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REFLECTIONS, HISTORIC AND OTHER, SUGGESTED BY THE BATTLE OF THE JAPAN SEA.

By Captain A. T. MAHAN, U.S. Navy.

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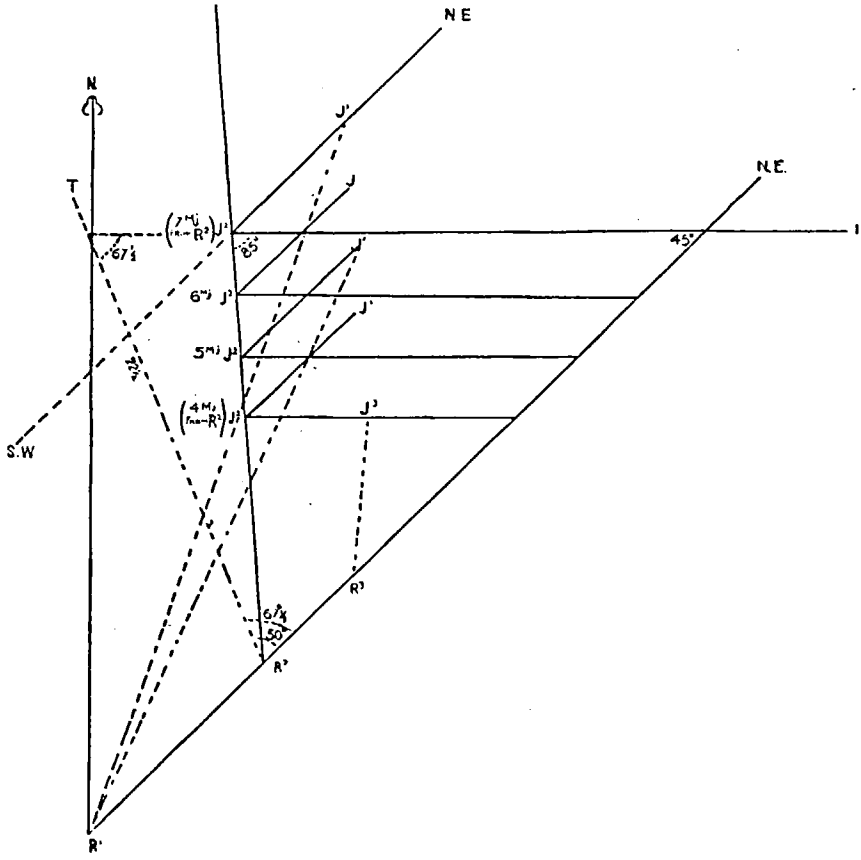
THE principal and determining features of the Battle of the Japan Sea have been made known to us by the official reports; but many details are wanting, and, as was justly remarked in a very able article in *Blackwood's Magazine* for last February, probably can never be supplied, the drama having passed too rapidly, and the actors having been too busily occupied, to take precise notes. The writer of the paper therefore devoted part of his space to an investigation of the problem, and to an attempt to reconstitute the earlier features of the engagement, as well as its subsequent phases. It is to this discussion that I owed the study embodied in the following plan, in which I have also availed myself of some of his data, more particularly with reference to the train of the guns of either party; but the particular line of enquiry which I have followed differs, I think, somewhat from his. It is in any event merely tentative; and its principal use, except as an attempt, to solve a question of reasonable professional interest, lies in familiarising the mind with some of the conditions of the encounter, and so making more easy the reflections which appear to follow naturally, from considering the relative position of the combatants.

Admiral Togo, in his report, says that at 1.45 p.m. the Russians were first seen from his flag-ship, "a few miles to the south." As they were known to be heading northeast, he then steered southwest, to deceive them into the impression that he meant to pass by in an opposite parallel direction. He does not report whether his fleet during this demonstration was in line abreast or line ahead. The latter might readily be presumed, but I have seen no positive statement to that effect; whereas one Russian account explicitly says: "A little after 12,[1] seventeen powerful ships of the enemy were sighted, in line abreast, holding a course from northeast to southwest, and at an angle of approximately 45° to us." From such a disposition the

[1] The other times of this account are a half-hour fast.

line of battle, east, could be instantaneously formed. However, whatever the first formation, the southwest course continued till 2.05 p.m., when it was suddenly changed to east; three minutes after which, or at 2.08, the Russians opened fire, having, however, before that "slightly changed their course to the right,"—kept off. Up to that time they had been steering northeast, at a speed of about twelve knots.



Nothing definite, either in distance or bearing, is herein given about the positions, or speeds, of the Japanese. Assuming R^1 as the Russian position when first seen, we have from it the course, northeast, and the time, twenty minutes, one-third of an hour, to the moment when Togo headed east. As the Russian speed was about twelve knots, laying off four miles on a northeast course gives us R^2, as the position of the head of the Russian column at the same moment. R^1 and R^2 are assured positions. Now, as the full force of the Russian broadside could only train 40 to 45 degrees forward of the beam, it seems reasonable to conclude that the Japanese admiral would execute his change of course either by the time the guns could

bear upon him, or at a distance when their so bearing would not be very material; while he would keep coincidentally in view the train of his own guns, which was slightly less than that of his opponents.

R^2 being the position of the leaders of the Russian left column at 2.05, I draw the line $R^2 J^2$ making with the northeast course an angle of 50 degrees, giving a compass bearing of N. 5° W., or 40° forward of the Russian beam. This is conjecturally the bearing of the head of the Japanese column when round to an east course, and as part of the Russian battery would then bear but scantly, the movement of keeping off, which ensued at once, and before opening fire, would be natural. Upon the line $R^2 J^2$ lay off by scale the distances four, five, six, and seven miles, which in yards would be respectively eight, ten, twelve, and fourteen thousand. Like the bearing, these distances are conjectural, but the truth very probably lies somewhere between the two extremes. Accepting them successively, and laying off from each a compass northeast, we have for each the southwest line down which the Japanese ran while the Russians were moving northeast four miles, from R^1 to R^2. Admiral Togo has not favoured us with his rate of steaming on this course; but as there was no cause for haste, rather the reverse, I presume he did not go over two or three miles to the Russian four. Taking such distance as rather less than three miles, we get the several positions, J^1, corresponding to R^1, according to the several estimates of the distance between the opponents, at the moment when the Japanese went about and the Russians opened fire. By protractor and scale it appears that for a distance ($R^2 J^2$) of seven miles, the Russians when first seen by Togo bore from him S. 20 W., distant something over 12 miles; for a distance of five miles, S. 25 W., distant 10 2-3 miles. The latter is not improbable.

