

SCIENTIFIC WARFARE.

A few years ago we drew attention, in connection with Sir William Armstrong's celebrated letter to the *Times* on "Harbour Defence," to a novel method of mounting ordnance devised by Major Moncrieff. Sir W. Armstrong had urged in the strongest manner that some cheap but efficient means should be taken for affording protection to our open sea ports. He pointed out that in the case of Liverpool a single hostile ironclad might do incalculable mischief, destroy masses of merchantmen closely packed in docks, and burn large stacks of warehouses containing merchandise worth millions. The remedy proposed by Sir W. Armstrong was a system of floating gun carriages, each mounting a heavy rifled gun. Mr. George Rendel, of Elswick, had recently devised such a craft, named the *Staunch*, a vessel about 80 feet long, 25 feet beam, 6 feet draught, and 150 tons displacement. Sir William Armstrong's letter may be said to have called into existence our present *Hornet* fleet, of which the *Staunch* was the type. These vessels have no masts or rigging, but they are provided with twin screws and duplicate engines, and from their small draught are able to manoeuvre in very shallow waters, where they could not be approached by an ironclad. In estimating the value of these little ships, we cannot do better than quote the opinion Admiral Sir R. Spencer Robinson expressed in his evidence before the Committee on Designs. Referring to this class of vessel, he remarks: "That is the most admirable invention for defending or for attacking that ever existed; they are literally floating gun carriages, and it would be almost impossible to hit them. They have no speed, and perhaps could not do much by themselves, but attached to a fleet they are the most valuable class of boat we have, and I wish we had 100 of them." This strong opinion, coming as it did from such an authority, carried due weight, and, as before stated, we have now a standing increasing *Hornet* fleet, armed with 10-inch rifled guns of great power. In the *Staunch* type the gun is mounted on a moveable platform in the fore part of the boat and in a line with the keel. At the same time, to provide for heavy weather, the platform carrying the gun can be lowered into the hold, thus relieving the little vessel of its deck weight, and enabling it to carry its armament, when not in action, in the form of cargo. The operation of lowering the gun is effected by a powerful system of screw machinery driven by a small engine. In 1869 Major Moncrieff proposed a plan of raising and lowering a gun by what he termed hydro-pneumatic agency. The gun was mounted on a special carriage, which on recoil was to drive a piston into a cylinder filled with water, and communicating by a pipe with a reservoir, the lower half of which held water, and the upper half compressed air. Major Moncrieff argued that, under these conditions, the compressed air would act as a spring, and on being eased by a stopcock would return the piston, and thus the gun, to its original position. This plan theoretically appeared so promising that Sir W. Armstrong and Co. were induced to take it up in a practical manner, and to apply it to a gunboat of the *Staunch* class which they had under construction for the Dutch Government. On Sir W. Armstrong guaranteeing the successful application of hydraulic agency to the mounting of the gun, the Dutch Government—much to their credit—consented to the gun of the *Hydra* being mounted on the new system. The *Hydra* is a gunboat

of the *Staunch* type, with twin screws, duplicate engines of 50 horse power collectively, and 150 tons displacement. She mounts a 9-inch 12-ton Woolwich gun, firing a 250lb projectile, with a charge of 50lbs. On Friday last this vessel was minutely inspected in the *Tyne* by *Rear Admiral Lakhutchof*, the Russian naval attaché, Major General Dudley Wilmot, R. A., Lieut. Colonel Close, R. A., and Major Flett, R. E., the President and two members of the Moncrieff Committee, Captain Boys, R.N., of H. M. S. *Excellent*, Major Moncrieff, and the officers of the Dutch navy, who were specially employed in superintending the construction of the boat. The gun was repeatedly raised and lowered by the hydraulic machinery, with out firing. We must here allude to an important alteration in the original design which the Messrs. Armstrong found it necessary to adopt in working out the details of the machinery. The most prominent feature in Major Moncrieff's original proposal was the utilization of recoil. The force of recoil was to be stored up by using a counterweight, as in the case of the well known Moncrieff carriage. But Messrs. Armstrong appear to have found difficulties in applying this force, and have consequently adopted simple hydraulic machinery combined with an air accumulator similar in many respects to that used in hydraulic lifts and cranes. In the *Hydra*, therefore, the recoil of the gun is not utilized, and the gun is raised by a small pumping engine which communicates with the lifting presses. But although the principle of the utilization of recoil has been thus abandoned in the *Hydra*, much credit is due to Major Moncrieff for originality in his ingenious proposal, the main object of which was to secure all the advantages without the defects of the turret system. Thus, in advocating the adoption of a rising and falling gun, Major Moncrieff contemplates doing away with the top gunner represented by a turret weighing some 170 tons, while at the same time he thoroughly protects the gun except at the moment of firing, and secures an all-round barbetto fire. On Saturday the *Hydra*, the above named party with the exception of the Russian Admiral being on board, left her moorings off Elswick and steamed down to the mouth of the *Tyne*. She here went through all the operations of loading, laying and firing with complete success. Four rounds of battering charges, and three rounds of service charges were fired, the gun throughout being worked by three men, one of whom, the captain, had the means of governing the whole movements not only of the gun but of the vessel. By touching one lever the monster rose from his lair and exhibited his black muzzle over the bulwark. Another lever, communicating with the ship's rudder, afforded the means of bringing the weapon in line with the object, while the pressure of the key of a magneto electric apparatus fired the gun, which then plunged back into the hold. Here it was rapidly reloaded. Again it rose, vomited forth a stream of fire and slowly descended. The whole time occupied by the two rounds being about a minute and a half. All these operations, with the exception of the actual loading, were performed by one man, under cover of a steam cylindrical iron shield, which protects the operator from rifle bullets or small fragments of shell, and which, carried over the opening in the deck through which the gun rises and falls, keeps out water in case of a heavy sea. A system, however, of hydraulic loading has also been perfected by Mr. George Rendel, and, altogether, we may now assume that the application of hydraulic power as an agent for

