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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LESSONS OF THE JAPANESE WAR.

The capture of Port Arthur marks the tragic close of the first stage of the Russo-Japanese war; for although, as we pointed out in these columns a few weeks ago, the destruction of the Port Arthur fleet was the primary object of the investment, the capture of the fortress itself will be looked upon by the world at large as being, thus far, the most signal success of the war. It is superfluous to speak in praise of the heroism displayed by all ranks of the besiegers and the besieged. The story of the siege, as it appeared in the daily press, speaks for itself. In the display of desperate courage the siege of Port Arthur may have been equaled in some notable sieges of history, but it is certain that it has never been surpassed. Port Arthur bore the reputation of being one of the most impregnable of fortresses. The topography of the surrounding country was admirably adapted for defensive works, and its fortifications were constructed according to the latest theories of military engineering. It was defended by intelligent officers and disciplined and hardy troops, yet its fall has taken place within five months from the time it was closely invested, or in three to four months shorter time than it took the allied armies of England and France to reduce Sevastopol. Evidently the fortifications cannot be built that must not give way ultimately to sapping and mining. If the invading force has a sufficient reserve of men to make good the losses, it is only a question of time when zigzag trenches will be carried up sufficiently close to the walls of the fortification to enable the tunnels to be driven and the high-explosive mines laid that will blow the most massive parapets to pieces, and leave the fort open to be taken by storm. It is the trench and the mine that brought about the fall of Port Arthur. Another lesson of the siege is that in planning harbor fortifications too much attention cannot be given to laying out adequate defenses on the land side. It cannot be denied that many of the seacoast fortifications of the United States, unassailable though they be from the sea, are entirely open to successful attack by land.

THE TORPEDO BOAT.—Of the naval lessons of the war, surely the most valuable, and certainly the most surprising, is the comparative inefficiency of the torpedo boat. In not a single case has the torpedo boat been able to send a warship to the bottom. In the first attack at Port Arthur, although the Russian ships were at anchor and totally unprepared, the two battleships and the cruiser that were squarely torpedoed remained afloat, and were able, next morning, to steam in and beach themselves for investigation and repair of the damage. The only possible exception was the cruiser "Boyarin," and in her case it is possible that it was a floating mine and not a torpedo from a destroyer that sank her. It seems to be impossible for a torpedo boat to get within range, either by day or by night, of a warship that is on the alert; and when she does, the chances of making a hit are very remote. In the various engagements, torpedoes appeared to have been fired by the score without finding the mark (except in the night surprise of February 8), a notable case being that of the battleship "Czarevitch," which, after being terribly crippled by the concentrated fire of four Japanese battleships, and with her speed cut down to 4 knots an hour, was subjected to a night attack by the Japanese destroyers, and yet seems to have been able to beat them off and to make port the next morning without being once struck by a torpedo. By all the laws of torpedo-boat warfare, she should have been sent to the bottom in short order. On the other hand, the destroyers have developed unexpected ability for doing duties which were supposed to belong to the cruiser of 2,000 to 5,000 tons displacement. They have kept the sea, and have done splendid scouting work in all weathers. The future destroyer will probably be of from 500 to 600 tons displacement, and to her will fall, very largely, the picket and scouting duties which previously were supposed to be beyond her legitimate sphere of work.

THE BATTLESHIP.—No less surprising than the bursting of the torpedo-boat bubble is the remarkable ability developed by the battleship and large cruiser to receive the blow of the torpedo without being permanently crippled. Battleships and even cruisers have been torpedoed, and therefore (theoretically) destroyed, only to appear in a few weeks' time in the fighting line, apparently capable of putting up a stubborn fight of many hours' duration. In the sortie of August 10 there were four Russian battleships and one cruiser, that had previously been either torpedoed or struck by floating mines. Yet they were able to keep station for hours and steam at good speed in spite of a deadly hail of 12-inch shells from the Japanese fleet. Even more remarkable does the indestructibility of the battleship by the torpedo appear, when we remember that the repairs to the damaged ships were executed in a beleaguered harbor that was subject to the plunging shell fire of the enemy. Furthermore, some of the ships that stood the hammering of that long afternoon fight of August 10 had been mined or torpedoed and repaired more than once during the previous few months of the siege.

Surely the most ardent advocate of the torpedo and the torpedo boat will now admit that the battleship has won out in a fair fight between the two; and probably from this time on we shall hear very little talk about the abolition of the great fighting ship and the substitution of a mosquito fleet of destroyers. Not only has the battleship demonstrated its powers of successful resistance against what was supposed to be the most stupendous destructive engine of modern times; but it has proved itself to be, on every possible point of comparison, the supreme fighting unit of modern naval warfare. In all the operations under Togo, the battleship has formed the floating base from which the protected cruisers and the various flotillas of torpedo boats have operated. When the stress of battle came, it was the foot-thick armor on waterline and turrets that enabled the battleship squadron to stand up against the heaviest artillery of the enemy; and it was the 12-inch guns of the battleships that time and again drove the Russian fleet into Port Arthur, finally holding it there until the siege mortars of the Japanese army completed the work of destruction. What armor plate and cellular and compartment subdivision have done for the defense of the battleship, the heavy-caliber gun has accomplished, as its means of attack. More, even, than in Napoleon's day is it true that "Providence is on the side of the heavy artillery;" and the Japanese with their rare military instinct have been the first to realize that the victory of the future will lie with the ship that carries the biggest guns and the best gunners, and that can show the highest speed. Modern face-hardened armor has done everything that was asked of it. As far as is known at present, no gun protected by heavy armor has been put out of action by the penetration of that armor; and it will probably be revealed when the war is over that the "shots below the waterline," to quote the Russian dispatches, by which several of their ships were disabled, were plunging projectiles, which, striking the water just before they reached the ship, retained sufficient velocity on reaching the hull below the armor belt, to penetrate the shell of the vessel. If this be so, we shall probably see the belt armor extended a foot or two deeper below the waterline.