It is expedient to notice here one or two surface facts. By taking the general position he did, to which the several points J^1 are conjectural approximations, the Japanese admiral preserved to himself interior lines of movement—shorter distances to cover—whatever course the Russians might take, unless they retreated. That is, he secured for himself the certainty of bringing the enemy to battle, quite irrespective of any superiority of speed on his part. The course steered by each from R^2 and J^2, by their intersection complete a triangle, of which much the longer side belonged to the Russians. Not unless Togo, steering S.W., had continued to the line $R^2 T$, bringing the enemy at R^2 to bear S.S.E., would the distance to be run have become equal; and the consequences of such continuance entailing not only more distance to run, but more extreme train for his guns and less for those of the Russians, were too obvious to be tempting. Whatever use he made of this primary advantage, however, the admiral had secured it by the position taken, on full information. All things considered, the most commanding bearing on which to have the enemy was due south, and it is probable that he did not greatly depart from that to either hand before going about. Again, should both fleets continue on their respective courses, east and northeast, maintaining equal speeds—as to J^1 and R^2—not only would they draw together, but the Japanese, having the interior line, would draw ahead at their discretion, throwing the Russian broadsides more and more out of action. Further, in order to overcome this disadvantage, the Russians would need a speed of fourteen knots to a Japanese ten, or seventeen to a Japanese twelve; a

difference of speed beyond that contemplated as possible, in clean bottomed ships, by either the advocates or opponents of very high speed in battle-ships. This difference in favour of the Japanese resulted from choice of position relative to the enemy's probable objects, and not from the superiority of speed they undoubtedly possessed.

Prior to the late war, the importance of speed to battle-ships was necessarily discussed and determined upon *a priori* reasoning. It will be well to see what further light may seem to be thrown upon the question by the events of the war itself. Concerning this there is necessary the warning that such illustration is inevitably partial; for the instances are limited, and generalisation from them must not be too dogmatic. As far as it goes, however, it will possess the advantage of the concrete over the abstract; and will itself give occasion to some theoretical reasoning based upon simple geometrical considerations, which to my own mind possesses weight.

Essentially, the Russian fleet in the late war was placed upon, and willingly accepted, the defensive. The battle of the Japan Sea is itself but an instance of this, for the Russian aim there was not to destroy the enemy, but to escape to Vladivostok. It was the cardinal, and, in view of the aggregate size of their navy, most discreditable feature of the campaign as a whole on their part, that no decided attempt was ever made to destroy the Japanese fleet by sheer hard fighting. This applies more particularly to the Port Arthur division in its general management, and especially in the two sorties of 23rd June and 10th August, 1904, in neither of which can be traced the slightest influence of the Nelsonic maxim, "By the time the enemy had beaten us soundly, they would do no more harm this year." Having thus neglected all opportunity of clearing the way for the Baltic division, and the Japanese having by the fall of Port Arthur obtained opportunity thoroughly to refit their fleet, Rodjestvensky was pretty well compelled to adopt first a defensive strategic object; that, namely, of reaching Vladivostok with as little fighting as possible, in order to put his own vessels as near as might be on a material equality of condition with their opponents, and also to associate to himself such other Russian ships as the place contained. His fleet was the last naval hope of Russia, as Togo's had all along been the sole naval reliance upon which Japan could rest; he was justified accordingly in wishing to put himself on the best possible footing before daring the issue that must in the end be dared, if the tide of war was to be reversed in Russia's favour. What bearing would the highest speed of his battle-ships have had upon his movements? That of unarmoured cruisers is not here in account, one way or the other.

We know what actually happened, though that as yet imperfectly. Upon this chiefly we must reason, but are at liberty also to consider by the way alternative courses of action, open to the Russian admiral after his arrival in Far Eastern waters. By the Naval Annual of 1905, the speeds of the chief battle-ships, whose names became familiar to us through the battle of Tsushima, were from eighteen to eighteen-and-a-half knots. Without taking too literally this result over the measured mile, we may assume that the original speed of the chief battle force on either side was substantially equal, with a slight advantage in favour of Japan. It is true that this assumption somewhat traverses the exultation deriving from each quarter-knot extra

speed on a trial trip; but it is not unsound in practice. Actually, the Russian fleet had a very long voyage before reaching the scene of operations, where its enemy already was; but, if the two had had voyages of equal length to make, the time of arrival—a strategic consideration—would have depended less upon the small difference of speed above given, than upon accompanying circumstances of weather, coal endurance, the quality of coals available, facilities and rapidity for coaling on the way, not to mention unforeseeable accidents. However, assuming that, whatever the relative experiences in these ways, the faster fleet arrives first, of what advantage would it be, if the gain of time has been due to speed obtained at the sacrifice of fighting power? The enemy on coming up keeps the field; or, if encountered and equally skilful, conquers in battle by superior force.

In the event, the Russian fleet arrived upon a ground long before held by its enemy; and the speed of its line of battle was gravely diminished by the fouling of the bottom inevitable in such an experience as it had undergone. Further, and of more general importance to the consideration before us, because of universal application, the speed of the faster ships had to be reduced to that of the heterogeneous slower vessels which had been added to raise the fighting power of the whole body. It is not likely that another modern fleet will soon again present such diversity of types as the last agony of Russia compelled her to assemble; but the fast battle-ship built this year will always find her speed conditioned and lowered in the same way by that built three years ago, so long as the standards of size and consequent speed depend upon the ship your neighbour is laying down. We are at the beginning of a series to which there is no logical end, except the power of naval architects to increase size.

In 1898, just after the war with Spain, I made this remark to the then Secretary of the Navy; saying that, on the path we were treading, I saw no reason why we should not reach 20,000 tons, nor why stop there. He replied, that he saw no reason to apprehend such an issue. In a very recent number of the *Proceedings of the Naval Institute*, an officer with whose professional intelligence and thoughtfulness I have ample acquaintance, writes that he had asked a naval architect what sized ship would be requisite to embody all the high qualities now demanded. The reply was 50,000 tons. To this the officer would not accede, but he believed 20,000 would be needed. Why he thought the progression must stop there, I did not understand. The point to be tenaciously remembered is, that the 20-knot-ship must, as a rule, come down to the speed of the 18-knot; for battle-ships are built to work together. The only case in which inequality of speed may be utilised is in the close pursuit of a flying enemy—what our forbears called "a general chase." There the faster ships may overtake the enemy's slower, and compel the whole body to fight or abandon them; but in such case, if speed have been gained at the sacrifice of gun power, the advantage is contestable, unless the main force of the pursuer is very close behind.

