SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
Scientific American Building Monthly (Established 1885)..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 17, 1905.

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.

THE EFFECT OF THE WAR ON NAVAL CONSTRUCTION.

Among the many surprises of the Japanese war is the fact that it is likely to produce but few changes in naval construction. So true is this, that the results may be taken as a triumphant vindication of the theories upon which the navies of the world have been built up.

When the full technical story of the struggle comes to be written, and the facts regarding the behavior of the war material have been collected, and the lessons deduced therefrom, naval constructors will, no doubt, see where they can improve on existing designs; but it is safe to say that the improvements will consist in modifications of a minor character. Already the fact is recognized that the present distribution of the total displacement of a navy among battleships, armored cruisers, protected cruisers or scouts, and torpedo boats, is about the best that can be made, and that each type of vessel is admirably adapted to the particular work which it has to do.

This result has the twofold effect of strengthening the confidence of the naval architect in his work and of giving a flat rebuke to the thousand-and-one naval cranks, who decry the big battleship and cruiser, and tell us that the torpedo boat and the submarine are destined to revolutionize naval construction, and sweep our big ships from the high seas. As a matter of fact, naval construction is a process, not of spasmodic revolution, but of steady and consistent evolution. By the strict law of the survival of the fittest has the battleship grown to its present huge proportions, and taken its place as the secure foundation upon which the whole structure of the navy is built up.

In the matter of details, however, there will be changes. The fleet action of August 10 (described in the SUPPLEMENT of December 31, 1904, and the SCIENTIFIC AMERICAN of March 11, 1905) was carried on, from the opening of the battle shortly after noon until 3 o'clock, at a range which was never less than six miles. In the second phase of the engagement the battle reopened at a range of four miles, and the distance between the ships was not reduced to two miles (which was hitherto supposed to be the probable battle range) until about an hour before the close of the fight. Now, at distances of from four to nine miles, at which last-named range, according to Capt. von Essen, the battle opened, only 10-inch and 12-inch guns can be used to any effect. Moreover, the greater the range the greater the advantage to the expert gunners; and hence it will be found that in the future the tendency will be to discard in our battleships, and to a less extent perhaps in our cruisers, any guns below a caliber of say 9.25 inches. Already, indeed, England is building two battleships which carry 9.2 guns in place of 6-inch guns in the secondary battery.

Armor, if of good quality, has proved wonderfully efficient, and, as far as we can learn, the cases of penetration of armor are very few. Probably we shall see in the future a disposition to reduce the thickness of the armor, and utilize the weight thus saved by increasing the armament. Or, if that be not done, the armor will be extended over a wider surface. It would be odd if we should come back to the type of the French "Dupuy de Lome," built some fifteen years ago, which was completely clothed with armor over the whole of the topsides and well down below the waterline. As a method of protection to the guns and crews, turrets are preferable to casemates. They have the objection that they are liable to become jammed by shell fragments; but this could be overcome by giving heavier protection in the wake of the turntable.

A serious problem that may well occupy the attention of our naval constructors is the protection of the uptakes and smokestacks. A high-explosive shell, bursting within a smokestack, tears it asunder, giving it the appearance of a burst steam pipe. When this happens, it is impossible to maintain steam in the boilers; speed is cut down; and the ship is at the mercy of her opponent. It is not unlikely that the practice which some navies have followed of armoring the base of the smokestacks, will be widely followed, and that the protection will be carried up to a greater height. This will be costly on displacement, and will have a serious effect on stability, but it will probably be done.

The torpedo boat has neither gained nor lost in reputation by the war, at least in the estimate of naval experts. It has done neither more nor less than they expected it to. Up to the Battle of the Sea of Japan not a single battleship had been sunk by a torpedo boat in action; and we shall have to await the arrival of authentic details to be sure that such a thing happened in Korea Straits.

The steering gear is another vital point which the searching fire of the Japanese has reached at times with disastrous effect. Several steering stations must be installed. In this connection, we are reminded of a portable electric steering wheel, which was described to the Editor by Lord Crawford during his recent visit. It consists of a circular disk with contact points, which may be carried to any part of the ship, even to the masthead if desired, and attached to electric cables which lead to the electric steering wheel. If, as in the case of the "Czarevitch" in the battle of August 10, the conning-tower steering gear becomes disabled, the portable gear can be carried to some other post on the ship, and immediately attached to the steering-gear wiring.

This duplication of parts might well be carried out with regard to other elements of control and direction, such for instance as the range finders. Both vertical and horizontal range lines should be established on every ship, and more than one of each, if possible. This is rendered necessary by the fact that the tendency, so common in this war, to overshoot, has resulted in the fighting tops or platforms on which the vertical range finders are established being swept by a storm of shell. To preserve the integrity of the range-finding apparatus should be one of the naval constructor's very first endeavors.

Finally, as a precaution against the formidable menace of mines, and the less formidable menace of the torpedo, something must certainly be done to more fully protect the flotation of the warship. The Germans have taken up this problem already, and are out with a design for a double-double bottom, one within the other. The idea is a good one, did it not make such inroads on the displacement. It will be necessary to adopt the double bottom, or go in for a greater subdivision of compartments. More numerous compartments would involve enormous inconvenience in the working of the ship, and would be costly in displacement. However, measures of some kind will have to be taken, for the very first desideratum in a fighting ship is that she shall float.

It can readily be seen that the modifications above mentioned all imply an increase in weight and size. Battleships, we venture to say, will in the future grow larger, not less, and they will unquestionably continue to be the most numerous and important type among the ships of the navy of the future.

