-48, Union Street, Glasgow.

CABLES (Chains)—
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.
Sykes, Richard, & Son, Ltd., Cradley Heath.
Taylor, Samuel, & Sons, Brierley Hill, Staffs.

CAISSONS & DOCK GATES—
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.

CAPSTANS (Electric)—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Engine Works, Elswick.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

CARGO BLOCKS—
Higginson & Co., 7, Hurst Street, Liverpool.

CARPETS—
Stewart Archibald & Co., 40-48, Union Street, Glasgow.

CASTINGS (Steel)—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Steel Works, Elswick.
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.
Stewarts & Lloyds, Ltd., 41, Oswald Street, Glasgow.

CASTINGS (Steel, Iron and Brass)—
Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton.
Chambers, John, Engineer and Shipbuilder, Lowestoft.
McRobie, John & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

CHAINS—
"The Coventry" Chain Co., Ltd., Spon End Works, Coventry.

CHRONOMETERS—
Kelvin & James White, Ltd., 16, 18, 20, Cambridge Street, Glasgow.

COMPASSES (Recording)—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

COMPASSES (Ship)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Kelvin & James White, Ltd., 16, 18, 20, Cambridge Street, Glasgow.

CONDENSERS—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

CONDENSER TUBES (Brass and Copper)—
The Yorkshire Copper Works, Ltd., Leeds.

CONTROLLERS & CONTROL GEAR—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

BUYERS' GUIDE—*continued.*

CONVEYORS—
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.

COOKING APPARATUS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Carron & Co., Carron, Stirlingshire.
Grieve, T., & Sons, Bedford Street, North Shields.

COPPERSMITHS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Chambers, John, Engineer and Shipbuilder, Lowestoft.

COPPER TUBES—
The Yorkshire Copper Works, Ltd., Leeds.

CORK INSULATION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

CORRUGATED IRON—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

COUNTER (Engine)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

COUNTERS (Pneumatic)—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

CRAB WINCHES—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

CYLINDERS (Copper)—
The Yorkshire Copper Works, Ltd., Leeds.

DELTA METAL—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

DERRICKS—
Stewarts & Lloyds, Ltd., 41, Oswald Street, Glasgow.

DIRECTION INDICATORS—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

DIVING APPARATUS MANUFACTURERS—
Heinke, C. E., & Co., 85, 89, Grange Road, Bermondsey, London, S.E.

DOCK GATES—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Engine Works, Elswick.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.

DOORS (Watertight)—
British Thomson-Houston Co., Ltd., Rugby.
Stone, J., & Co., Ltd., Deptford, S.E.

DREDGE PLANTS—
Simons, Wm., & Co., Ltd., Renfrew, Nr. Glasgow.

DRILLING MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

DRILLS—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Openshaw Works, Manchester.

ELECTRIC CRANES—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Engine Works, Elswick.
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRIC DERRICKS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRIC DYNAMOS & MOTORS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ELECTRIC HEATING & COOKING APPARATUS—
British Thomson-Houston Co., Ltd., Rugby.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Road, Glasgow.

ELECTRIC LAMPS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Kelvin & James White, Ltd., 16, 18, 20, Cambridge Street, Glasgow.
McGeoch, Wm., & Co. Ltd., 28, West Campbell Street, Glasgow.

ELECTRIC LIGHTING—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRIC-LIGHTING PLANT—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ELECTRIC MOTORS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ELECTRIC WIRES—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL ENGINEERS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

ELECTRICAL INSTRUMENTS (Ammeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL INSTRUMENTS (Circuit Breakers)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL INSTRUMENTS (Relays)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL INSTRUMENTS (Voltmeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ENAMEL MANUFACTURERS—
Wailes, Dove & Co., Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

ENGINE (Electric Light)—
Greenwood & Batley, Ltd., Albion Works, Leeds.

ENGINE-ROOM OUTFITS—
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

ENGINES (Land)—
Chambers, John, Engineer & Shipbuilder, Lowestoft.

ENGINES (Marine)—
Chambers, John, Engineer and Shipbuilder, Lowestoft.
Crabtree & Co., Ltd., Great Yarmouth.
Howden, James, & Co., Ltd., Scotland Street, Glasgow.
Plenty & Son, Ltd., Eagle Iron Works, Newbury, Berks.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

ENGINE & DECK STORES—
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

ENGINE FITTINGS—
Hannan & Buchanan, 75, Robertson Street, Glasgow.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ENGINE-ROOM OUTFITS—
Grieve, T., & Sons, Bedford Street, North Shields.

EVAPORATORS—
Weir, G. & J., Ltd., Cathcart, Glasgow.

EXPLOSIVES—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Scotswood Works.

