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WHO SHALL RULE THE WAVES?

A contest of a very remarkable kind is now going on, one which is pregnant with important results in respect to commerce, to naval architecture, to geographical discovery, to colonisation, to the spread of intelligence, to the improvement of industrial art, and to the balance of political power among nations. The nature of this contest cannot be better made intelligible than by giving the words of a challenge recently put forth: 'The American Navigation Company challenge the ship-builders of Great Britain to a ship-race, with cargo on board, from a port in England to a port in China and back. One ship to be entered by each party, and to be named within a week of the start. The ships to be modelled, commanded, and officered entirely by citizens of the United States and Great Britain respectively; to be entitled to rank "A 1" either at the American offices or at Lloyd's. The stakes to be L.10,000, and satisfactorily secured by both parties; to be paid without regard to accidents, or to any exceptions; the whole amount forfeited by either party not appearing. Judges to be mutually chosen. Reasonable time to be given after notice of acceptance, to build the ships, if required, and also for discharging and loading cargo in China. The challenged party may name the size of the ships—not under 800 nor over 1200 American register tons; the weight and measurement which may be carried each way; and the allowance for short weight or oversize.'

There is a boldness, a straightforwardness, an honesty in this challenge, which cannot be mistaken. It is difficult to be interpreted in any other sense than that the challengers *mean* what they say. Brother Jonathan has fairly thrown down the gauntlet to the Britishers, and it behoves the latter to take it up in a becoming spirit. Our ship-builders, especially on the Dee, the Clyde, the Wear, the Mersey, and the Thames, ought to feel that much is now expected from them; for if once the Yankees obtain a reputation—a European reputation it will then be—for outstripping British ships on the broad seas, our ship-owners will assuredly feel the effects in a commercial sense.

This question of the speed of ships is a very curious one. Empirical rules, rather than scientific principles, have hitherto determined the forms which shall be given to ships. Smith adopts a certain form because Brown's ship sailed well, whereas Jones's differently shaped vessel was a bad sailer; although Smith, Brown, and Jones collectively may be little able to shew *why* one of the vessels should sail better than the other.

If opportunity should occur to the reader to visit a large ship-building establishment, such as those on any one of the five rivers named above, he will see something like the following routine of operation going on:—

There is, first, the 'ship's draughtsman,' whose duties are somewhat analogous to those of the architect of a house, or the engineer of a railway, or the scientific cutter at a fashionable tailor's: he has to shape the materials out of which the structure is to be built up, or at least he has to shew others how it is to be done. When the ship-builder has received an order, we will say, to construct a ship, and has ascertained for what route, and for what purpose, and of what size it is to be, he and his ship's draughtsman 'lay their heads together' to devise such an arrangement of timbers as will meet the requirements of the case. Here it is that a *science* of ship-building would be valuable; the practical rules followed are deductions not so much from general principles as from accumulated facts which are waiting to be systematised; and until this process has been carried further, ship-building will be an *art*, but not a *science*. Well, then; the draughtsman, gathering up all the crumbs of knowledge

obtainable from various quarters, puts his wisdom upon paper in the form of drawings and diagrams, to represent not only the dimensions of the vessel, but the sizes and shapes of the principal timbers which are to form it, on the scale, perhaps, of a quarter of an inch to a foot. Then this very responsible personage goes to his 'mould-loft,' on the wide-spreading floor of which he chalks such a labyrinth of lines as bewilder one even to look at. These lines represent the actual sizes and shapes of the different parts of the ship, with curvatures and taperings of singularly varied character. One floor of one room thus contains full-sized contours of all the timbers for the ship.

So far, then, the draughtsman. Next, under his supervision, thin planks of deal are cut to the contours of all these chalk-lines; and these thin pieces, called *moulds*, are intended to guide the sawyers in cutting the timbers for the ship. A large East Indiaman requires more than a hundred mould-pieces, chalked and marked in every direction.