An instance partly in point was afforded in Kamimura's pursuit of the Port Arthur division of armoured cruisers, in August, 1904. The "Rurik" having been disabled in the engagement, Kamimura pressed on after her two consorts, leaving the reduction of the "Rurik" to two of his unarmoured cruisers. The "Rurik's" speed being reduced, and her steering gear damaged, the Japanese vessels, though inferior in force and only of equal original speed, were enabled to

maintain their positions under her stern, where her power of injuring them was reduced to a minimum; and they kept her engaged until their armoured vessels returned, when the Russians opened her valves and she sank. This presented the essentials of a general chase in the holding of an enemy's vessel till the main force comes up,—in this case, back; and the incident of inability to steer is precisely one of the determining features in a general chase, for the rear vessel in such case cannot deflect. She must keep on after her consorts; for, if she turns to fight, she facilitates the approach of the enemy's slower main body. To this chiefly was due the preponderance of injury received from a weaker opponent by the American frigate "President," when chased by a British squadron in 1815. She could not turn upon her immediate assailant, because of the latter's consorts following at a distance in her wake. So the British frigate "Penelope" hung effectively upon the quarters of the French 80-gun ship "Guillaume Tell," seeking to escape from Malta in 1800, and contributed powerfully to her capture by the squadron, the approach of which prevented the ship of the line turning her broadside on her swift but petty foe.

At the meeting off Tsushima, in May, 1905, the Japanese battle fleet proper had over the Russian an advantage of two or three knots speed at the time when Rodjestvensky came abreast the north point of Formosa; the moment when the strategic campaign may be said to have opened. Of what determining advantage was this excess of speed to Admiral Togo? The latter had to consider that, granting the Russians had coal enough, it was open to them either to proceed by the straits of Korea, as they did, or to the east of Japan, coming out by the Tsugaru straits, abreast Vladivostok. By the latter route they must cover 2,100 miles, against 1,200 by the former. We are told that Togo remained convinced throughout that the shorter road would be taken; but, by the position in which he placed his fleet, at Masampho, he insured intercepting the enemy irrespective of relative speeds, though certainly not irrespective of the damaging accidents to which all military plans are liable. Masampho is but fifty miles from the north end of Tsushima, which may be regarded as the geographical centre, around which revolved all operations, actual or possible. For the larger view of campaign issues, the two positions are identical. From Tsushima to Vladivostok is 500 miles; from the west end of the Tsugaru strait to Vladivostok is 400. Supposing Rodjestvensky to take the Tsugaru route, and the two fleets to have equal speeds of twelve knots—that maintained by the Russians—Togo, in order to intercept the enemy off Vladivostok, would need to know that they were not coming by way of Tsushima only nine hours before they cleared the straits; for he would have only 100 miles more than they to steam. If, instead of off Vladivostok, he should prefer to meet the enemy as they came out of the Tsugaru straits, he would need the same knowledge of their intentions little over two days,—which at twelve knots is 576 miles,—before they cleared the straits; for the western exit is but 600 miles from Tsushima. As the way round the east side of Japan is so much the longer, there would be ample time to receive the needed information, and to decide where to await the enemy. In short, Togo was quite able to grapple with the strategy of the conditions upon terms of equal speed; and it may be added even with speed inferior by two or three knots. By the choice of central position, insuring interior lines, and by adequate measures for receiving intelligence, he made himself master of the

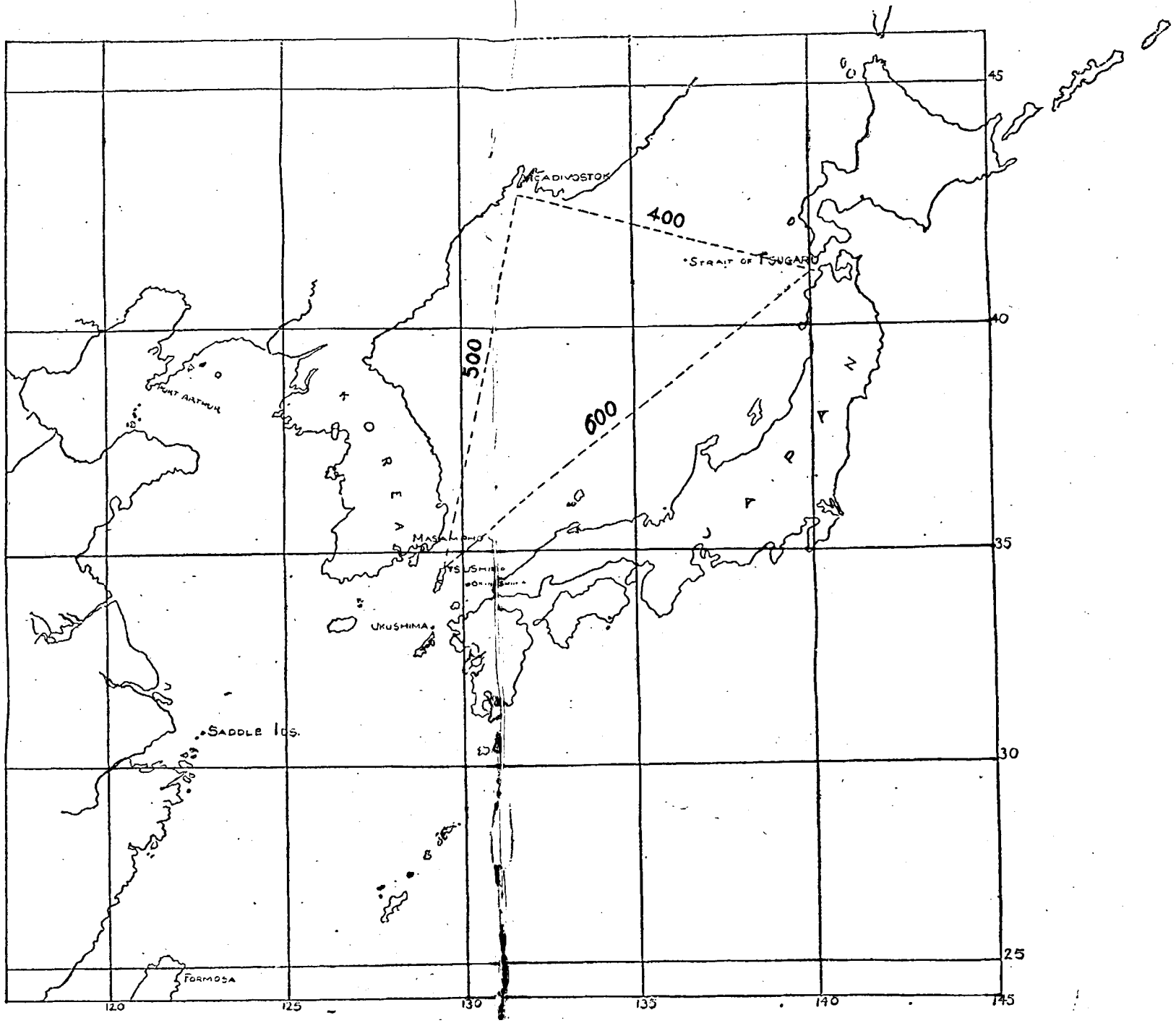
strategical situation independent of probable speeds. The tactical question is another matter, to be considered later.

