

BROADSWORD EXERCISE ON MEN-OF-WAR.

Since the old days when vessels fought on the Spanish Main, after the adversaries had hulled each other until one of the vessels was hors de combat, "boarding" was resorted to. The sailors, literally armed to the teeth, for they often carried knives in their mouths, rushed upon the deck of the doomed vessel and with pistol, cutlass and knife fought to the death. These days are pretty much over and now when the boarding party reaches the vessel the ship has usually surrendered and the sailors are only needed to police it. Their comrades stand at the deadly rapid-fire and machine guns, and any attempt at interference with the boarding party would result in the deck of the ship being swept by a hail that nothing could withstand. It might be supposed that our modern methods of warfare, deadly though they are, would have relegated the cutlass to the limbo of things forgotten, but this is not the case, for there are still many occasions where sailors could use them effectively, as in landing troops on a hostile shore, and broadsword exercise is regarded by naval officers as an excellent means of keeping their men in a good physical condition.

To-day we really fight by machine, and the personal equation does not enter to any great degree as regards the larger part of the rank and file. It is obvious that in a battleship, where the bulk of the heavy work is done by some fifty distinct engines and electric motors, the occupation of the sailor is pretty well gone, unless he is also an engineer, electrician or mechanic, and there is no work aloft in modern warships provided with military masts. While this has undoubtedly limited the labors of the crew, it also makes it incumbent upon the officers to devise some substitute, so that the efficiency of the sailors shall not be impaired for lack of proper exercise which cannot be obtained in the ordinary routine, various drills have been devised. We have already

illustrated the "setting up" drill, both with and without arms (see the SCIENTIFIC AMERICAN, August 14, 1897), and we now show a broadsword drill between two pairs of sailors under the lee of one of the turrets of the "Terror." The exercise is exciting and is much enjoyed by the sailors, and has a great advantage over the "setting up" drill, as the sailors exercise in pairs,

rifle with a turret mount and it is made on the "built-up" principle. Although many foreign gun makers have discarded the hooped gun, we still continue to make them, and our guns are inferior to none. The distinguishing feature of our American rifles is their great life, and one of the 10-inch guns on the "Miantonomoh" has been fired over a hundred times at the Indian Head proving grounds, and many more times after being placed on the ship. It is believed that the war with Spain will give data which may determine the average life of our 12 and 13-inch guns, but it is not expected that the war will last long enough to put any of our guns out of action on account of weakness caused by repeated firing. Out of all of the guns made at our Washington gun factory, not one has ever burst in service, while abroad gun accidents under service conditions are of not infrequent occurrence.

The navy of the United States has twenty-eight of these 13-inch guns. The battleships "Indiana," "Massachusetts," and "Oregon" have already been furnished with them, and the "Kearsarge," "Kentucky," "Alabama," and "Wisconsin" will each have four mounted in their two turrets. The gun is built of three parts, tube, jacket and hoops. The bore of the gun is formed of a tube which is of uniform diameter throughout, except where the powder chamber cuts it

away. The gun is built up around this tube by shrinking on bands which, while really smaller than the tube itself, are expanded by heat and then shrunk on, producing great compression; care is of course taken to prevent the tube from being compressed beyond its elastic limit. What is termed the "jacket" is another approximately cylindrical tube which is more than one-half as long as the gun. This reinforces the tube where it is cut away for the powder chamber and also gives the necessary support for anchoring the breech mechanism. The

