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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1026.

For the Week Ending August 31, 1895.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

It is now forty-five years since this important association held its first meeting, under the presidency of Professor Edward Hitchcock. That was in Philadelphia, where the next meeting also was held. Annual meetings have been held ever since, in Boston, New Haven, Cincinnati, Albany, Cleveland, Washington, Montreal, Indianapolis, Toronto, Rochester, New York, Brooklyn, and other cities, mostly in the Northern States, although it was originally intended to alternate between the North and the South. One reason for the preference for the cooler latitudes is that it has been found necessary to hold the meetings during the summer vacation in order to accommodate the members connected with colleges and schools.

There are now 2,000 members enrolled, including nearly every eminent scientist in America, besides many persons who would claim only to be friends of scientific aims and pursuits. The attendance on the annual meetings varies from 200 to 1,000 members, besides the large number of casual visitors attracted to the public lectures and social entertainments. It is eminently a popular organization, aiming at the "advancement of science" by influencing the minds of the multitude, and seeking to stimulate scientific research far beyond the bounds of its limited membership.

It is now fifteen years since the A. A. A. S. has met in New England, although its official home is at Salem, Mass., and it was incorporated by a special act of the legislature of Massachusetts. It seems appropriate, therefore, that this year its anniversary should be held in the charming city of Springfield, where it convenes from August 28 to September 5, with excursions to follow and with affiliated societies meeting both before and after. At first the discussions and papers were all in general session. But as the work broadened it was found necessary to divide into nine sections, representing Mathematics and Astronomy, Physics, Chemistry, Mechanical Science and Engineering, Geology and Geography, Zoology, Botany, Anthropology, and Economic Science and Statistics. Even this subdivision was found to be insufficient, and the affiliated societies referred to were formed, namely, the Geological Society of America; the Society for Promotion of Agriculture; the Entomological Society; the Society of Engineers: the American Chemical Society; the American Forestry Association; the Association of State Weather Service, and the Botanical and other clubs, all of which usually meet during the association week.

Yet daily general meetings are held, for the election of officers, hearing of reports, and transaction of general business. Two or more free evening lectures are also given complimentary to the citizens of the locality, and there is free admission to the public addresses made by the president and the vice presidents.

The citizens of Springfield have made ample preparations for welcoming the large body of scientific guests who are expected this week, and many plans have been laid for their entertainment. The general sessions are held in the Y. M. C. A. building; the presidential address will be given in the Court Square Theater; and the general reception will be in the City Hall. The hotel headquarters are at the Worthy Hotel. Various neighboring cities have extended invitations and arranged for excursions enabling the guests to visit many points of scenic, historic, or scientific interest.

THE LESSONS OF THE BATTLE OF THE YALU.

The current number of the Century contains a graphic account of this battle, written by an eyewitness and active participant, Philo N. McGiffen, who was in command of the battle ship Chen Yuen on that memorable occasion. He disclaims all intention of giving a technical account of the action, and wishes his readers to regard the description as a series of vivid impressions, received in the midst of five hours of the most terrific artillery duel the world had ever seen. Whatever may have been the writer's intention, he has certainly given us a series of war pictures that are not merely fraught with tragic interest to the lay reader, but are also full of valuable lessons for the future guidance of the professional naval designer.

For the past forty years, or ever since armor was first placed upon a warship's sides, the science of warship design has been almost entirely theoretical. The nations of the earth have poured their wealth like water into the naval treasury, and the naval boards have spent it faster than it came to hand. Huge navies have been created on purely theoretical lines, and just how far these theories were correct and just what was the relative value of the many and diversified types of ships, guns and armor, no one, not even the experts, could tell.

It is true there had been a naval fight at Lissa, in which the ram, that classic weapon of Greece and Rome, had demonstrated its deadly power; it is true that the Chile-Peru war has produced one memorable sea fight in which gun contended with armor; and again, in the sinking of the Blanco Encalada, the torpedo, under modifying circumstances, showed that theory had proceeded along the right lines and had produced a weapon of appalling destructive power; but yet, taken for all in all, the experience gained had been very meager, in comparison to the thousand and one questions that were awaiting solution.