Let us now examine the alternative course, actually adopted by Rodjestvensky. At 5 a.m., Togo at Masampho received by wireless telegraphy definite intelligence that the enemy were sighted, at a point designated 203 in the Japanese intelligence system, apparently steering for the eastern Tsushima channel. We do not know certainly where 203 is, but, since two hours later the Russians were again reported, definitely, as 25 miles northwest of Ukushima, and as their speed was twelve knots, we can calculate that at 5 a.m., they were 114 miles from the scene of action, 10 miles north of Okinoshima, chosen by Togo upon the basis of the information transmitted continuously by his scouts. Masampho is from 80 to 85 miles from the same selected point. By good scouting and intelligent choice of position, coupled doubtless, though not explicitly affirmed, with heavy boiler fires and all preparations for instant departure,[1] the Japanese could move on an interior line, shorter by thirty miles than that of the enemy. At nearly equal speeds of twelve knots, this gave the former two hours and a half to spare; while, for the Russians to overcome this disadvantage, they would require a superiority in speed of more than four knots, throughout the seven hours in which their opponents were covering their distance. Had the two equal speeds been fifteen knots, the advantage in time for the Japanese would have been two hours; they requiring 5 3-5 hours, their opponents 7 3-5. With this higher speed, the Russians, during the time taken by their opponents, would have needed to maintain a speed five knots greater than theirs, or twenty knots, to arrive coincidentally with them. Now, when speeds between fifteen and twenty are reached, nautical readers do not need to be told that, to make increases of four or five knots per hour with the same displacement, guns must be thrown overboard; not in the race on the water, but in the plans of the constructor. Fighting power must be sacrificed. In the light of such conditions what are we to think of trivial increases of speed, a quarter, or one knot, or even two knots of top speed, which is a very different thing from the working speed which naval operations will compel for the best aggregate results.

Togo thus, by good scouting and choice of position, secured beyond reasonable hazard his strategic object of bringing the Russian fleet to battle, irrespective of speeds. Certainly, his problem was much simplified by the Russians' difficulty in having but a single port of refit open to them. But the fair reply is that the two admirals, like all general officers, had to deal with the problem before them; and a glance at the map will show that, had Port Arthur remained Russian to the day of battle, *the fleet within being destroyed*, the existence of the two ports need have made little change in Togo's plans, a consideration which deepens the condemnation of those who could find for that fleet no better use than to sink it.

If superior speed can be shown to have had so little necessary effect upon the strategy of the campaign, how was it in the tactics of the battle? Owing to his sagacious choice of position, the Japanese admiral was able to appear directly across his antagonist's desired

[1] Togo's report reads: "The different sections of the fleet at once (5 A.M.) commenced their hostile operations along the lines respectively laid down for them in the pre-arranged plan."



line of advance. He had headed him; not only in the usual sense of the word, but in acquiring intelligent knowledge and appreciation of the conditions before him. Any remarks on the tactics on the occasion would be incomplete, if mention were omitted of the advantage obtained by a thoroughly up-to-date system of scouting. I infer, from casual mention, that the field of sea over which the enemy would probably approach was divided into squares, to each of which a number was given. Of these, 203 was one. Wireless telegraphy speaks for itself. The system was better than that of a century ago, simply in so far as means have been developed; now, as then, antagonists may be on equal terms. It depends on themselves. There is no indication that Rodjestvensky knew anything certainly of his adversary's position, or dispositions, before the battle-ships came actually in sight. Togo, on the contrary, notwithstanding a haze contracting the horizon, "was able, before I could see the enemy with my own eyes, to know that the enemy's fighting sections comprised the whole of the second and third squadrons; that they were accompanied by seven special service ships; that the enemy's ships were disposed in a double column formation; that their strength was placed at the head of the right column, with the special service ships at their rear; that the enemy's rate of speed was about twelve knots; that the enemy were continuing to steam in a northeasterly direction; and so forth." Any change that might occur from moment to moment would be equally transmitted. He was thus able to decide, not only the point at which he would fight, but his dispositions for action. The Russian may be said almost to have been taken by surprise. If he had available scouts with him, they should have been far enough in advance of the main body to preclude observation, by driving off the enemy's lookouts, so as at least to insure equality of time for intelligent preparations. Togo's outer scouts, the ones which sighted the Russians at 5 a.m., were over a hundred miles from Masampho. It is interesting to remember, and illustrate results as compared with a century ago, that the leaving Cadiz by the allied fleets before Trafalgar was known to Nelson, fifty miles at sea, two and a half hours after the operation began; a period perhaps shorter in relation to power of movement than the results of to-day.

To return to the question of speed as affecting the battle. Togo reported that, his fleet having assembled at noon ten miles north of Okinoshima, he first sighted the enemy at 1.45 p.m., a few miles to the south. Let us interpret "south" literally; due south. The assumption is permissible; for reference to the simple geometric construction given above will show that, with the Russians bearing anywhere between S.S.E. and S.S.W., Togo retained the shorter line of operations, granting merely equal speeds. The Russians, being by this hypothesis due south, and steering northeast, it is plain that should Togo steer east—which for battle he did—he took one perpendicular of a right angled triangle, leaving to his opponents the hypothenuse. The other angles being 45 degrees, the distance they must traverse to reach the point where the two courses intersected, was nearly one-half greater than his. If his speed were ten knots only, they must go fourteen, merely in order to arrive together; while with equal speeds, if he took thirty minutes, they would need forty-two. It will be noted, also, in virtue of these shorter times, that if Togo continued to the point of intersection, he would be directly ahead of the enemy, and only their bow guns would bear; whence it follows

that, since he bore from them 45° forward of the beam when they were due south, as he advanced he would bring them more and more behind, throwing most of their battery successively out of bearing. To this doubtless was due the Russians keeping away, even before they opened fire; many of their guns at first scarcely bore properly, and, should they continue, would not bear at all. Having in view the Russian object of reaching Vladivostok without fighting, escape from the dilemma was hopeless, on any terms of speed likely to be found between two battle fleets. This will be shown further on. Under the particular circumstances there were but two alternatives: a charge direct, in line abreast, upon the Japanese fleet, trusting to breaking through in a mêlée, and some of the faster vessels escaping; or else to accept a formal pitched battle, by keeping off to insure the full play of their batteries. This was what was done actually, though clumsily; for the double column, with which the Russians ill-advisedly went into action, could not quickly develop the full power of the broadsides. It is ill performing under fire manœuvres which should be accomplished before. This process of keeping off had, of course, to be continuous to preserve the bearing of the guns.