EXTRUDED METALS (Brass, Bronze, Copper, Delta Metals)—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

FANS—
Adam, J. M., & Co., Ibrox Iron Works, Glasgow.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FEED-WATER HEATERS—
Weir, G. & J., Ltd., Cathcart, Glasgow.

FENCING (Wrought Iron)—
Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton.

FILES—
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.

FILTERS (Marine)—
Chambers, John, Engineer & Shipbuilder, Lowestoft.

FLAGS—
Speeding, James, & Co., Sail Works, Sunderland.

FLAGS AND BUNTING—
Stevenson, Jas., 1,103, Argyle Street, Glasgow.

FLOATING DOCKS—
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.

FLOORING (Cork)—
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

FLUE BLOWERS—
Diamond Blower Co., 75b, Queen Victoria Street, London, E.C.
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

FORCED DRAUGHT—
Adam, J. M., & Co., Ibrox Iron Works, Glasgow.
Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.
Howden, J. & Co., Ltd., Scotland Street, Glasgow.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FORGINGS—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Steel Works, Scotswood, Newcastle.
Beardmore, Wm., & Co., Ltd., Parkhead Works, Glasgow.
Hingley & Sons, Ltd., Netherton Iron Works, Staffs.

FORGINGS (Bronze)—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

FORGINGS (Steel)—
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.

FORWARDING & SHIPPING AGENTS—
Agence Maritime Anvoise, Antwerp, Belgium.
Moenmenbeim, J., Antwerp, Belgium.
Schirrawn, G., Antwerp, Belgium.

FRIGIDOMETERS (Iceberg Detector)—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

FURNACES—
Beardmore, Wm., & Co., Ltd., Parkhead Works, Glasgow.

GALLEY GEAR—
Grieve, T., & Sons, Bedford Street, North Shields.

GALVANIZERS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

GAS ENGINES—
Beardmore, Wm., & Co., Ltd., Parkhead Works, Glasgow.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

GATES (Wrought Iron)—
Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton.

GAUGES (Pressure)—
Hannan & Buchanan, 75, Robertson Street, Glasgow.

GAUGES (Ships' Draught)—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

GEAR CUTTING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

GEARING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

GEARS—
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.

GEARS (Noiseless or Silent)—
British Thomson-Houston Co., Ltd., Rugby.

GRAPHITE—
Graphite Products, Ltd., 218–220, Queen's Road, Battersea, London, S.W.

GRINDING MACHINES—
Greenwood & Batley, Ltd., Albion Works, Leeds.

HEATING APPARATUS—
Kelvin & James White, Ltd., 16, 18, 20, Cambridge Street, Glasgow.

HIGH SPEED STEEL—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Openshaw Works, Manchester.

BUYERS' GUIDE—*continued.*

HOSE—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

HYDRAULIC CRANES—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Engine Works, Elswick.

HYDRANTS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

INDIARUBBER, etc.—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

INDICATORS—
Buchanan Brothers, 16, Carrick Street, Glasgow.
Hannan & Buchanan, 73, Robertson Street, Glasgow.

INDICATORS (Engine Direction)—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

INDUCED DRAUGHT—
Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

INSULATIONS—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

IRON ROOFS AND BUILDINGS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

JOINTING—
Beldam, Robert, 12, New London Street, London, E.C.

LAMPS AND LIGHTS—
Grieve, T., & Sons, Bedford Street, North Shields.
Kelvin & James White, Ltd., 16, 18, 20, Cambridge Street, Glasgow.

LAUNCHES (Steam)—
Chambers, John, Engineer & Shipbuilder, Lowestoft.
Crabtree & Co., Ltd., Great Yarmouth.
Rodger, Robert, & Co., Boatbuilders, Greenock.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

LAUNCHES (Steam and Motor)—
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Rodger, Robert & Co., Boatbuilder, Greenock.

LIFEBELTS AND BUOYS—
Speeding, James, & Co., Sail Works, Sunderland.

LIFTS (Window)—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.
Peters, G. D., & Co., Ltd., Moorfields, London, E.C.

LIQUID-FUEL APPARATUS—
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.

LOCOMOTIVE TUBES (Copper and Brass)—
The Yorkshire Copper Works, Ltd., Leeds.

LUBRICATING GREASES—
Graphite Products, Ltd., 218–220, Queen's Road, Battersea, London, S.W.

LUBRICATORS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

MAGNESIA—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

MARINE ENGINEERS—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Elswick Works, Newcastle-on-Tyne.
Beardmore, Wm., & Co., Ltd., Parkhead Works, Glasgow.
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Chambers, John, Engineer and Shipbuilder, Lowestoft.
Crabtree & Co., Ltd., Great Yarmouth.
Delegación de la Compañia Trasatlantica, Cadiz, Spain.
Isherwood, J. W., 4, Lloyd's Avenue, London, E.C.
Simons, Wm., & Co., Ltd., Renfrew, Nr. Scotland.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
Workman Clark & Co., Ltd., Belfast.