FAST LONG-DISTANCE TRAINS.

The announcement by both the New York Central and the Pennsylvania systems that they are about to put on an eighteen-hour train to Chicago will bring to the public mind the fact that these two companies each placed in service two or three years ago a twenty-hour train between the same cities. The Pennsylvania Railroad system ran its train for some months, and after a checkered career it was taken off, for the ostensible reason that it interfered with other traffic. The New York Central train has continued in service, running with remarkable regularity. The Pennsylvania system has been spending large sums of money in reducing the heavy grades and sharp curvature on its mountain division, and the changes in location have led to a reduction of the total distance from Jersey City to Chicago to 904.4 miles. The total distance over the New York Central route is 959.15 miles, a difference of over 50 miles in favor of the Pennsylvania route. On the other hand, while the grades and curvature on the New York Central system are comparatively easy, those on the Pennsylvania route, especially where it passes through the mountains, are heavy and continuous.

Because of the longer distance traveled it is likely that the fastest speed over long distances will have to be maintained by the New York Central flyer, and that the credit of possessing the fastest long-distance train in the world will continue to belong to the latter system.

The question of the continuance of a fast service of this kind, is one for the public to decide. If these trains are well patronized, they will continue to run; and should the demand for this class of service become general, we may look to see not one but several eighteen-hour trains running between New York and Chicago. Both of these great railroad systems are well equipped for running these fast trains day by day with perfect regularity, and the practicability of such a service depends entirely upon the question as to whether it can be made to pay.

As to which train will give the steadier and smoother running, there can be no doubt that the New York Central, because of the absence of any mountain division, will be at a decided advantage.

In running over its mountain division the Pennsylvania flyer, if it is to be on time, will have to negotiate the curves at a speed for which no amount of superelevation of the outer rail can fully compensate, and "rail-sickness" may claim its victims. Moreover, the three-tie suspension joint of the New York Central system, in which an extra tie is placed immediately beneath the joint, entirely removes that persistent "hammering" which is such an ever-present nuisance on some fast expresses.

VENTILATION OF THE SUBWAY.

During the construction of the New York Rapid Transit Subway, the SCIENTIFIC AMERICAN frequently drew attention to the fact that one of the most serious and difficult problems connected with the undertaking, was that of ventilation. At that time we contended that for the circulation and renewal of air within the tunnel something more would be required than the piston-like action of the trains, which the engineers believed would prove sufficient for the purpose. After the opening of the Subway we were agreeably surprised to find that, although a moving train filled only about one-fourth of the cross-sectional area of the four-track tunnel, it proved sufficient to produce strong currents, which caused a liberal inflow and outflow of air at the station entrances. Moreover, the renewal of the Subway atmosphere thus brought about was greatly assisted by the action of the easterly and westerly winds at the Subway entrances and exits, the strong downward current at the entrances facing the wind and the equally strong upward currents at the opposite entrances facing away from the wind, clearly proving that a very thorough circulation of air was taking place, at least at the stations. Nevertheless, now that the warm weather has come, it cannot be denied that the condition of the atmosphere in the Subway is very disappointing. That the oppressiveness is not altogether due to lack of circulation and renewal of the air, is proved by the fact that the air currents at the entrances and on the platforms are as strong in the warm as they were in the cold weather. Just what the unpleasant symptoms are due to is a question difficult to determine, but they are probably caused by the increased temperature acting upon the naturally humid atmosphere in the tunnel, and upon the odors due to exhalation from the enormous crowds that use the tunnel, especially at the rush hours.

Much of the discomfort is due to the fact that a refreshing drop in temperature on the street is not felt until some hours afterward in the Subway, and a person entering from the cooler outside atmosphere is apt to suppose that the heated air is an evidence of vitiated atmosphere. The problem of properly ventilating the system will be one of the most difficult yet undertaken by the engineer. Some relief may be obtained by installing a system of fans, but it would have to be put in upon a very costly scale before it would add materially to the renewal of air that is now taking place at the station entrances. It is of course unreasonable to expect that travelers in the Subway will enjoy as pure an atmosphere as that of the elevated system; but if the oppressive symptoms continue to increase as the midsummer heat comes on, some steps will certainly have to be taken to mitigate the nuisance.

THE SUBMARINE BOAT DISASTERS.

The recurrence of fatal explosions on board the English submarines, to say nothing of some of less fatal character that have occurred in our own and other navies, must go far to shake the faith of naval officers in this type of craft. The explosion referred to in our own navy happened when one of our boats was making a trip down to Southern waters. The submarine did not founder, but the injuries to the crew were serious. The trouble was attributed to the accumulation of explosive gases within the vessel. Later, in February last, a shocking disaster happened to the British submarine A5, which blew up off Queenstown, six of her crew being killed and twelve seriously injured. While a rescuing party were getting out the victims, a second explosion occurred, causing further injuries. And now there come from the other side the tidings of an accident of a similar character, but accompanied with a more terrible loss of life. While submarine A8, which is of the same type as A5, was engaged in practice outside Plymouth breakwater, three distinct explosions were heard, and the vessel, which seems to have been lying at the surface with hatches open, sank in several fathoms of water. According to telegraphic reports, the explosion could not have been fatal to all on board, as signals were made some time after she went down, stating that she was submerged and could not come to the surface. Subsequently to this there was evidence of another explosion, and all hope for the fourteen men that went down with her was abandoned. In this connection we are reminded that another British submarine, known as A1, was struck by a steamship while engaged in maneuvers last year, and sank with a loss of all her crew.