THE ARMORED CRUISER.—Another fighting unit that has vindicated its design is the armored cruiser. Of this type the Japanese navy possessed eight at the opening of the war, and they have all been conspicuously employed in the various operations. They have taken part in the bombardments of Port Arthur, and in the various naval engagements, two, at least, of them taking their place in the first line with the battleships, and placing their 8-inch shells with telling effect on the Russian ships. The destruction of the Vladivostock fleet was accomplished by the armored cruiser division under Kammimura. Judging from the frequency with which practically every one of these eight ships has been mentioned during the war, they seem to have done continuous duty—a fact that speaks well for their endurance, particularly when we remember that at one time or another they have probably all come under the fire of the heavy guns both of the Russian fortifications and the battleships.

THE MAN BEHIND THE GUN.—If asked to name the most important lesson of the war, at least on the naval side of it, we answer without hesitation that it is the supreme importance of an efficient personnel. The officers must be absolute masters of the theory and practice of their profession, and the men must be subject to the most rigid discipline, and possessed of unbounded faith in their officers. The events of the war have proved to a demonstration that the Japanese personnel is as conspicuous in these qualities as the Russian personnel is deficient in them. To this fact first and last is to be attributed the unbroken success of the one navy, and the unending string of disasters that has befallen the other. At the opening of the war there was little to choose in fighting efficiency, at least on paper, between the two fleets. The navy was composed of some of the very best ships the genius of Russian, French, and American shipbuilding yards could design and turn out; and its complete annihilation in the brief period of a few months' time, is due to the almost total lack of that technical knowledge and those sailorly qualities without the possession of which Russia may as well give up once and for all her dream of becoming a great naval power.

PERFORMANCE OF FRENCH AND AMERICAN LOCOMOTIVES COMPARED.

In view of the statements which appeared in the European press a few years ago, to the effect that the American-built locomotives imported into Europe had proved to be extravagant in consumption of fuel and oil, the report of recent tests of locomotive performance on French state railroads will be found to be satisfactory, and largely contradictory of these statements. In the current issue of the SUPPLEMENT we publish an article from one of our French correspondents, giving the gist of the results obtained. The comparison is of value, because the conditions under which it was made were such as to render the results obtained reliable; although some allowance must be made for the fact that the perfect acquaintance of the engineers with the French type of locomotives, and their unfamiliarity with the imported American type, must, at least in the earlier days of their service, have militated somewhat against the latter. The comparison was made between two French engines, one of which was of the celebrated De Glehn compound type, and two American locomotives, one of the simple type, and the other the Vauclain four-cylinder compound. The coal consumption per horse-power, contrary to the generally-accepted opinion, is shown by these tests to be about the same for the American as for the foreign locomotives, the American compound burning 3.3 pounds of coal per horse-power per hour as compared with the consumption of 3.24 pounds for the French De Glehn engine, and the consumption of the American simple engine being about the same as that of the French simple engine, the respective figures being 4.45 pounds and 4.40 pounds per horse-power per hour. The criticisms of the American locomotives made by Mr. Nadal, who had charge of the tests, are that they showed a low boiler efficiency; that there was excessive priming; that the steam is not utilized so economically in the cylinders; that while the American piston valves have certain undoubted advantages, they are difficult to keep tight, causing much loss by steam leakage; and that in consequence of less careful construction, the internal resistance of the American locomotive is greater than that of the French type. In a thoughtful discussion of these tests, the Railroad Gazette draws attention to the fact that the French single-expansion engine averaged 575 horse-power, or 85 per cent of the normal power, which is 675 horse-power, while the competing American single-expansion engine did the same work, developing 575 horse-power; but that this is only about 63 per cent of its normal power, and, therefore, it was not working under such economic conditions as its competitor. Regarding the utilization of the steam in the cylinders, Mr. Nadal is of the opinion that the cylinder economy of the American engines would be as good as that of the French engines if, instead of cutting off at 40 to 50 per cent of the stroke, they cut off at 20 to 30 per cent, which is the French practice. He recognizes the fact that the American engine is worked harder, and that it is considered in this country that the saving of fuel should not be made at the expense of ability to haul heavy trains. The American compound developed superior drawbar pull at high speed; for while the De Glehn compound shows a falling off of nearly 50 per cent, as the speed rises from 30 to 60 miles an hour, the reduction in the Vauclain compound is only 21½ per cent.

In an apparatus for ascertaining the effect of pressure on magnetic induction, Mr. F. C. Frisbie uses rings of iron placed in a box of iron having walls 2 inches thick. Resin oil is forced in and pressure applied to the inside by a screw plunger, the pressure obtainable being 18,000 pounds per square inch. Using a steady field it is found that increase of pressure up to 16,000 pounds per square inch increases the magnetic induction by from 0.5 per cent to 3.0 per cent, according to the primary field used. But using steady pressure, it is found, in general, that for an unannealed specimen, increase of field first decreases induction to 1 per cent, and then increases it until it becomes about 1 per cent total increase. When the specimen is annealed, there is the same initial decrease but less pronounced subsequent increase. Besides the above results, it is found that hydrostatic pressure alters the amount of residual magnetism.