I have said there was no escape from the Russian dilemma. To get to Vladivostok without fighting was impossible under any probable conditions of speed in the battle-ships. If instead of heading off gradually to keep the broadsides in play, the Russians had at once steered east, parallel to Togo, they would with equal speeds have achieved no advantage. To keep off farther, bringing him abaft the beam, would impose upon him the greater distances; but such a course would be but the beginning of running away, of a stern chase; and to realise its complete benefit their backs must be fairly turned on Vladivostok, in full retreat. Such a course would have been less acceptable to Togo; but the issue would have been to bring out a condition too often disregarded by even professional men, though all know it. Squadron speed is not an average; it is the speed of the slowest. Consequently, when one party runs away, there will be among the vessels of his antagonist some which possess more than the equal speeds we are assuming. These take up the chase, and by their greater swiftness bring to action the rear vessels of those in flight. The others must either turn back to support them, which brings on a general action; or, using their own superior speed, escape, leaving a partial victory to the enemy. But if unable to fight before, much less will they be able after such losses.

To anticipate Togo, under the courses the two combatants were steering immediately before the action—east and northeast—the Russians required a speed greater by one-half. If he went ten knots they needed fifteen; if twelve, eighteen. No professional opinion on either side of the controversy, I presume, will say that such differences are anywhere, or by any one, considered. The gains in speed, achieved by successive increases of tonnage or of engine space, at the cost of greater expenditure to obtain size, or of fighting power to increase speed, are much smaller. Let us suppose that the Russians had a fleet-speed superiority of two knots. By steering a parallel course, should Togo permit that condition to continue, they would draw ahead at the rate of two miles an hour. In five hours this would be ten miles, during which, assuming twelve knots for the slower fleet speed, the faster will have run seventy, the distance of the nearest shore. It then has to turn north towards Vladivostok,

with its slower opponent approaching to traverse its course by means of its faster vessels. It may be objected that the proximity of land, being particular to the instance before us, is foreign to the general discussion. The reply is that all safe generalisation is based upon numerous instances, and this is one; but further, as a matter of general experience, it is quite as likely that the slower fleet will have some ships equalling or excelling the fleet speed of the faster, as that the fleet speed of that faster body will be two knots greater than its adversary's. In the particular instance, the Japanese did have the two or more knots superiority, due to the particular cause that, being in home waters, they had been recently docked. Had conditions of speed been against them, instead of favouring them, doubtless Togo would have modified both his strategy and his tactics. Now if Togo's actual superiority of two knots speed, due to the nearness of his home bases, gave him no determining superiority which he was not equally able to obtain, and did obtain, by good strategy, it may fairly be asked would it have been worth while for the Russians, at the time of meeting, to have had two knots greater fleet speed, purchased by the sacrifice of gun power; to achieve the mere result of running away, with such doubtful chance in their favour.

Before summarising a conclusion, let us note one prominent feature of the battle of the Japan Sea, commonly to the partial engagement of the previous 10th August, the bearing of which upon the question of speed seems to me to have engaged little attention. One of the frequent incidents of both actions is the damage to funnels, either complete destruction or large perforation, destroying or diminishing draught, and with it speed. If the battle-ships keep together, which, as a rule, they should, the fleet speed is reduced at once to that of the injured ship. This factor does not come into play in the movements which precede the action, but it may seriously affect conditions of flight and pursuit, as also the power conferred by superior engine development in subsequent operations by fleets distant from their means of repair. The loss of a modern funnel will be like the loss of a former-day lower mast. Certainly, no discussion of the utility of speed obtained at the sacrifice of gun power can be adequate, if it does not take full account of this specific result, which has also a further bearing. The funnels are open to serious injury by guns of that secondary battery, six to eight inch, which there is now a tendency to discard. It has long been my own opinion that the so-called secondary battery is really entitled to the name primary, because its effect is exerted mainly on the *personnel*, rather than the material of a vessel; and I am glad to find this view supported by the author of the article in *Blackwood*, though he does not use the same words. Whatever the improvements in quickness of handling 12-inch guns, it can scarcely be that, with an equal aggregate weight of broadsides, they can rival in volume of fire the much greater number and more rapidly discharged pieces of smaller calibre; and, when within the limits of useful perforation, volume of fire, multiplicity of projectiles, is better than individual weight of projectile, because it gives a greater number of hits. But under any useful construction of battle-ships there cannot fail to be important parts vulnerable to the smaller calibres.

There are other points of view from which the experiences of the Battle of the Japan Sea throw suggestive light upon the question of primary and secondary armaments—so-called; but it is best first

to summarise conclusions in the subject of speed, with which we have been consecutively dealing. First of all, it must be remembered, and repeated, that no one maintains that increase of speed, even a quarter of a knot, is not a desirable thing; or that greater speed, even to a small amount, is not of value, strategically and tactically. What is contended is that speed at its best is a less valuable factor in a battle-ship than fighting power, and that it is subject to more serious deductions, unavoidable and accidental, than fighting power is; and that for these reasons—original inferiority of value and greater uncertainty of maintenance—it must be kept severely in its proper place of subordination in the design of battle-ships. If we could assume a standard battle-ship,—and nothing condemns the assumption of an ideal as useful to reasoning,—a ship in which fighting qualities. speed, coal endurance, and all the rest, were realised in perfect proportions, we would say that any increase of speed obtained by improved processes of engine-driving was a distinct advantage, but that the same increase, if obtained by sacrificing gun power to greater engine space was a disadvantage. Again, granting such a ship, we would say that to obtain increase of speed by increasing the size, whether the proportion of gun power be maintained or not—though especially if not—is also a mistake; for it means one of two things: fewer ships, or a larger national budget. Practically, the navies of the world have now committed themselves to solving their problem by progressive increases of size, which affects national expenditure in two principal ways: first, increase of cost by bigger ships, and, second, by prematurely relegating to the dump vessels good in themselves, but unable to keep up with the one last built. To-day's "Dreadnought" has no immunity from the common lot of all battle-ships. In a fleet, to-day, her speed will be that of her slower sisters; more "Dreadnoughts" must be built to keep up with her; and upon them in turn, according to the prevalent law of progress, she will be a drag, for her successors will excel her.