MARINE SPECIALITIES—
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Diamond Blower Co., 73b, Queen Victoria Street, London, E.C.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

MARKING-OFF TABLES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

MATTRESSES—
Stewart, Archibald, & Co., 40-48, Union Street, Glasgow.

MATTRESSES (Magnesia)—
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

MECHANICAL STOKERS—
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.

METALS (Patent)—
Bowran, Robt., & Co., Ltd., Newcastle-on-Tyne.
Delta Metal Co., Ltd., Delta Works, East Greenwich.

MOTOR BOATS—
Chambers, John, Engineer and Shipbuilder, Lowestoft.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Rodger, Robert, & Co., Boatbuilders, Greenock.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

NAVAL ARCHITECTS' SUPPLIES—
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

OIL ENGINE LAMPS—
Seelisch, Meyer & Co., 75, Southwark Street, S.E.

OIL ENGINES—
Babcock & Wilcox, Ltd., 30, Farringdon Street, London, E.C.
Beardmore, Wm., & Co., Ltd., Parkhead Works, Glasgow.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Edina Manufacturing Co., 19b, Broad Wynd, Leith.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.

OIL ENGINES (Marine)—
Plenty & Son, Ltd., Eagle Iron Works, Newbury, Berks.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

OIL-FUEL INSTALLATION—
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

PACKING—
Beldam, Robert, 12, New London Street, London, E.C.
Walker, Jas. & Co., Ltd., Lion Works, Garford Street, West India Dock Road, E.

PAINTS—
Briggs, W., & Sons, Ltd., Dundee.
Graphite Products, Ltd., 218–220, Queen's Road, Battersea, London, S.W.
Kalbitum Paint Co., Ltd., Belvedere Works, Belvedere, Kent.
Wailes, Dove & Co., Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

PANELLING—
Stewart, Archibald, & Co., 40-48, Union Street, Glasgow.

PERFORATED METALS—
Braby F., & Co., Ltd., Eclipse Works, Glasgow.

PIPES (Brass and Copper)—
The Yorkshire Copper Works, Ltd., Leeds.

PIPE-JOINT COMPOUND—
Graphite Products, Ltd., 218–220, Queen's Road, Battersea, London, S.W.

PROPELLERS—
Billington & Newton, Ltd., Longport, Staffs.

PROPELLER BLADES—
Billington & Newton, Ltd., Longport, Staffs.

PROPELLERS (Screw)—
Chambers, John, Engineer & Shipbuilder, Lowestoft.
Spencer, John, & Sons, Ltd., Steel Works, Newburn-on-Tyne.

PUBLICATIONS—
Fraser, Asher & Co., Ltd., 164, Howard Street, Glasgow.
"Shipbuilding and Shipping Record," Queen Anne's Chambers, Westminster, London, S.W.
Smith, John, & Son (Glasgow), Ltd., 135, George Street, Glasgow.

PULLEY BLOCKS—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Higginson & Co., 7, Hurst Street, Liverpool.

PUMPS—
Edina Manufacturing Co., 19b, Broad Wynd, Leith.

RADIATORS (Electric)—
British Thomson-Houston Co., Ltd., Rugby.

RADIATOR TUBES—
The Yorkshire Copper Works, Ltd., Leeds.

RAILINGS & GATES (Iron)—
Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton.

RECORDING LOGS (Ships')—
McNab Marine Appliances, Ltd., 23, St. Mary Axe, London, E.C.

REFRIGERATING MACHINERY—
Hall, J. & E., Ltd., Dartford Ironworks, Kent.

REFRIGERATORS (Insulating Materials)—
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

RHEOSTATS & RESISTANCES (all kinds)—
British Thomson-Houston Co., Ltd., Rugby.
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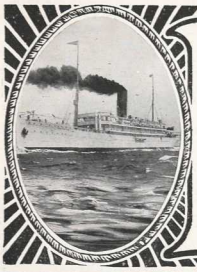

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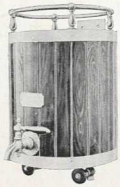

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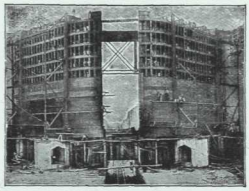

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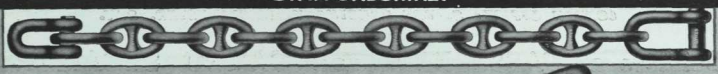

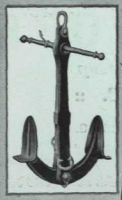

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