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**NOTES AND COMMENTS ON THE DEVELOPMENT
OF MARINE ENGINEERING IN THE SYDNEY,
NEWCASTLE, AND HUNTER RIVER SERVICE**

(By D. CHALMERS.)

In taking a review of the development of Marine Engineering in the Sydney-Newcastle and Hunter River trade, it became evident that there had been circumstances which, by retarding the progress towards the standards attained in other Services, rendered such review and study the more interesting, as it brought into more vivid comparison the difference between the earlier and later periods.

These circumstances were:—

The navigable depth of the river restricted the depth of vessel employed, and thus tended to retain the paddle steamer in the service:

Being a coal port, the cost of fuel was at a minimum, and hence a very considerable incentive in other trades was much reduced in this.

In a recent number of "Engineering" (24th October, 1913), the introduction of the Compound Engine was given as in 1854 and of the triple as in 1887, whereas in this trade the advent of the "Namoi" in 1884 was the first of the passenger steamers to be so fitted, the arrival of the "Hunter" in 1907 making the date for the triple, or 30 and 26 years later, respectively.

As these Districts were intimately concerned in the early efforts of Steam Navigation in this State, it may be briefly noted that the first vessel to turn a wheel in Port Jackson was the "Sophia Jane," in May, 1831. Her dimensions were 126 feet long, 20 feet beam, 256 tons, 50 H.P., and a speed of 8 knots, with a draught of 6 feet. In the following year the "William the Fourth" was built at Clarence Town; her dimensions were 80 feet long, 15 feet beam, and 7 feet from keel to deck, with a speed of 7 knots.

About this time a vessel named the "Experiment" was built, and was propelled by two horses making a circuit upon deck; her speed is given as 6 miles per hour, going to Parramatta, completing the return in three (3) hours. One of the author's neighbours, Captain Small, born and bred on the river, and now in his 86th year, assured me that he had a distinct recollection of these vessels as a boy, and later on as a member of their crew. He also furnished me with some interesting lines as giving a local colouring to his narrative, and said that even at so early a period in the history of Steam Navigation the cry was, "More Steam," "More Steam," or an equivalent to "More Speed—More Speed."

Dr. Lang mentioned that in 1834 there were two vessels engaged in the trade, leaving Sydney at 6.0 p.m., reaching Newcastle about the same hour the following morning, and Morpeth about 11.0 a.m.

From clippings from the "Newcastle Herald" of September, 1834, the "Sophia Jane" and the "William the Fourth" were casually mentioned as having made several trips during the month.

In 1840 the Hunter River Coy. started, eventually becoming the A.S.N. Coy. Their first steamer, the "Rose," was a vessel of 151 feet long, 20 feet beam, draught 6 feet

6 inches, with side lever condensing engines, a boiler pressure of 7 lbs., afterwards increased to 10 lbs. per square inch, cylinders 40 inches diameter, 42 inches stroke, and a speed of 12 statute miles. She was afterwards joined by the "Thistle and Shamrock."

The Hunter River New Steam Ship Coy. started in 1855 with the "Hunter," the "Williams," and the "Patterson." In 1874 the "Kembla" was put in the trade, being eventually taken over by the Newcastle Steamship Coy., who also in 1880 acquired the vessels of the A.S.N. Coy., the two latter companies becoming one in 1891, thus forming the present Newcastle and Hunter River Steamship Coy.

Having thus briefly touched upon the historical aspect, it may be as well to note the capacity of Port Hunter, and also the capacity of the rivers flowing into it:—

The discovery of coal and the rich lands on the rivers gave an impetus to the Port, and much had been done through the formation of the breakwater and by dredging to improve its facilities, the result being that a depth of water on the bar of 29 feet and over had been obtained, and in the harbour, where there were dry sand banks, deep-sea ships could ride safely at anchor.

