

ordinary screw blade put it at a disadvantage for quick retardation—the flat back of the bow screw as described improved this important stopping function, very needful in a crowded harbour.

Thus, although the use of a bow screw only in a double-ended boat had not been proved to be a speed-increasing or a power-saving device, its other proved advantages for this particular harbour traffic quite justified its use. The Author's contention appeared to be that he had secured handiness, saved time lost in turning when backing out from a wharf, and economised the weight, cost, and space required for machinery as compared with double-screw boats,—although the trials showed with a great sacrifice of the cardinal virtues of high speed and low expenditure of power and coal on the pulling run; when the propeller was aft, the economy was very good, though impaired by the necessary modification of the propeller blade section required to get even such efficiency as is attained when pulling.

Mr. Shirra exhibited a diagram (Plate XVI.) showing the results obtained from the trial of the "Lady Northcote."

Mr. Thomas Brown said it would be readily conceded that ferry steamers should be completely under the control of the captain at all times and under all circumstances. To secure this a double-ended steamer with a propeller at each end was, in his opinion—and he would support this opinion with evidence,—much superior to the same type of steamer with only one propeller. As soon as the propeller revolved in a double-ended steamer with a propeller at each end the captain had control over his vessel; on the other hand, with the single propeller pulling, a good deal of steerage

way was required before the rudder had any effect on the vessel.

He had frequently noticed when on board the "Lady Northcote" that on arriving at Darling-street Wharf from Mort's Dock only one mooring line was made fast, and that at the after gangway, and the engines were kept going astern all the time passengers were embarking, so keeping the steamer's head pointed well over to Sydney, and the aft end hard against the after pile; on giving the order to go ahead the boat sheered very much to starboard, and in one instance had to stop, and just cleared Messrs. Fenwick's water-boat, which was at their wharf; the wind was westerly. The distinct object of the two propeller arrangement was to ensure the maximum amount of safety in conducting the ever-increasing passenger traffic, and at least no diminution of speed in navigating difficult water, and in general to ensure all possible control over the steamer.

The Sydney Ferries had twelve double-ended steamers with a propeller at each end, varying in size from the "Wallaby," carrying 308 passengers (which steamer is 27 years old and is still running 14 hours daily), to the "Kulgoa," with certificate for 1255. There was no trouble with any of them, and the Company was now building two more of the same type, one to carry 750 passengers and the other 1400.

The author made a statement in his paper which he did not think should be allowed to pass without some comment. To him (the speaker) it was misleading to a certain extent, but more especially to those who were not conversant with details of construction of this class of vessel. He referred to the remark that in a ferry steamer having 110 feet of shafting difficulty was experienced in keeping it in line satisfactorily, and fur-

ther that it could not be done whether a heavy scantling or a light one be adopted. This the author made a strong argument in favour of using only a single screw, reducing the line of shafting from 110 feet to 40 feet. Now his (the speaker's) experience had not been proved. Since 1891 eleven double-ended steamers with propeller at each end had been constructed for the Sydney Ferries, beginning with the "Kangaroo" in 1891 and ending with the "Kareela" in 1905. Five of these had been constructed under his personal supervision, and in no instance had they had either to lift or lower the engines or re-line the shafting. All that had been necessary was to make up the wear on the outer bushes or an occasional plummer block. Our experience led us to the conclusion that the hull of the vessel can be built quite strong enough to ensure there being no trouble with the shafting. The author referred to the case of a ship in which even girders of lattice work failed to maintain the hull in proper shape. This was, however, probably due to the fact that such strengthening girders were put in to remedy the defect of a hull that had already shown a tendency to seriously sag.

With regard to the instances quoted by the author of one of the screws being removed from two of the Balmain Ferry Co.'s steamers he would like to ask if it was not a fact that the principal reason for doing so was the impossibility of running the two lengths of shafting? Also, was it not a fact that a good deal of trouble and expense had been experienced with the shafting of the steamer Vauclose owing to the vessel altering her shape, and she had only one propeller?

The "Kamilaroi," their latest vehicular steamer, was of the two-tunnel type, one propeller at each end. After she was launched in 1901 they found that the ends had

gone down further than had been allowed for; there was an overhang at each end of 34 feet from each end of the keel. They cut and raised the outer bearing bracket, and put in stays from end to end on both sides of vessel, and after five years' running had had no trouble with either the shafting or engines. During the first six months' running she did not answer her helm as well as was desired. They then fitted a new keel piece and carried it well out, and now there was nothing to complain of.

The "Kareela," launched in 1905. Machinery made and fitted on board by Chapman and Co. After all the shafting, with propellers, were bolted together, he saw Mr. Manning on board, who told him that shaft was so true that he could easily turn it round by means of a 14-inch shifting spanner on end of the worm spindle. He (the speaker) doubted this, but it proved to be correct, as they were able to turn the whole length of the shafting, with propellers and stern gland packed, and he remarked that he had never seen its equal.