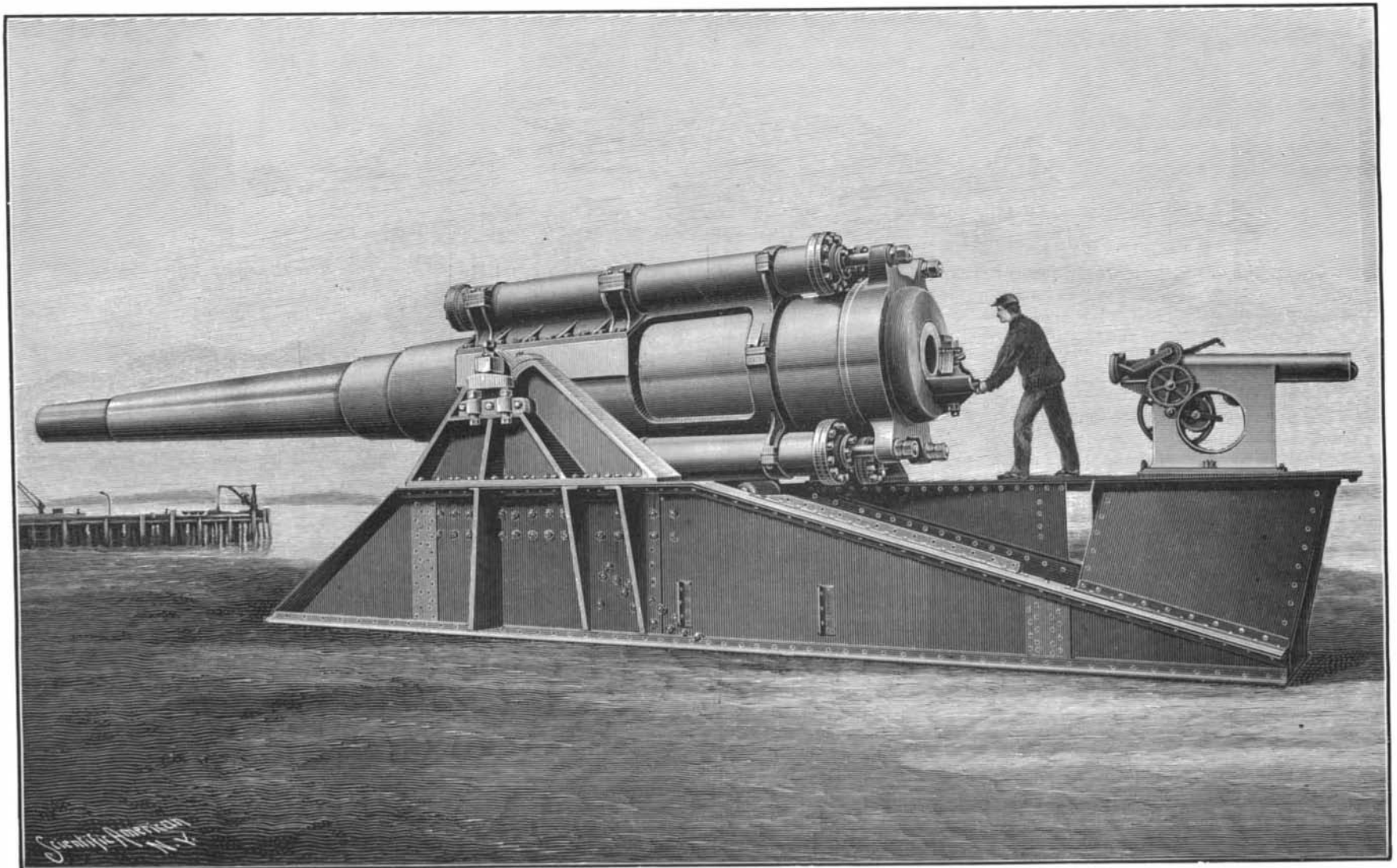


BROADSWORD EXERCISE ON THE MONITOR "TERROR."

thus introducing the personal element. Our engraving is reproduced from a photograph by Frank M. Boetler.

OUR NEW THIRTEEN-INCH GUNS.

The high power rifle of to-day is the crowning feature of the modern floating fort—a battleship. Although the old gun founders cast beautiful cannon of artistic design which modern ordnance cannot approach for beauty, still the modern gun, though exceedingly plain, is a work of the highest mechanical order. The gun shown in our engraving is a 13-inch



THIRTEEN-INCH NAVAL GUN WITH TURRET MOUNT AT THE INDIAN HEAD PROVING GROUNDS.