Navigation with vessels drawing 11 or 12 feet was also possible to Morpeth on the Hunter, and to Clarencetown on the Williams. Judging by the draught of the earlier steamers, the deepening of the harbour, assisted by dredging on the rivers, had been very effective in giving an additional depth for navigation; the distance to Morpeth being 29 or 30 miles, and Clarencetown a few miles further from Newcastle. The Patterson, flowing into the Hunter at Morpeth, being navigable for 16 miles to Patterson township for vessels drawing about 7 feet.

From these conditions, it would be readily understood how this depth of water controlled the type of vessel to be used on the river, and thus the paddle steamer, giving the possibility of higher speed above that of the screw propellor, was retained. As an illustration, the centre of effort with the paddle steamer "Newcastle" for the wheels was 3 feet below the water level; this, with 2 feet more to the tip of the floats, would make an immersion of 5 feet to absorb the effort of 2,000 H.P. at a light draught of 11 feet. This effort did not affect the flotation of the hull to the same extent as the same effort from the screw would, being nearer the surface, and making but little disturbance to the water under the hull.

On the other hand, the propellor must be fully immersed. With a nine (9) foot propellor, as with the "Hunter," this would mean a depth of 10 or 11 feet, and their action being to throw the water from under the hull had a tendency to make the vessel squat or settle; the greater the speed, the greater this tendency. In shallow places, where the flow or supply to the propellers may be restricted, it became necessary to reduce speed to avoid dragging on the bottom; so that, neglecting the tendency to settle, this would mean twice the depth necessary for the paddle wheel.

Being curious on these points a few years back, the distance from the rail to the water was taken when lying at the wharf at Morpeth; on the run down this was again measured at different localities and speeds. At Raymond Terrace flats (where at low water there would be a possibility of dragging on the sand), the tide being high, the speed of the vessel ("River Full") was about 8 or 9 miles. At this place the distance to the water was lessened by 4 feet 7 inches; further on, with more water under the

hull, this was 3 feet; in passing Hexham, on reducing the speed from "Half" to "Slow," increased the distance 16 inches; on the "Full astern" order at the wharf there was a distinct lift aft of from 3 inches to 6 inches. With good water under the hull the difference was about 2 feet 6 inches to 3 feet.

In Mr. Bradfield's paper on the North Shore Bridge, he gave figures relative to this squatting effect in regard to the "Mauretania" taken 10 years ago in New York Harbour, for when going at over 18 miles it was equal to 4.65 feet at Romer, with about 15 feet under the keel when stationary. A rough rule was given as follows, viz., $\frac{1}{5}$ of the speed in Statute Miles as equal to the squat in feet. By the same authority the Suez Canal Coy. required at least 3 feet under the keel, and in this connection it may be said that the action of the propellor must be beneficial to the channel, tending to deepen it, as compared with the widening or surface effect of the paddle wheel.

Another effect of navigation in shallow water was to drive the water ahead. As an instance: the effect of a passing steamer at the mouth of the Patterson is felt at the Township at the head of navigation,—16 miles away. This was akin to the tidal wave which arrived at Morpeth about three (3) hours later than at Newcastle, hence it followed that it must travel up the river at a speed of about 10 miles per hour, and, the range of tide being from 3 to 4 feet at Morpeth, there must be a considerable current flowing. To test this, the revolutions were taken from the counter, using the divisor used for the sea trips; it gave a minimum effort of 43.6 miles as compared with 62.1 as a maximum under adverse conditions, so that a moderate estimate would give 2 or 3 miles as the flow of the current.

The Author's connection with the trade began in 1880; there were then three (3) Companies so engaged:—

The A.S.N. Coy.

The Hunter River N.S.S. Coy.

Newcastle Steamship Coy.