This solution was expected to come in the breaking out of the long-expected European war. To the surprise of every one, it was in the East, and not in the West, that the test was made. It was the semi-civilized races of the East that taught the Western nations the true value of their modern guns, ships and armor.

It has been contended that the test is not conclusive; that on the part of one, at least, of the combatants there was too much cowardice, irresolution and general incompetency, to render the results of much technical value. But we think that any one who reads this account by an eye-witness of the cool, dogged bravery of the Chinese gunners above deck and the Chinese engineers below deck; the one decimated by a murderous tempest of quick-fire shell, and the other slowly roasted in an engine room temperature of 200° (see description), we think that any reader must admit that the two Chinese ironclads were fought for all there was in them, and that the results of the fight furnish us with reliable data for future designs.

The chief interest of the battle centers in the two Chinese ironclads and the principal squadron of the Japanese. They fought out the fight all to themselves; the flying squadron of the Japanese, consisting of the lighter and swifter cruisers, directing their attention to the lighter armed Chinese ships. It was just such a test as the naval world had been looking for—swift, unarmored or lightly armored ships against slower but heavily armored battle ships. The four ships constituting the principal squadron were armed with one 12½ inch gun placed forward, amidships, in an armored barbette, and a secondary battery of lighter quick-fire guns. This 12½ inch gun is, in some respects, the most formidable gun afloat. Built by Canet, in France, it has extreme length, great velocity, and has a theoretical penetration at the muzzle of 50 inches of iron! Theoretically, the shot from this gun should have ripped the Chinese ships from end to end, and have pierced their 10 inch and 14 inch armor like so much cardboard. What are the facts? Says Commander McGiffen: "We were struck both on the 14 inch belt and 10 inch conning tower by the 12½ inch shells," but "no shot penetrated more than four inches." So that, if this be true (and the authority, surely, places it beyond question), the comparatively light and somewhat out of date armor of the Chen Yuen had about 70 per cent of resisting power to spare against the most powerful penetration of modern ordnance!

This proves to us what the writer has long believed, viz., that penetration as shown at the proving grounds will always be vastly in excess of the actual penetration in time of battle. The test shot is always fired normal to the plate, but in action not one shot in one hundred will strike normal to the plates on the curved, oblique, or spherical armored portions of a battle ship. With every degree of deviation from the normal at the point of impact, the shot has to travel that much further to pass in a diagonal line through the plate; and there is an extreme angle at which it will refuse to "bite" at all, and will glance away, inflicting comparatively little damage. Unquestionably this is what happened in the majority of cases where the shots struck the armored portions of the Chinese ships.

Another lesson of the fight is that a heavily armored barbette, placed high above the water line, and resting upon a light unarmored substructure, is a mistake. The opponents of this system of construction, which is to be found in the Admiral class of Great Britain's navy, and in the turrets of the 8 inch guns in our own battle ships Indiana and Oregon, have claimed that a well-directed shell, placed beneath the floor of these barbettes, would wreck the whole gun and mountings, and disable the gunners. This is precisely what happened when the Chinese Chen Yuen, by a well-directed shot at 1,700 meters from her 12 inch gun, killed 49 and wounded 50 men on the Japanese Matsushima, and totally disabled her 12½ inch gun, which was mounted as above described.

Though the heavy guns fell so far below their theoretical effectiveness, the larger class of quick-fire guns, the 4·7 inch and 6 inch, proved to be fully as terrible in their destructive effect as was anticipated. At distances varying from 1,000 to 3,000 meters they poured in a perfect tempest of armor-piercing shells, against which the light 1 inch and 2 inch shields of the Chinese were worse than useless. It seems that these light shields are a positive source of danger to the gun crews they are supposed to protect. Too weak to keep out the quick-fire shells, they are yet stout enough to give the percussion necessary to explode the shells that pass through them. These shields thus became, in the words of Commander McGiffen, "veritable man-traps." They simply inclosed the flying fragments of the bursting shells, and concentrated their destructive effect. So fully alive to this danger were the Chinese