Another skilful personage, called the 'converter,' then makes a tour of the timber-yard, and looks about for all the odd, crooked, crabbed trunks of oak and elm which he can find; well knowing that if the natural curvature of a tree accords somewhat with the required curvature of a ship's timber, the timber will be stronger than if cut from a straight trunk. He has the mould-pieces for a guide, and searches until he has ferreted out all the timbers wanted. Then he sets the sawyers to work, who, with the mould-pieces always at hand, shape the large trunks to the required form. And here it may be noted as a remarkable fact, that although we live in such a steam-engine and machine-working age, very few engines or machines afford aid in sawing ships' timbers. The truth seems to be, that the curvatures are so numerous and varied, that machine-sawing would scarcely be applicable. Yet attempts are from time to time made to construct such machines. Mr Cochran has invented one; and it is said that at the Earl of Rosse's first soirée as president of the Royal Society, a model of this timber-cutting machine was exhibited; that Prince Albert cut a miniature timber with it; and that he thus began an apprenticeship to the national art of ship-building.

Leaving the supposed visitor to a ship-yard to trace the timbers through all their stages of progress, we will proceed with that which is more directly the object of the present paper—namely, the relation of *speed to build*. Some sixteen or eighteen years ago, the British Association rightly conceived that its Mechanical Section would be worthily occupied in an inquiry concerning the forms of ships, and the effect of form on the speed and steadiness. The inquiry was intrusted to Mr Scott Russell and Mr (afterwards Sir John) Robison; and admirably has it been carried out. Mr Scott Russell, especially, has sought to establish something like a *science* of form in ship-building—precisely the thing which would supply a proper basis for the artificers.

It is interesting to see how, year after year, this committee of two persons narrated the result of their unbought and unpaid labours to the Association. In 1838 and 1839, they shewed how a solid moving in the water produced a particular kind of wave; how, at a certain velocity, the solid might ride on the *top* of the wave, without sinking into the hollow; how, if the external form of a vessel bore a certain resemblance to a section of this wave, the ship would encounter less resistance in the water than any other form; and thus originated the *wave principle*—so much talked of in connection with ship-building. A ship built on that principle in that year (1839) was believed to be the fastest ship in Britain. In 1840, the committee stated that they had 'consulted the most eminent ship-builders as to the points upon which they most wanted information, and requested them to point out what were the forms of vessel which they would wish to have tried. More than 100 models of vessels of various sizes, from 30 inches to 25 feet in length, were constructed,' and an immense mass of experiments were made on them. In 1841, they described how they had experimented on vessels of every size, from models of 30 inches in length to vessels of 1300 tons. In the next following year, the committee presented a report of no fewer than 20,000 experiments on models and ships, some of which afforded remarkable confirmation of the efficiency of the wave principle in ship-building. Thus the committee went on, year after year, detailing to the Association the results of their experiments, and pointing out how the ship-builders were by degrees giving practical value to these results.

Now, a country in which a scientific society will spend a thousand pounds on such an inquiry, and in which scientific men will give up days and weeks of their time to it without fee or reward, *ought* not to be beaten on the broad seas by any competitor. It affords an instructive confirmation of the results arrived at by the committee, that when some of our swiftest yachts and clippers came to be carefully examined, it was found that the wave principle had been to a great extent adopted in their form, in cases even where the vessels were built before the labours of the committee had commenced. The *art* had in this case preceded the *science*. And let it not be considered that any absurdity is involved here: farmers manured their fields long before chemists were able to explain the real nature of manuring; and so in other arts, ingenious practical men often discover useful processes before the men of science can give the rationale of those processes.

It may be all very well to assert, that 'Britannia rules the waves,' and that 'Britons never will be slaves,' and so forth; only let us prove the assertions to be *true*, or not assert at all. We must appeal to the 'Shipping Intelligence' which comes to hand from every side, and determine, from actual facts, whether any one country really outsails another.