The dimensions of the representative boats then in service being given to show the progress made to that time:—

Name of Steamer.	Builder.	Date.	Length.	Beam.	Tonnage.	Draft
Kembla	...McNab, Greenock	... 1860	209'	22' 6"	449	8' 3"
Coonabara	...J. Stewart, London	... 1862	223'	27' 2"	901	9' 6"
City of Brisbane, J. & A. Inglis, Glasgow	1863	230'	27' 3"	634	8' 7"	
Maitland	... McNab, Greenock	.. 1873	231'	27' 1"	880	9' 7"

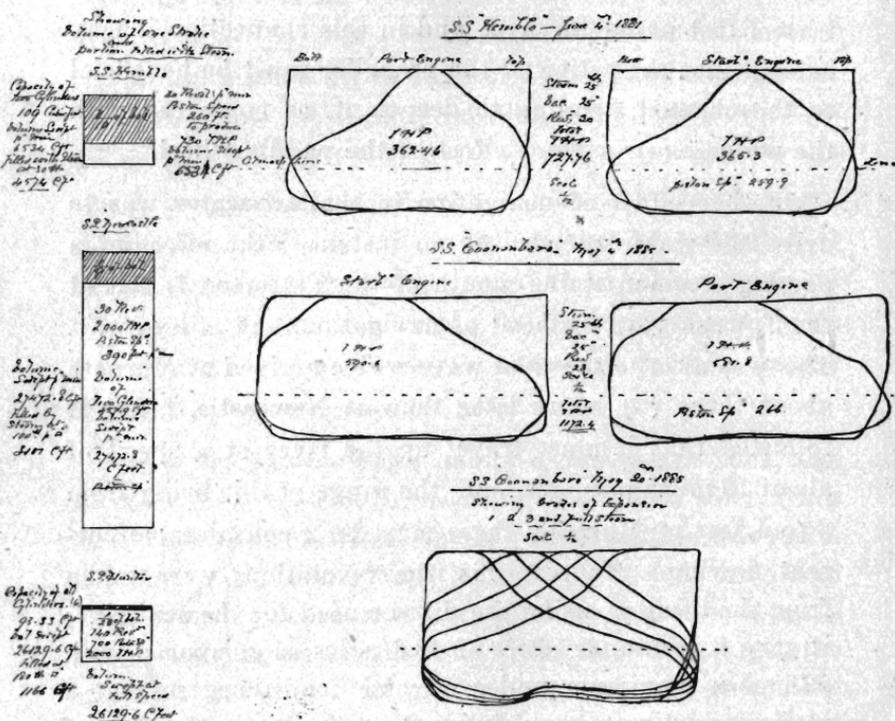


Fig 1.