This wilful premature antiquating of good vessels is a growing and wanton evil. It is true, indeed, that this obsolescence is more in idea, in crude impression, than in fact. The vessels thus outstripped and outclassed remain immediately serviceable for places in the fleet, as well as for detached minor duties; but the inferiority to which they are successively dropped is different in kind from that of the old 74-gun ships, as contrasted with the three-decker. These were a permanent recognition of the fact, elicited by constant war experience, that a medium class of vessel was the best constituent unit for the composition of a fleet, which nevertheless could beneficially be strengthened at certain points by heavier batteries. Our present condition is that of abandoning all attempt at a guiding conception of types, or standards, except the crude one that each ship must be bigger than the last. The ultimate tendency of this, of course, will be to make ships after too short a time unequal to a place in the line. The moral effect is still worse, for it is inducing, in the navy as in the public, a simple trust in bigness, and, what is worse, an absence of trust in anything but bigness. Undoubtedly if all other things—skill, courage, numbers, combinations, fortitude—are the same on both sides, bigness, barring accidents, will carry the day; but when have all other things been the same? We are putting in the foremost place of consideration that which military history shows to be the least of several factors. We have, indeed, the proverb, that "Provi-

dence is on the side of big battalions;" but we know it is not true Napier is nearer the truth, in saying, that the presence of Napoleon on a battle-field was equal to a reinforcement of 30,000 men. Providence is most often on the side of men who best know how to manage their battalions, or their ships; the smaller have more often triumphed by their conduct, than the bigger by their weight.

The perforation of funnels, with the diminution of speed, is but one illustration of the very serious effect which may be produced by the secondary batteries; that may be expected from them. In the present incipient, but well defined, purpose to dispense with these batteries, it is well to note at once the reversion to the "Monitor" type, which had a day, was abandoned, and now seeks to return. The single turreted monitor was for its limited uses effective; when it passed beyond those limits, of still waters, and posed as a sea-going battle-ship, it showed deficiencies which excluded it from such a function. The single turreted monitor was logical; it gave an all-round fire for a battery fully equal to the capabilities of its tonnage, and so concentrated in space that about it could be accumulated all the armour protection the tonnage could bear. Having a very low freeboard, one that also could be adequately armoured; and as the vessel was intended for, and made its whole war record in, still waters, there was no rolling to expose the under water, unarmoured hull. Further, the prescribed proportion between tonnage and battery weight being that compatible with all-round fire of the latter, size was restricted in the individual ship, and numbers increased. This facilitated dispersion of vessels around a single object, such as a shore battery, giving dispersion of guns with concentration of their fire; a disposition which is easily seen to combine the least exposure of one's own force with the greatest effect upon the opponent.

The advance to the two-turreted monitor was not logical; the increase of tonnage did not give all-round fire to the increased battery; for a considerable arc of train each turret stood in the way of the other. One or more three-turreted monitors were built in the United States towards the end of the Civil War, when the vogue of the monitor type probably reached its highest; but they saw no service. As turrets were added, and size increased, the vicious tendency became obvious. Exposure was concentrated, and dispersion of pieces was sacrificed. The concentration in each turret of so large a part of the whole battery gave a maximum of exposure, which necessitated elaborate protection for the turrets; and from this necessity defensive armour assumed a preponderance of consideration in the minds of officers and designers, entailing a predominance of the defensive over the offensive, which is also the note of long distance action. This is the precise opposite of Farragut's aphorism, that the best defence is our own rapid fire; that is, offence. Such a mental attitude is so contrary to the teachings of history that it should at once arouse inquiry. Nevertheless, the usefulness of the first monitors diverted attention from their limited sphere of action, which it was attempted to transfer to the deep sea. Not for the first time, nor yet for the last, men were assured that we had a revolution in naval warfare; not only implements, but principles, had been subverted. The prepossession in favour of heavy straight-ahead fire, to which the broadside was to be sacrificed, and the emphasis laid upon the ram, contributed powerfully to this conclusion. Those who kept touch with naval tactics of twenty or thirty years ago will remember the influence

of these two ideas upon ship construction, and upon suggested fleet formations. Ingenious devices for increasing fire ahead were multiplied. A ship's side was broken into redans, and raised into stories for this object; while for battle purposes the line abreast almost superseded the line ahead. Both these dominant prepossessions have now disappeared. No attempt at ramming was made in the late war; while in practice the broadside has reasserted the superiority inseparable from the fact that a vessel, being five to six times as long as she is broad, can always deploy a given weight of battery more effectively along her side than across her beam. The one exception to this is the small monitor—not the big.

Small, slow, clumsy to handle, but with the utmost battery it could carry concentrated in two pieces which were substantially one, and with all-round fire, the single turreted monitor was the gun-boat of its day; the double turreted monitor was a degenerate from it. The "Inflexible" of the British Navy, launched, I think, in the seventies, marked the extreme and final development of this type. I have not references at hand, but as I remember she carried two turrets, each with two 16-inch guns; and many will remember the controversy as to the effect which injuries by gun-fire to her hull, forward and abaft the armour belt, would exert upon her flotation. While admitting that a certain degree of perforation might cause her to upset, it was justly argued that the amount of such injury that could be effected was an artillery question; which I apprehend was equivalent to saying that hits from a battery like her own, of a very few large guns, were likely to be too few to admit the dangerous amount of water. From this followed directly that numerous pieces, unequal to her armour, but equal to piercing her unarmoured extremities, might effect the desired injury, in whole or in part.

This conceded, there was cut out work for what are now called secondary batteries. For sea-going, the true monitor had proved hopelessly slow, and with any wave motion an extremely bad gun platform, owing less to the depth of the roll than to its excessive rapidity. Though demonstrated to be safe by several long voyages, notably one trans-atlantic, its general nautical qualities were poor. Low freeboard had to be abandoned, and the excessive metacentric height to be diminished in the interest of good aiming. There was thus induced a large superstructure, which, since the "Inflexible" period has been utilised for the placing of the so-called secondary batteries, ranging from 4-inch to 8-inch guns, and above. Their number and rapidity of discharge constitute a great volume of fire, destined for targets such as the "Inflexible's" extremities—should such still exist—or other objects, such as the corresponding secondary batteries of an opponent. The question of adjustment between number of such pieces and the most effective calibre for the individual gun is one of detail, quite apart from that of the principle that such a battery has its approximate and important target in the enemy's vessel. If generally abandoned, that part of the mutual exposure disappears; but is there no other, not yet protected, perhaps not susceptible of protection?