Among the facts which thus present themselves to notice, is one relating to *clippers*. Who first gave the name of clipper to a ship, or what the name means, we do not know; but a clipper is understood to be a vessel so shaped as to sail faster than other vessels of equal tonnage. It is said that these swift sailers originated in the wants of the salmon shippers, and others at our eastern ports. A bulky, slow-moving ship may suffice for the conveyance to London of the minerals and manufactures of Northumberland and Durham; but salmon and other perishable articles become seriously deteriorated by a long voyage; and hence it is profitable in such case to sacrifice bulk to speed. Leith, Dundee, and especially Aberdeen, are distinguished for the speed of their vessels above those of the Tyne and the Wear; and the above facts probably explain the cause of the difference. The Aberdeen clipper is narrow, very keen and penetrating in front, gracefully tapering at the stern, and altogether calculated to 'go ahead' through the water in rapid style. As compared with one of the ordinary old-fashioned English coasting brigs of equal tonnage, an Aberdeen clipper will attain nearly double the speed. One of these fine vessels, the *Chrysolite*, in a recent voyage from China, traversed 320 nautical miles (nearly 370 English statute miles) in twenty-four hours: this was a great performance. But it must not be forgotten, that the United States claim to have attained a high ship-speed before England had thought much on the matter; the Baltimore clippers have long been known on the other side of the Atlantic as dashing, rapid, little vessels, mostly either single or double-masted.

It is to the opening of the China trade the present wonderful rivalry may in great part be attributed. So long as European vessels were cooped up stagnantly in Canton river, and allowed to trade only under circumstances of great restriction and annoyance, little was effected except by the tea-drinking denizens of Great Britain; but when, by the treaty of Nankin in 1842, Sir Henry Pottinger obtained the opening of the four ports of Amoy, Foo-tchow-foo, Ning-po, and Shang-hae, and stipulated that foreign vessels should be allowed to share with those of England the liberty of trading at those ports, there was a great impetus given to ship-builders and ship-owners: those who had goods to sell, thus found a new market for them; and those who could perform the voyage most quickly, would have a quicker return for their capital. This, following at an interval of seven or eight years the changes made in the India trade by the East India Company's charter of 1834, brought the Americans and the French and others into the Indian seas in great numbers. Then came the wonders of 1847, in the discovery of Californian gold; and those of 1851, in the similar discoveries in Australia.

Now, these four dates—1834, 1842, 1847, 1851—may be considered as four starting-points, each marked by a renewed conquest of man over the waves, and a strengthened but not hostile rivalry on the seas between nation and nation. So many inducements are now afforded to merchants to transact their dealings rapidly, that the ship-builders are beset on all sides with demands for more speed—more speed; and it is significant to observe that, in almost every recent newspaper account of a ship-launch, we are told how many knots an hour she is expected to attain when fitted. Every ship

seems to beat every other ship, in the glowing language employed; but after making a little allowance for local vanity, there is a substratum of correctness which shews strongly how we are advancing in rate of speed.

It will really now become useful to collect and preserve records of speed at sea, in connection with particular ships of particular build, as a guide to future construction. Mr Henry Wise published a volume about 1840, containing an analysis of one hundred voyages, made by ships belonging to the East India Company, extracted from the ships' logs preserved by the Company. It appears that an average gave 112 days as the duration of a voyage from London to Bombay. Now, within the last few months we have seen that the *Chrysolite*, a small clipper, built at Aberdeen for a Liverpool firm, has made the run from England to China in 104 days; and the *Stornoway*, built at the same place for a London firm, has accomplished the distance in 103 days. Let the reader open his map, and compare the relative distances of Bombay and China from England, and he will then see what a wonderful increase of speed is implied in the above numbers. Three American clippers were sighted during the out and home voyages of the two vessels, and, if newspaper reports tell truly, were distanced by them.

