

NASMYTH'S TORPEDO BOAT OF 1853.

More than forty years ago, to wit, February 19, 1853, the SCIENTIFIC AMERICAN published illustrations of James Nasmyth's torpedo boat, which presents several features of novelty, and we have thought it of sufficient interest to our readers to reproduce the description and illustrations as originally given by us. Peculiar interest attaches to this submarine boat of nearly half a century ago from the fact that a selection is soon to be made, by a board of examiners of the Navy Department, of a type of submarine vessel, for the construction of which Congress has appropriated \$200,000. Some fifty or more proposed plans have been examined, and the selection has, it is stated, been narrowed down to a choice between the Baker and the Holland types, the former of which has had some trials on the Detroit River and the latter in the waters near New York City. Both of these submarine boats have been illustrated and described in the SCIENTIFIC AMERICAN; the Baker boat, July 30, 1892, and the Holland boat experimented with also by Lieut. Zaslinsky, August 7, 1886. The following is the description:

"The annexed engravings are views of a floating, partly submerged propeller, torpedo vessel, proposed by James Nasmyth, of Patricroft, England, for

destroying large ships of an invading fleet. Fig. 1 shows the floating mortar, steered by the man at the sight hole, X, and shown attacking the enemy. Fig. 2 is an enlarged view of the great brass mortar and shell. The cap, C, explodes the instant it is brought in contact with the breech, R; this it does in consequence of the protruding end of the shell being crushed against the side of the enemy. The flange, SS, is just so strong as to resist any ordinary pressure, and is thereby made safe till crushed back by contact with the side of the enemy.

"Fig. 3 is a transverse section of the mortar. "Mr. Nasmyth is the inventor of the steam hammer, which bears his name, and various other useful inventions, and, besides, he is a first-rate astronomer and mathematician. The following is his own account of the invention, which was sent to the *Illustrated News*:

"The principles on which the arrangement and construction of the floating mortar is based consist, in the first place, of a monster self-exploding shell, so arranged as to explode on having its breech end crushed against the breech of the mortar, the self-exploding cap being situated there, as will be seen on reference to the engraving.

"In order to enhance the destructive effect upon the enemy's ship, the shell is so far submerged as to tear its way into the enemy six feet under water line.

"Next, to protect the shell from the effect of the water while resting in the chamber of the mortar, it is rendered waterproof by being inclosed within a perfectly watertight copper case, which will so effectively

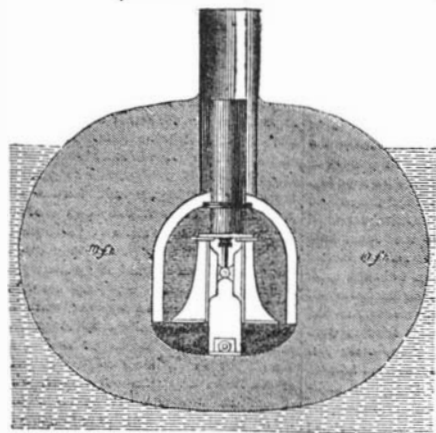


Fig. 2.

secure it from the action of the water as that it may remain, if need be, for years in the chamber of the mortar, submerged, as before said, six feet under water line, and ready for service at any time.

"The crush consequent on coming in contact with the side of the enemy is the agent whereby the monster shell is made to explode. A very moderate velocity of the floating mortar would, when brought up against the side of the enemy, prove sufficient for this purpose; so much so, that, in order to obviate the chance of its explosion by accidental contact with any other object, I have so placed the flange joint of the copper case against the mouth of the mortar that the crush against the side of the enemy, resulting from a speed of two

or three miles per hour, shall be sufficient to overcome the resistance of this flange, and crush the self-exploding cap at the breech end of the shell against that of the mortar, and so cause it to explode and tear its fearful way through the side of the enemy. Thus it will be evident that we can never fail to render the shell effective, inasmuch as that it is the very fact of contact with the side or hull of the enemy that brings the self-exploding agency into action. No ship that has ever been built, either wood or iron, could survive the fearful hole which a monster shell, exploded under such circumstances, would produce.