In the Battle of the Japan Sea, the Japanese had in broadside 17 guns of primary battery; 16 of 12-inch and one of 10-inch; mostly, if not all, turret guns. It had also a total of 110 guns of secondary battery, in broadside. Of these totals, all the primary pieces and forty at least of the 6-inch guns were in Togo's own division, which

began the action, received the first fire, and apparently endured the brunt and inflicted the greatest damage. In this division alone the lighter pieces were to the heavy in the proportion of 2½ to 1, and we may be justified in assuming that calibre for calibre there were at least four discharges of the secondary to one of the heavier, with the consequent probability of a proportionate number of hits. This estimate is the more to be accepted, because Kamimura's division, the armoured cruisers, which carried nothing heavier than 8-inch guns, certainly brought their fifty-odd into the contest; for the "Asama" of this class was forced for a time to withdraw, in order to repair injuries from the Russian shells. The volume of Japanese fire then amounts to 17 primary and some 90 odd secondary guns. With what result? The "Oslyabya" was sunk, by gunfire; the "Souvaroff" lost by gunfire a mast and two funnels, a disablement which permitted her to be torpedoed, so far successfully as to incline her ten degrees; the "Alexander III." and "Borodino" were also sunk by gun fire, or in consequence of it, for both went down before the night torpedo attacks were made. The "Orel," when brought into port, had the upper part of her forward funnel shot away, as also the muzzle of a 12-inch gun. We still need more definite and specific information, which, in the case of the sunken vessels, may never be had; but from the heeling of some, and the sinking of all, might naturally be inferred that shots penetrating near or below the water-line were a principal contributory cause. We are told, however, that owing to the weight of stores, ammunition, and coal on board, the armoured belts were submerged, and in consequence the hulls at the water-line, and close above, were easily penetrable. I own to some perplexity as to how this should arise, from the reason specified, when so near the point of arrival, and so obviously improper with battle imminently probable. If such submersion existed, as the preponderance of evidence goes to show, it seems more likely due to a circumstance stated by Captain Klado, of the Russian Navy, in his "Battle of the Sea of Japan," advance sheets of which I have been permitted to see. He states that several armoured vessels of that service were terribly over-weighted, the displacement exceeding that intended, so that the belt of thickest armour did not rise two feet above the water. The displacement of the "Souvaroff" should have been 13,500 tons, whereas, in fact, it exceeded 15,000. Granting the fact of submersion, to whatever due, it nevertheless appears from the sea conditions of the battle that, under usual and proper conditions of submersion, rolling may frequently be so heavy as to expose continually unarmoured bottoms, while yet not so extreme as to preclude decisive fleet action. Can the armour belt be continued to the extremities, bow and stern, of such thickness as to exclude secondary batteries, and at the same time of such depth as to provide against the exposure of the bottoms by rolling? and, if so, will the gain of defensive strength compensate for the weight thus deducted from offensive purposes? Against such a target, penetrable to all guns, volume of fire is of the utmost importance; for, while the aiming may be all of the best, the opportune moment of the shot's arrival, when the bottom is exposed, is beyond the control of the aptest gunner. In so far the effect is chance; and favourable chance increases with numbers or volume. Further, as stated by Sir William White in a recent lecture, the Russians declared they were blinded by the volume of shells from the Japanese guns. This result being

upon the *personnel*, goes far to establish the actual superiority of the secondary battery, in which the Russians had little more than half the number possessed by the enemy; while in the heavier calibres they had more than double.

The disposition to revert to the monitor type by discarding secondary batteries is the composite result of two prepossessions: in favour of high speed and of distant action. The latter is to be enforced by the combination of superior speed with guns, the effective range of which is insured by great size; by heavy calibre. By my greater speed, be it but a fourth of a knot, I shall maintain a position where my adversary's secondary battery can do no harm, while my own primary, outnumbering his in the degree obtained by sacrificing secondary guns, will destroy him. Superficially plausible, the argument is logically unimpeachable. The difficulty is that it disregards experience; not of its own proposition, indeed, for it has not been experimentally tried, but the experience of history. It is the old gun-boat theory, in one of its several incarnations; for, if the essential principle of design remain, a gun-boat is no less a gun-boat because a hundred times as big. Given a small number of long-range guns, take a position suitable by favourable range, and within the dead angle of the enemy's broadside, utilising a calm or shoal waters; and behold the hostile frigate disabled and captured.

I do not think the parallelism of principle is here overstrained. The dominating considerations in the two arguments are identical, though it must be admitted that the qualifying factors are somewhat different and may affect the practical issue now. In the case of gun-boats, always presumed to be provided with guns of the heaviest calibre, history has recorded its verdict. To-day the decision seems to turn upon the question whether the primary batteries, under all conditions which admit of fleets engaging, can make efficient practice at ranges which will prevent the secondary guns of the enemy from perforating the funnels or exposed bottoms. This analysis concedes superior speed to the fleet which has discarded secondaries; but it is needless to say that, unless the distance taken does insure the immunity of funnels, the fleet with the least volume of fire—without secondary batteries—is by all theory of probability the one most likely to lose speed by the fallen funnel of a single ship. It is to be observed, also, that the great distances proposed do away with the advantage of the flat trajectory—the point-blank of to-day—in which the heavier guns excel the lighter. Recourse must be had to elevation of guns, with which, against a target of horizontal extension, such as a ship's hull, errors of aim increase in accelerating ratio. All naval men know full well the "good line shot, but over," "or short;" a shot, in brief, that has missed its mark through vertical deviation. The grouped funnels, three or four in number, of the modern fast battle-ship, offer on the contrary a vertical target, one the least often missed by the average gunner, who usually shoots straight, but errs by too high or too low. In South Africa, I have heard that the Boer fire lost immensely in effectiveness, when instead of level they had to fire down hill. Of course, the funnel development of two fleets may be assumed equal; but the question posed is the effect of volume of fire. Both, too, may be assumed equal in exposure of the underwater bodies; but inferior volume of fire carries with it increased probability of being oftenest hit.