raising, lowering, loading and working the heaviest ordnance has been successfully worked out by Sir William Armstrong & Co. — *London Globe*, July 22.

THE BRITISH NAVY.

The strength of the British navy is almost beyond comprehension. The old ships which Nelson and others used with such terrible effect could not, were they all assembled in one fleet, fight the *Devastation* alone with a spark of success. They might pour in their shot, but it would fall like rain from the massive sides of the ironclad, and was to them when struck by a charge of one of the 35 ton guns. The first ironclad, the *Warrior*, was built in 1860, and Captain Semmes, of the *Alabama*, said of her that she, single handed, could destroy the whole naval force of the United States. Then came her sister the *Black Prince*, armed with thirty-two 68 pounders, and capable of being worked at 5,700 horse power. The *Achilles* next came off the stocks, more heavily armoured than her predecessors, and with a tonnage of nearly 10,000 tons. The *Hector* was launched in 1862. It was discovered that in this class of ironclads the draught of water was so great as to prove an inconvenience; accordingly monsters of a new fashion were constructed. The first of this second class were the *Agincourt* and *Northumberland*, whose dimensions were increased far beyond that of the vessels of the first class, thus reducing the tonnage and allowing the building of heavier armor. Each of these vessels is 400 feet long, of nearly 7,000 horse power, and with 5½ inch plates. The *Lord Clyde*, and *Bellerophon* are also of this class. Meantime some of the best of the old line of battleships were rapidly converted into ironclads, the *Prince Consort*, the *Royal Sovereign*, and the *Enterprise* being of this class. In 1867 the controversy between the friends of the broadside and turret systems set in, and the construction of new ships was carried on with great activity. The authorities were determined that at whatever cost England should have the best type of an ironclad. In a very short space of time the *Monarch*, the *Captain* (since lost), the *Hercules*, the *Sultan* and the *Audacious* were produced by the turret system, carrying four 25 ton guns and wearing 8-inch, and in some parts 10-inch plates. Their engines are capable of being worked up to 8,500 horse power. Another class is composed of the *Defence* and *Resistance*, throwing a broadside of 640 and 1,250 pounds respectively. In 1871 the *Glatten* was launched. This vessel is designed chiefly for action against first class ports and fortresses. Her armament consists of two 25-ton guns, carried in one turret. The *Glatten* alone of all the fleet has been actually tested, firing experiments having been made upon her. The ordeal was a severe one; but the damage done to her turret even by the heaviest guns was comparatively insignificant. The giant of them all, however, is the *Devastation*. She carries four 35 ton guns, disposed in two revolving turrets, the object in her design being "to produce a ship combining powers of offence and defence greater than those possessed by any two ships she was likely to meet." All the important parts of this ship are covered with 12-inch armor. To provide for an all-round fire from her turrets, masts, yards and rigging were dispensed with, and she relies entirely upon her engines. She carries 1,700 tons of coal, equal to eighteen days supply when she is running ten knots an hour. Besides these monsters, there are the *Caledonia*, the *Hot*