"The next feature is the intimate union of our mortar with the hull of the screw steam vessel, which

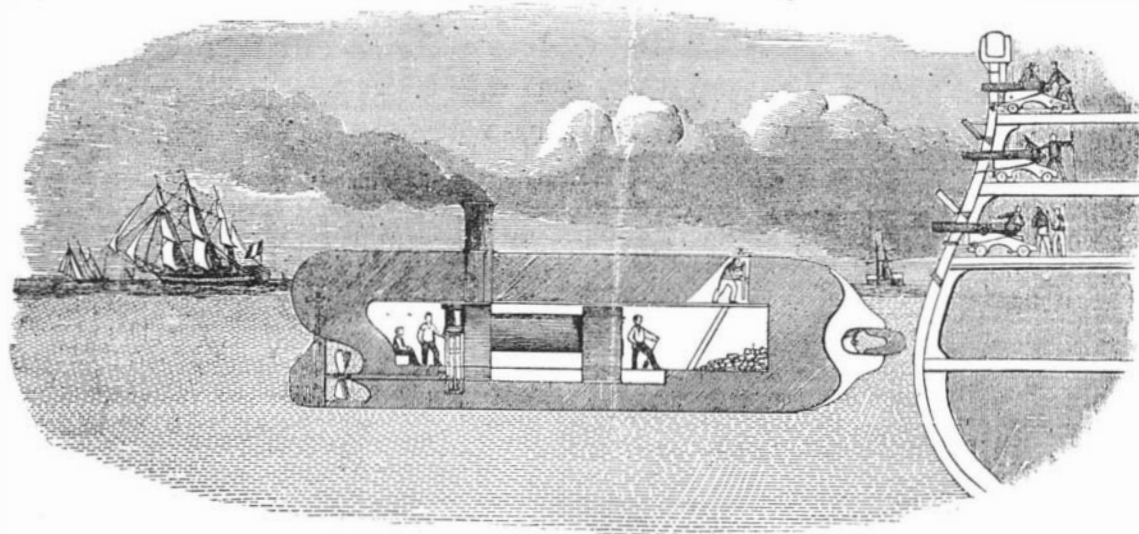


Fig. 1.—NASMYTH'S TORPEDO BOAT OF 1853.

transports it direct to the object which we desire to destroy. The mortar is (as will be seen on reference to the engraving) made part and parcel of the vessel, and so situated as to unite the most effective mechanical arrangement with the strongest position of the vessel, viz., 'end on,' so that the entire mass of our vessel (mortar and all) is brought into play, as the means whereby the concussion or recoil due to the explosion of the shell is absorbed by the entire mass of the floating mortar, so that no sensible recoil or concussion would be experienced.

"Next is the manner in which the crew who attend to the navigation of the floating mortar, together with the steam engine, boiler, and screw, are protected from the action of shot, whether red hot or cold. This object is attained by giving the vessel, in all directions where assailable, such a thickness of timber as that no shot, of whatsoever description, can penetrate to the interior. To insure this, the hull of our floating mortar will be made at least ten feet thick, of poplar wood, which material is admirably adapted for the purpose, by reason of its lightness, toughness, and incombustibility. Red hot shot might lodge in it, but would fail to set it on fire. A red hot shot would only char a few inches of the timber around it and cool at its leisure, and from the extent to which the hull would be submerged, the portion above water presents no surface favorable for the effective action of shot; while, as there will be most ample accommodation in the interior for a high pressure engine and boiler, with direct action screw propeller, there is nothing to prevent our obtaining a velocity of eight or nine miles an hour, although for the actual objects of the vessel a speed of five or six miles would be ample. The draught of the engine furnace would cause perfect ventilation for the crew, which need not consist of more than three or four handy men.

"I would observe, in conclusion, that as this class of vessel is chiefly designed for defense against invasion, and would not have to act against an enemy, probably, at greater distances than one or two miles from our shore, it could speedily return for another shell; the means for lodging which in the chamber of the submerged mortar are most simple, but not needful at present to describe. I conceive, however, that the total destruction of one enemy's ship at each trip would be sufficient service.

"Three or four such floating mortars, each of which sending to the bottom of the sea the largest ships an invading enemy might dare to bring toward our shore, would make such a demonstration as would strike terror into the largest fleet that molested a peaceful nation; and not fail to confirm the maxim, that the best way to prevent war is to render the results so terrible as that evil-disposed nations will think twice ere they face such wholesale destruction as our floating mortars would not fail to deal out to them.