We must not expect that the vast and unprecedented emigration to California and Australia now going on, will be designedly and materially connected with high speed, because most of the emigrants go in roomy ships, at fares as low as are attainable; but goods-traffic, and the higher class of passenger-traffic, are every month coming more and more within the domain of high speed. Let us take two instances which 1852 has afforded, one furnished by England, and one by America—one connected with the Australian trade, and one with the Chinese. The Aberdeen clipper-built barque, *Phœnician*, arrived at Plymouth on February 3, having left Sydney on November 12, and performed the voyage in 83 days! Her previous voyages had varied from 88 to 103 days. The other instance is that of the American clipper, *Witch of the Wave*, a fine vessel of 1400 tons burden, which left Canton on 5th January, and arrived in the Downs on 4th April, a period of 90 days. Her greatest speed is said to have been 338 nautical miles—equivalent to about 389 English miles—in 24 hours.

Thus it is, we find, that in one voyage we beat the Americans—in another, they outstrip us; and there seems at present no reason why either country should fail in making still further advances. The Liverpool and New York packet-trade affords another example of the same principle which we have been considering; gradually these truly noble vessels are acquiring an increased rate of speed. Not only does the general desire for high speed impel their owners to this, but there is a more direct incentive in the increased rivalry of steam-vessels. The American 'liners,' as the sailing-packets on this route are usually called, have had in past years an average of about 36 days outward passage, and 24 days homeward; but they are now shooting ahead unmistakably. The *Racer*, built at New York in 1851, and placed upon the Liverpool station, is a magnificent clipper of 1700 tons register; it made its first voyage from New York to Liverpool in 14 days—a quickness not only exceeding that of its predecessors, but leaving nearly all of them many days in arrear. Even this, however, was shortly afterwards excelled; for another new clipper, the *Washington*, accomplished the distance in a little over 13½ days.

The pleasure-vessels which are so numerous in the south of England, belonging to the several yacht-clubs, are sharing in the modern speed-producing improvements observable in other vessels. Every one has heard of the yacht *America*, which arrived at Cowes from the United States in July 1851, and of the challenge which her owners threw out against English yacht-owners. Every one knows that the *America* beat the yachts which were fitted against her. This victory has led to an immense activity on the part of yacht-builders in England; they are studying all the peculiarities in the build and the trim of the yachts belonging to the different ports and different countries; and we are justified by every analogy in expecting, that good results will spring out of wits thus sharpened.

Although we have not deemed it necessary in the present paper to touch on the national struggle between steam-ships, we must not forget that one of the most promising and valuable features in steam navigation arose as an appendage to sailing. The *auxiliary screw* will deserve the blessings

of our colonists, for reasons which may be soon told. When it was yet uncertain what result would mark the contest *Screw v. Paddle*, it was suggested that the screw-propeller might probably be used as an auxiliary power, for occasional use during calms and contrary winds; the vessel to be a sailing-vessel under ordinary circumstances; but to have a marine engine and a screw for exigencies at times when the ship would be brought to a stand-still or even driven backwards. About seven years ago, an American packet-ship, the *Massachusetts*, a complete sailing-vessel in other respects, was provided with a screw and a steam-engine powerful enough to keep the ship moving when winds and tides were adverse; the screw was capable of being lifted out of the water when not in use. In her first voyage from Liverpool to America, this ship gained from five to thirteen days as compared with five other ships which sailed either on the same or the following day. This experiment was deemed so far successful, that the Admiralty ordered, in 1846, an auxiliary screw to be fitted to the *Amphion* frigate, then building at Woolwich. Another example was the *Sarah Sands*, an iron ship of 1300 tons; she had engines of 180 horse-power, much below that requisite for an ordinary steamer of the same size. She could carry three classes of passengers, coal for the whole voyage, and 900 tons of merchandise. She made four voyages in 1847, two out and two home; and in 1848 she made five: her average time was about nineteen days out, and seventeen days home, and she usually passed about six liners on the voyage.

