power of locomotion is dependent on accident; neither will it be the absurd turret ship with its principal weights on deck, the exact pattern of the unwieldly galleon of the sixteenth century, with castellated poops, forecastles, and low waists; but it will be what Major Moncrief has pointed out, a vessel of a good capacity with a shot and-shell-proof deck, under which her armament will be, and over which her guns will rise to deliver their fire and sink below when it is done. She will carry many guns and little armor, except on deck.

The philosophy of this system depends on the fact, that naval actions are not fought inside the smooth water of a port or under the shelter of a break water, but in an open seaway where the opposing vessels will have a list to port or starboard exposing more or less of the deck, and that is precisely the weak point of every ironclad yet constructed. No vessel at sea will lie on an even keel, hence the chance of hitting with rifled artillery is not greater than with the smooth-bore, for the motion of the gun-carriage and target are not the same, the roll and heel of any vessel being in proportion to her build and the disposition of her centre of gravity as well as of her rigging, spars, &c., if she have such appurtenances.

Russia and the United States, having the best deposits of iron in the world, will take the lead in producing cast-iron smooth-bore artillery for naval purposes. It is quite another question, however, whether either will under any circumstances become a great naval power. We think not. The constitutional aptitude of the people of both countries is entirely in another direction.

THE attention of our readers is directed to the following description of *Torpedo Engines* from the United States *Army and Navy Journal* of 7th December. The trial trip described took place on 21st November at the United States *Torpedo* Station, Goat Island, off Newport, R.I., in the presence of a distinguished party of officers of the United States Army and Navy. The vessel as described is 25 feet long, 2½ to 3 feet deep, and floats nearly submerged. The trial took place at high water. We have expressed a a very decided opinion as to the value of such means of defence, and there is nothing in the detailed experiment that would warrant our altering it.

A good deal has been written to prove the efficiency of the *Torpedo* as a weapon of warfare, but it has not materially improved since GIANABELLI attempted to blow up the bridge which ALEXANDER FARNESE had thrown across the Scheldt during the siege of Antwerp in 1587.

The readers of "MOTLEY'S" History of the *United Netherlands* won't find any material difference in the *modus operandi* on that occasion and in Mr. LAY'S experiment. The value of the machine in both cases is just the same whether operated by carbonic acid or clockwork. It may succeed once in ninety-nine times and with care can always be avoided.

Knowing what stress is laid on those experiments in England, and on the precedents furnished by the late internicine war in the States, we have collected material for a full history of recent experiments with submarine mines during that war, and shall give it to our readers as extracted from the United States' historical records.

It will be seen that the evidence is by no means favorable to the employment of the *torpedo* as an engine of defence, and it is totally against its offensive character, although it was tried under the most exceptional and favorable conditions for its success in both capacities in narrow rivers where it could be operated from either bank, and where its opponent had no choice but to go over it, or in shallow estuaries where the same conditions existed. On the whole, it was a decided failure.

"Mr. Lay's boat, the trial of which we described last week, as it appeared when resting on the ways ready to be launched for the experiment, is a cigar-shaped craft of boiler iron, twenty five feet long and pointed at both ends. At the stern is visible a screw propeller, and in the space beneath the sloping shell, forward of the screw, is the rudder, turning on a vertical post through the centre, instead of one end, of the rudder-blade. From the top of the shell rise two iron rods, near the bow and stern respectively. To the tops of these shielded lanterns may be fixed at night, enabling the navigator on shore to observe and direct the boat, while she remains comparatively invisible to the enemy. The bow contains a chamber for an explosive charge to be used when the boat itself is to be sacrificed for the destruction of an enemy's vessel; and if the charge is to be exploded by contact, as appears most suitable under the circumstances, percussion caps may be affixed to the tip itself, and to several nipples provided for the puspose. On other occasions torpedoes may be carried, as was the case in this trial, at the end of poles attached to the bow, and they may be exploded, to destroy small craft or remove obstructions, without detriment to the torpedo-boat.

"From the middle of the boat's bottom a double telegraph cable consisting of two insulated copper wires enclosed together in a gutta percha coating, proceeds to the galvanic batteries of the navigator. These comprise twelve Bunsen cups, enclosed on the present occasion in a wooden case resembling that of a hydrant. On the top of this case, which forms a convenient table are the dials and keys or levers by which the operator makes and breaks or reverses the currents of electricity passing over the two wires already mentioned. On one of these is marked at opposite points the words *port* and *starboard*, on the other *stop* and *start*. The intermediate position between port and starboard is one in which the key or lever completes no circuit, It is marked *steady*.

"This is all that can be seen beforehand. The boat having safely slid into the water and been fairly afloat, the signal was given to the operator to start the engine, and the little craft, her light greenish back scarcely visible above the water, moved away at the rate of about six knots an hour. The course was taken westward down the harbor, and maintained in this direction for about one third of a mile; then several turns were made to port and starboard, the boat obeying with great promptness the commands of the navigator, who stood on the shore watching the boat through a glass, and giving his orders to the operator at the dial. With equal promptness and ease, the engines were stopped or started at will. The boat can move in any direction except backward. There is no way of reversing the engines, though this could be provided if it were sufficiently important to justify the extra mechanism required.

"After the complete control of the navigator over the movements of the boat had been demonstrated to the satisfaction of all present, the order was given to return, and the boat came back with perhaps slightly diminished speed, and ran toward an old launch moored near a cluster of piles opposite the fort. It was intended to explode a torpedo against this launch, but a miscalculation of the course, or an unexpected eddy around the piles, caused the boat to swerve a little, and it was evident that she would neither strike the launch nor be able (by reason of the mooring rope) to pass between it and the piles. The engines were instantly stopped, and in a minute or so the boat had drifted clear, when she was started again, and this time struck the launch fairly, exploding the small torpedo carried at her bow. Some splinters flew, but the damage inflicted was not clearly visible, and as it had nothing to do with the question under trial, no one cared to inquire into it. The great point was the controllability of the torpedo boat, and this was triumphantly demonstrated. Questions of speed, power, and method of attack are important; but they are mere details of expense or policy in construction and management.

"The party then partook of an elegant collation at headquarters, after which it was announced that the interior of the torpedo boat could be inspected. We shall not undertake without the aid of drawings to explain to our readers the somewhat complicated details of mechanism and arrangement. It will be sufficient to point out the leading features of the plan.

"The boat is divided into compartments. At the bow is the compartment intended for the explosive mixture. Next follows a compartment containing strong wrought iron flasks filled with liquid carbonic acid. The pressure in these flasks is 600 pounds per square inch, but they are tested when manufactured, to bear 1,700 pounds. They contain when charged about 400 pounds of acid. In the next compartment is the reel of wire cable, which is paid out through the bottom as the boat moves. This chamber is accessible to the water; but the tight bulkheads on either side prevent the entrance of water into either of the adjoining compartments, except in one place where an adjusted cock, opens while the boat is moving, and closes when she stands still, admits water into an iron water-bottom under the flasks of carbonic acid, at a certain rate, just enough to preserve the uniform flotation of the craft, which would otherwise rise further and further out of water as the wire cable was reeled off.

"Forward of this reel compartment is that in which the driving and steering machinery is located. This consists of two electric batteries, "reducers" for the carbonic acid gas, and a pair of oscillating engines. Still further forward is the mechanism for steering, which will be presently explained.