But, if this estimate of probabilities be deceived, as chance may very well occasion, and the first ship to be disabled belong to the fleet with secondary batteries, what will the other fleet do? Close, for decisive action? It then sacrifices the very advantage supposed inherent in the longer range, heavier gun; for the ship thus disabled is by no means necessarily a ship lost to fighting, and the battery power of her fleet may have undergone no diminution. Her fleet too has every reason to wish to close; and, therefore, in the contrary event of the first ship reduced as to speed being in the fleet that wishes long range, the opponent will close at once, and can close, because the hostile speed is reduced to that of the slowest ship. All this, which is irrefutable, goes to show that the fleet which has thus placed its dependence on longe-range fire, has with it assumed the moral tone and temperament associated with the indisposition to close. An advantage gained cannot be improved, unless in itself quite decisive; a disadvantage which merely reduces its speed is, on the contrary, already a check, a moral as well as material defeat, which subjects it to the disaster of close action, less favourable to itself than to the opponent, the power of whose guns increases with approach. I do not wish to lay undue stress on moral forces, undeniable as is the effect of habitual action, or prepossession, upon moral strength; but I think appeal can be made confidently to history that the navy which, for any reason, habitually seeks to keep its enemy at a distance, in order to secure a preliminary advantage, usually fails to achieve more than a defensive success for the occasion, and in the long run finds itself brought to battle at an unexpected moment, under conditions unfavourable to it, both materially and morally. "Close" undoubtedly is a relative term; but, however extended or contracted, it can scarcely at any period mean farther than nearly the point-blank range of a ship's principal battery.

Among the many factors—such as armour protection and coal endurance—which enter into the efficiency of a battle-ship, speed and offensive power—gun power—are at present the leading competing considerations. The proper adjustment of all, allotting to each its exact proportion of the available tonnage, constitutes a problem of no small difficulty, and is not infrequently characterised as a compromise. One cannot easily recall all the loose expressions one may at various times have carelessly uttered, and it may be that I have myself used the word in this connection; but long ago I have adopted, as my view of military compromise, an absurd story I once heard of a dispute between man and wife, where they should spend the summer. He said Newport; she Saratoga; they compromised on Saratoga. The adjustment between the two necessary qualities of offensive power and speed for battle-ships may be called a compromise; but it should always be on offensive power.

What do you mean by this vague definition? I mean, primarily, the cultivation of the mental attitude which keeps offensive power in the foreground; a steadfast prepossession in favour of its immortal superiority. I should say next, a studious consideration of how far differences of speed really matter strategically. Control of the sea being the leading object of naval war, and strategy being more conclusive than tactics, what probable advantage does a fleet obtain by arriving ten days sooner, if it must get behind batteries on the coming of an opponent who has preferred offensive power to speed? Again, remembering that for a fleet the speed is that of the slowest, and

taking into consideration the incidents of naval war service, is it not probable that there can be determined a very probable serviceable fleet-speed for navies, than which two knots, more or less, at a given moment, will not greatly matter? That the Russian fleet, despite all disadvantage of heterogeneous units, of the long cruise, and protracted anchorages, without docking, was maintaining, on 27th May, a fleet-speed of at least twelve knots, while the Japanese seem not to have used more than fifteen, may afford some initial indications. No one is contending for no speed; but there are those who contend that speed is merely for bringing offensive power into play; that when it exceeds this, and expects to achieve success by running, it has small object, for the sea does not habitually, nor often, present positions at which, by anticipating an enemy, you achieve strategic effect. It sometimes does, but the rule is otherwise; and in the exceptional cases the observance of strategic considerations of position and interior lines will often, as in Togo's recent action, accomplish quite as much as higher speed. In short, at sea, speed falls within the province of evading the enemy; offensive power within than of crushing him.

The question of primary and secondary batteries also is not one of compromise, except as defined above. The one or the other must have its superiority admitted, and the inferior be discarded or duly subordinated. As this question supposes the fleets in presence, it is tactical, not strategical. I have already advanced the arguments in the matter, and now will only draw attention to the fact that here again speed, being an essential feature of ships that are to abandon secondaries, entails, necessarily, and avowedly, evading, keeping at long range; a system which never has worked historically. In tactics also, as in strategy, superiority of speed may be more than compensated by dispositions on the ground, as I hope to have illustrated by the incidents off Tsushima. Just at present, however, speed is continuously being gained without apparent sacrifice of aggregate gun power, by the simple but ruinous procedure of increasing size indefinitely; had still more been gained by sacrificing gun power, as in the armoured cruiser, there would have been increased necessity of evasion.

The ever-increasing size and startling cost of the battle-ship brings us also face to face with the opposing considerations of numbers and reduction of expense. That the relative cost of the larger ship is less than that of the smaller, that expenditure increases at a smaller ratio than tonnage, as stated, only partially qualifies the fact of the absolute increase, and does not at all modify the ultimate effect upon the numbers of the fleet. Budgets not being illimitable in size, there results between numbers and individual cost of ship an opposition, in the adjustment of which, as in that between speed and offensive power, there should be no compromise. The superior claim of the one or the other should be admitted; and when admitted, enforced in practice. A nation with wide naval responsibilities must have numbers in proportion; and this consideration is greatly reinforced by another, advanced before this war and confirmed by it, that naval war henceforward will be marked by greater losses of material than of *personnel*; that reserves of ships will be more needed than reserves of men. The exigency of renewing coal supply works in the same direction. When not able to coal in the open, ships must be more frequently sent to the base to re-coal. This means a greater number

of ships in order to maintain a given minimum on the cruising station. The bigger and fewer the ships, the greater the proportionate loss when one goes into port.

In most matters of dispute a concrete illustration is worth many words, and in this matter of compromise we have such in the armoured cruiser; a true compromise, if ever there was one. The very words "armoured" and "cruiser" are in direct opposition, as one might say "heavy light cavalry." The type discards unity of design, and deliberately embraces a double purpose. A cruiser should be like a bird of prey, of strong wing and rapid flight, which seeks not equals, but inferiors. The cruiser, whether for scouting, or for commerce destruction, or the carriage of messages, needs swift and long continued motion; that is, speed and coal endurance. As these two qualities should, in the battle-ship, be—not ignored—but subordinated to fighting power, so in the cruiser gun-power and armour are to be subordinated, and in the main discarded, so long as they interfere materially with the essential unity of design, to which speed and coal endurance both contribute. I am particularly glad to use this illustration; for it will serve better than any elaborate protest to show that opposition to the present breathless increase of speed in battle-ships proceeds not from any depreciation of speed as such, but from the conviction that in every class of naval vessel there should first of all, and first and last, throughout her design, be the recognition of her purpose in war. All other necessary qualities should be regarded as merely ministering to this one purpose, which in battle-ships is offensive power exerted in fleets, and in cruisers long continued speed, in vessels meant to act for the most part singly. As to numbers of cruisers, no fleet ever yet had enough of them, to scatter wherever needed.