The speed here mentioned is not quite equal to that of the truly remarkable clippers noticed above, but it far exceeded that of any liner at work in 1848. The example was followed in other vessels; and then men began to cherish the vision of a propeller screwing its way through the broad ocean to our distant colonies. From this humble beginning as an auxiliary, the screw has obtained a place of more and more dignity, until at length we see the mails for the Cape and for Australia intrusted confidently to its safe-keeping.

The icy regions of the north are braved by the auxiliary screw. The little *Isabel*, fitted out almost entirely at the expense of Lady Franklin to aid in the search for her gallant husband, is a brigantine of 180 tons, with an auxiliary screw to ship and unship. The *Intrepid* and the *Pioneer*, the two screw-steamers which form part of Sir Edward Belcher's arctic expedition—lately started from England—are to work with or without their auxiliary appendage as circumstances may determine.

The present article, however, will shew that sailing is not less alive and busy than steaming; and that the yachts and clippers of both nations are probably destined to a continuous series of improvements. When these improvements—whether by aid of scientific societies and laborious experiments, or by the watchful eye and the shrewd intelligence of ship-builders, or by both combined—have advanced steadily to a point perhaps far beyond that which we have yet attained, then, if at all, may we trouble ourselves about the question—'Who shall rule the waves?'

NUMBER NINETEEN IN OUR STREET

Number Nineteen in our street is a gloomy house, with a blistered door and a cavernous step; with a hungry area and a desolate frontage. The windows are like prison-slits, only a trifle darker, and a good deal dirtier; and the kitchen-offices might stand proxies for the Black Hole of Calcutta, barring the company and the warmth. For as to company, black beetles, mice, and red ants, are all that are ever seen of animated nature there, and the thermometer rarely stands above freezing-point. Number Nineteen is a lodging-house, kept by a poor old maid, whose only friend is her cat, and whose only heirs will be the parish. With the outward world, excepting such as slowly filter through the rusty opening of the blistered door, Miss Rebecca Spong has long ceased to have dealings. She hangs a certain piece of cardboard, with 'Lodgings to Let,' printed in school-girl print, unconscious of straight lines, across it; and this act of public notification, coupled with anxious peepings over the blinds of the parlour front, is all the intercourse which she and the world of men hold together. Every now and then, indeed, a mangy cab may be seen driving up to her worn-out step; and dingy individuals, of the kind who travel about with small square boxes, covered with marbled paper, and secured with knotted cords of different sizes, may be witnessed taking possession of Nineteen, in a melancholy and mysterious way. But even these visitations, unsatisfactory as most lodging-house keepers would consider them, are few and far between; for somehow the people who come and go never seem to have any friends or relations whereby Miss Spong may improve her 'connection.' You never see the postman stop at that desolate door; you never hear a visitor's knock on that rusty lion's head; no unnecessary traffic of social life ever takes place behind those dusty blinds; it might be the home of a select party of Trappists, or the favourite hiding-place of coiners, for all the sunshine of external humanity that is suffered to enter those interior recesses. If a murder had been committed in every room, from the attics to the cellar, a heavier spell of solitude and desolation could not rest on its floors.

One dreary afternoon in November, a cab stopped at Number Nineteen. It was a railway cab, less worn and ghastly than those vehicles in general, but not bringing much evidence of gaiety or wealth for all that. Its inmates were a widow and a boy of about fifteen; and all the possessions they had with them were contained in one trunk of very moderate dimensions, a cage with a canary bird twittering inside, some pots of flowers, and a little white rabbit, one of the comical 'lop-eared' kind. There was something very touching in these evidences of the fresh country life which they had left for the dull atmosphere and steaming fogs of the metropolis. They told a sad tale of old associations broken, and old loves forsworn; of days of comfort and prosperity exchanged for the dreariness of poverty; and freedom, love, and happiness, all snapped asunder for the leaden chain of suffering to be forged instead. One could not help thinking of all those two hapless people must have gone through before they could have summoned courage to leave their own dear village, where they had lived so many years in that local honourableness of the clergyman's family; throwing themselves out of the society which knew and loved them, that they might enter a harsh world, where they must make their own position, and earn their own living, unaided by sympathy, honour, or affection. They looked as if they themselves thought something of this too, when they took possession of the desolate second floor; and the widow sat down near her son, and taking his hand in hers, gave vent to a flood of tears, which ended by unmaning the boy as well. And then they shut up the window carefully, and nothing more was seen of them that night.