"The fear of an invasion has been very strong in the minds of the people of Britain ever since Louis Napoleon became President of France, and at present the excitement, we can perceive, is approaching fever heat. It was said once that, 'A sight of the gray coat of Napoleon (the great we mean) was enough to set all Europe in an uproar.' We must say that England seems afraid now in trusting in her wooden walls,

and, instead of terrifying her foes by keeping watch and ward on their coasts, as she once did, she is keeping a sharp lookout for the defense of her own coasts by such water hogs as this of Mr. Nasmyth. Prudence, no doubt, is the better part of valor, but we apprehend that this vessel could very easily be taken prisoner by a few boats before it was permitted to drive its snout against the side of an invading warship. It, no doubt, could be used at night as well as during daylight; but at the same time, we must say that since Mr. Nasmyth has brought this subject before the public, invading ships will be prepared for it, as they now understand what it is. Torpedo submarine vessels are not new; more than one has been invented in America, and for

many years they formed a more interesting subject to Robert Fulton than his steamboat. He was furnished with means by Napoleon to blow up an English frigate, but failed, and after that Napoleon seemed to entertain a prejudice against him. Lord Cochran invented a torpedo submarine vessel, but nothing of any consequence, so far as we are informed, resulted from it, and never will, we suppose."

Genuine Vinegar.

In the British Pharmacopœia, *The Analyst* says, vinegar is defined as "an acid liquid, prepared from a mixture of malted and unmalted grain by the

acetous fermentation." The specific gravity is from 1.017 to 1.019, and it is to contain about 5.41 of real acetic acid (C₂H₃O₂).

The vinegar of the German Pharmacopœia is required to contain at least 6 per cent of absolute acetic acid. In Russia the minimum limit of strength is 5 per cent; in Austria, 6; in Belgium, 5.6; in France, 8 to 9; and in the United States, 4.6 per cent.

In 1874 the Society of Public Analysts adopted 3 per cent of real acetic acid as the minimum limit of strength for vinegar.* This limit certainly cannot be said to err on the side of too great stringency, and there have been very few prosecutions for the sale of vinegar containing less than this very moderate proportion of acetic acid.

With regard to the sale of vinegar, the pharmacist stands in a far more delicate position than the general dealer, for it might be argued, with some plausibility, that, when purchased of a registered pharmacist, an article recognized in the British Pharmacopœia ought to comply with the description of it given by that authority. This would limit the "vinegar" to be sold by pharmacists to the very best quality of malt vinegar; and if the B. P. definition of vinegar were legally applied to-day, a considerable proportion of the trade would probably be caught tripping.

With the single exception of Brant, who appears to hold that vinegar may be legitimately manufactured from wood acid, while admitting that the product is inferior to the fermentation acid, all the authorities above quoted agree in regarding true vinegar as an

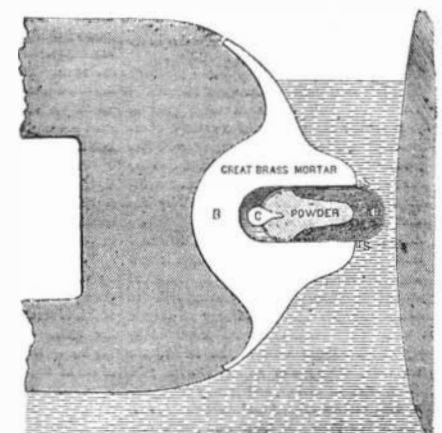


Fig. 3.

acid liquid produced by the acetous fermentation of alcoholic liquids, and consequently regard acetic acid from wood as not answering to the description of genuine vinegar.

It is said a female codfish will lay 45,000,000 eggs during a single season. Piscatorial authorities say that were it not for the work of the natural enemies of fish they would fill all the available space in the seas, rivers, and oceans.

* By the term "real acetic acid" there is good reason to believe the acetic anhydride was intended. Three per cent of (C₂H₃O)₂O corresponds to 883 per cent of (C₂H₃O)OH.—A. H. A.