The Author stated that the upkeep expenses in running the second propeller might be estimated at the low valuation of £100 per annum. But even if the £100 be correct, the cost would be slight in comparison with the extra security and safety given.

He had records, from which he estimated the total and average expenses for the last four years of running the extra length of shafting in the following steamers:—

"Carabella,"	574	passengers,	length of shafting	102	feet.
"Kangaroo,"	632	"	"	106	"
"Kirribilli,"	900	"	"	127	"

He had allowed for all stern-bush renewals, packing for stern glands, oil for pedestals, coal at the rate of

one ton per week, which amount he questioned, so that it would be seen he had made ample allowance. The results were as follows:—

“Carabella,” for 4 years, £104 14s; average per year, £26 3s 6d.

“Kangaroo,” for 4 years, £98 13s 5d; average per year, £24 13s 5d.

“Kirribilli,” for 4 years, £99 13s 9d; average per year, £24 18s 6d.

Seeing that the maximum saving was less than 1s 6d per day, should we risk the safety of the travelling public for such a trifle? He said no.

In reference to steering trials, he would like to ask the Committee how the first and second tests were carried out, as it seemed strange to him that a boat 116 feet long, going at $12\frac{1}{2}$ knots, could be brought to a state of rest in its own length. It took 40 seconds to do it. He admitted she was a light boat. Propeller forward, going at 10.4 knots, brought to a state of rest in 58 feet (half the boat's length) in 31 seconds. He had tested two of their steamers, viz., “Kummulla,” 119 feet (comp. engines), and the “Koree,” 140 feet (triple engines), to see in what distance they could be brought to a state of rest, and found that, as near as he could judge, the distance was about two lengths of the vessel.

The author had summed up six points in favour of the single screw:—

1st.—Reduced cost. This he would not dispute. The boat could be built of very light scantling, and the shafting could be lined up or lowered to suit the vessel.

2nd.—Reduced upkeep. This he had dealt with.

3rd.—Reduced coal consumption. This he had also dealt with.

4th.—At least equal handling power. On this point he entirely disagreed with the author. If he was correct why were the two propellers retained on the "Lady Napier," thereby, according to his statement, entailing a loss of £100 per year to the Balmain Ferry Co.?

5th.—Equal average speed, with the advantage of a little better speed one way of going. There was not much in this point.

6th.—All round a more profitable ship. This was a very debateable point.

The Directors of the Company with which he was connected were convinced that a double-ended steamer with propeller at each end was the type of vessel best suited for ferry purposes in Sydney Harbour, both as regards safety and reliability in working.

Mr. Reeks, in reply, expressed his thanks to those who had taken part in the discussion for the manly, unselfish manner they had approached the subject, and for their many expressions of appreciation of his poor efforts.

Nothing would give him greater pleasure than to take up each point, and there were many, and freely discuss each, but he forebore out of consideration for the Council's patience and the size of the future Record of Proceedings. To those who had allowed the idea to take possession of their minds that he was advocating double-ended single-screw ferry boats for all purposes he would refer them to the early part of his paper, and read: "All that remains to me, therefore, is to give you, gentlemen, our experiments, the results of our trials, and leave you to judge how far the system goes in the direction of success." The Association had an opportunity of judging, and are at full liberty to form their

own conclusions; for his own part, he should take, as had always been his habit, the circumstances of each individual service into account, and in future design rocker keel boats, partly or wholly straight keels, two or one screw, just as the case demanded; the day had gone by for a man to be born with one model in his head, which he ground out to order as if from a sausage machine.

The results of the trial runs in the "Lady Northcote" were unquestionably valuable, and indicated several things not thoroughly understood before, but it would not be very safe to design a steamer of this class on the data so obtained, for the stopping tests were based on the assumption that the skipper was stuffed, and therefore misleading, and a perusal of the Company's coal bill would act as a strong set off against the diagrams, indicting a heavy loss due to increased I.H.P. required for the "same speed pulling."

There was one point that had been missed, both in the paper and in the discussion, viz., that some places in Middle Harbour, on Lane Cove, and up the Parramatta, where it would be unwise to take a steamer with a propeller at each end.

The exact data as to the precise proportions of power in the bow and stern propellers of a double-screw boat is available so far as is known to Mr. Reeks, but an investigation and the results would be of the greatest possible interest to him, and he hoped some such tests will be made, and form the subject of a paper before this Institution at no distant date.

It went without saying that many most interesting points raised during this courteous and able discussion had not been replied to, the reason already given being

sufficient, viz., time and space. One statement, however, could not go without challenge. The "Lady Northcote, so generously placed at our disposal by her owners, was most emphatically not light built; she ranked as one of the strongest ferry steamers in the port of Sydney.

One question only: If the keel, to which so much importance was attached, supported the ends, what supports the keel?

