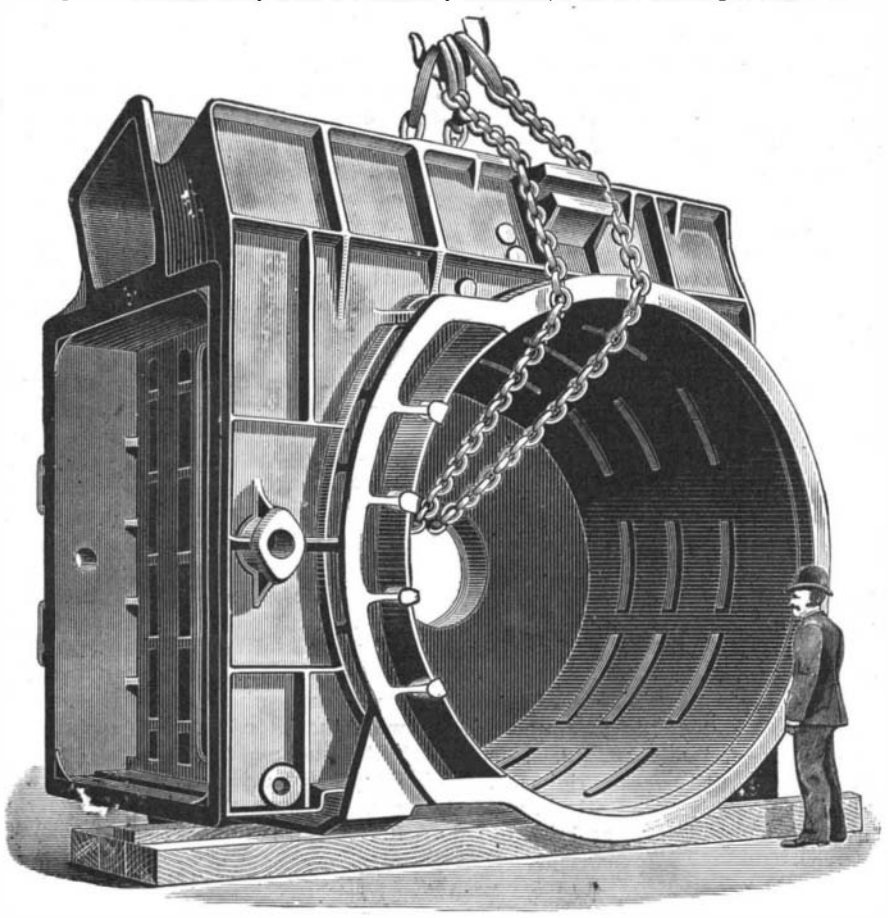
A LARGE CASTING.

The accompanying engraving from the *Engineer*, reduced from a photograph, shows a very large and fine casting, made by the Hyde Park Foundry Company, Glasgow. It is one of two large cylinders for a compound diagonal marine engine, and has been made to the order of the Fairfield Shipbuilding and Engineering Company—John Elder & Co. Each cylinder required forty tons of melted metal to cast it, and if, perhaps, we except the cylinders of the Ireland, Holyhead mail steamer, they are the heaviest ever made. Our engraving shows the cylinder without the liner, the working diameter of which inside is 112 in., with a stroke of 72 in. The finished weight of the cylinder with the liner in, lids, etc., will be about forty-two tons. The slide valve weighs fifty-nine hundredweight. The casting reflects much credit on the Hyde Park Foundry Company, which has had large experience in this kind of work, having turned out some of the heaviest castings ever made for marine engines.