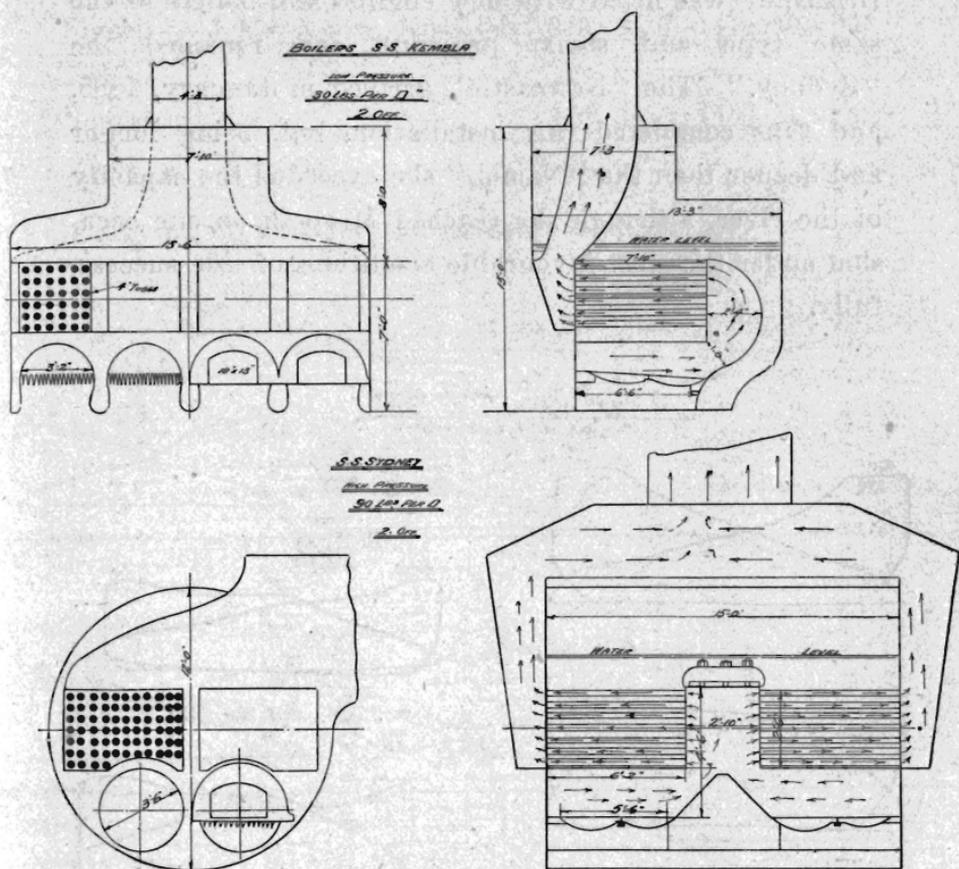


Fig. 2.

Figs. I. and II.—These vessels were all of iron, propelled by paddle wheels, fitted with wooden floats, and of the feathering type. The engines were low-pressure, oscillating, carrying a steam pressure of 30 lbs. per square inch.

It should be noted that the draught of these vessels show a distinct increase over the earlier steamers, thus indicating a greater depth of water in the river.

With the advent of the "Namoi" in 1884, the compound engine made its appearance, and thus marked the second period of advance. In this year the "City of

Brisbane" was fitted with new engines and boilers of the same type and steam pressure, and renamed the "Sydney." The "Newcastle" arrived in January, 1885, and thus completed this installation, but, being longer and deeper than the "Namoi," she exceeded the capacity of the river, although she reached Morpeth on one occasion under the most favourable conditions of tide successfully.

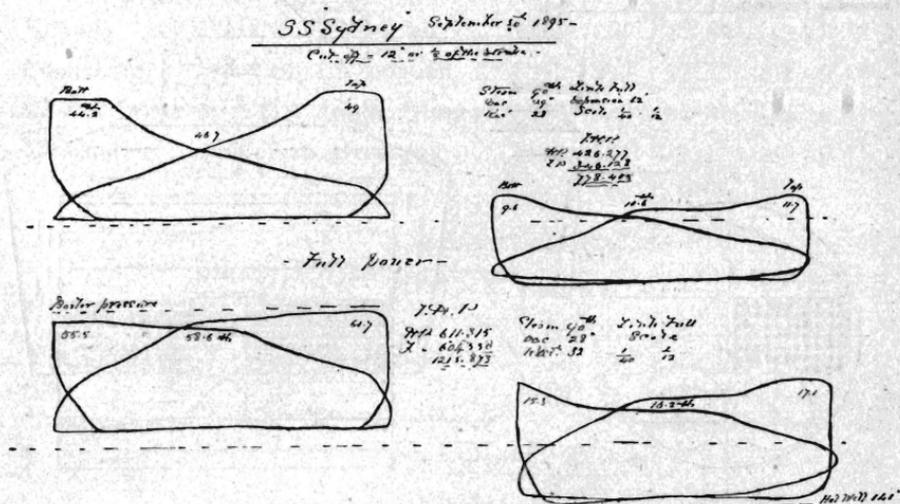


Fig. 3.

The hulls of these two were of steel, which material also displaced wood for the floats, a distinct gain both for strength and efficiency. The new machinery of the "Sydney" was as follows:—The cylinders were 34 and 70 inches diameter, with 60 inches stroke, and the boilers carrying 90 lbs. per square inch, developing 1,200 H.P., or fully 1/3 more than the old gear.

The dimensions of the "Namoi" and "Newcastle" were:—