Mrs Lawson, the widow, was a mild, lady-like person, whose face bore the marks of recent affliction, and whose whole appearance and manners were those of a loving, gentle, unenergetic, and helpless woman, whom sorrow could well crush beyond all power of resistance. The boy was a tall, thin youth, with a hectic flush and a hollow cough, eyes bright and restless, and as manifestly nervous as his mother was the reverse in temperament—anxious and restless, and continually taxing

his strength beyond its power, making himself seriously ill in his endeavours to save his beloved mother some small trouble. They seemed to be very tenderly attached one to the other, and to supply to each all that was wanting in each: the mother's gentleness soothing down her boy's excitability, and the boy's nervousness rousing the mother to exertion. They were interesting people—so lonely, apparently so unfit to 'rough it' in the world; the mother so gentle in temper, and the son so frail in constitution—two people who ought to have been protected from all ill and all cares, yet who had such a bitter cup to empty, such a harsh fate to fulfil.

They were very poor. The mother used to go out with a small basket on her arm, which could hold but scanty supplies for two full-grown people. Yet this was the only store they had; for no baker, no butcher, no milkman, grocer, or poulterer, ever stopped at the area gate of Miss Rebecca Spong; no purveyor of higher grade than a cat's-meat-man was ever seen to hand provisions into the depths of Number Nineteen's darkness. The old maid herself was poor; and she, too, used to do her marketing on the basket principle; carrying home, generally at night, odd scraps from the open stalls in Tottenham Court-Road, which she had picked up as bargains; and dividing equally between herself and her fagged servant-of-all-work the wretched meal which would not have been too ample for one. She therefore could not help her lodgers, and they all scrambled on over the desolate places of poverty as they best might. In general, tea, sugar, bread, a little rice, a little coffee as a change, a scrap of butter which no cow that ever yielded milk would have acknowledged—these were the usual items of Mrs Lawson's marketing, on which she and her young son were to be nourished. And on such poor fare as this was that pale boy expected to become a hearty man? The mother could not, did not expect it. Else why were the tears in her eyes so often as she returned? and why did she hang over her son, and caress him fondly, as if in deprecation, when she brought him his wretched meal, seeming to lament, to blame herself, too, that she had not been able to provide him anything better? Poor things! poor things!

Mrs Lawson seemed at last to get some employment. She had been seeking for it long—to judge by her frequent absences from home, and the weary look of disappointment she wore when she returned. But at last the opening was found, and she set to work in earnest. She used to go out early in the morning, and not return until late in the evening, and then she looked pale and tired, as one whose energies had been overtaken all the day; but she had found no gold-mine. The scanty meals were even scantier than before, and her shabby mourning was getting shabbier and duller. She was evidently hard-worked for very little pay; and their condition was not improved, only sustained by her exertions. Things seemed to be very bad with them altogether, and with little hope of amendment; for poor Mrs Lawson had been 'brought up as a lady,' and so was doubly incapable—by education as well as by temperament—of gaining her own living. She was now employed as daily governess in the family of a city tradesman—people, who though they were kindly-natured enough, had as much as they could do in keeping their own fortunes afloat without giving any substantial aid to others, and who had therefore engaged her at the lowest possible salary, such as was barely sufficient to keep her and her son from absolute want.

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