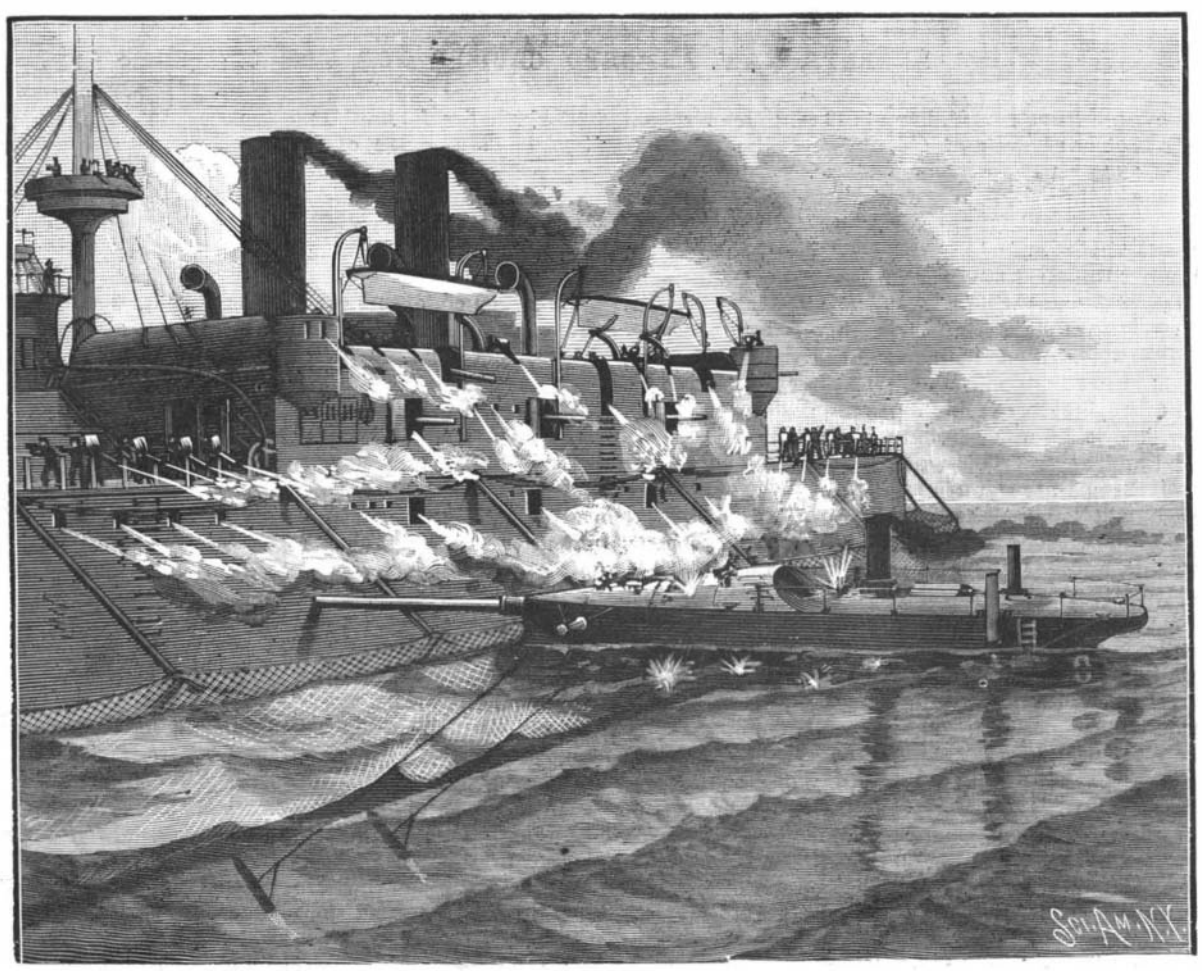
A LARGE CASTING.

THE BERDAN TORPEDO BOAT.

The history of attack and defense in war has, of late years, consisted in alternating phases of advance in one and the other art. As soon as a new gun or torpedo was invented, new and more impregnable vessels or forts were devised to meet its attacks. The stationary or tidal torpedo was the earliest of the forms of this weapon. To avoid or to ward it off nothing special was done, as it appeared a very uncertain instrument, and one not likely to be often used. As steam came into more general use, the torpedo was still easier to evade, until the idea of making it move by its own or by imparted power through the water was thought of. Then it became a more serious problem. Finally, when torpedo boats were introduced as a regular type of war vessel, the subject of defense was more earnestly considered. Ships were provided with nets; their bottoms were made cellular; improved apparatus for maneuvering the nets was supplied. To-day the torpedo must, in attacking a vessel, strike against it. A distant concussion cannot be relied on. Its striking point should be under the water. Above the load line the plating is so thick that an aerial torpedo would do comparatively little harm. To get at the vessel's bottom it must dive under a torpedo net, which may run down below the keel, and after diving must rise within the area of the net and explode as it strikes the bottom. This is the best that a torpedo can do. Even then it may not sink the vessel, as one somewhat celebrated test has recently shown. Yet if it can execute this maneuver with some speed, it will do the most that a torpedo can do, and will develop to the uttermost the peculiar powers of the missile. The speed must be held as a feature adding to the destructiveness of the missile. Any increase of momentum in a large torpedo will exercise some favorable influence on its powers of destruction.

In the illustration accompanying this article we show a torpedo system possessing many features of interest. It seems to be an advance, and a novel way of dealing with the torpedo net, similar in some respects to the pair of connected automobile torpedoes already devised for this end, and due to the same inventor. This system is far more practical, however, in the sense that isolated torpedoes are always uncertain. It is the invention of General Berdan, now of Washington, D. C., already well known for his inventions and improvements in torpedo practice. One of these, the one just spoken of, has already been illustrated in our columns.* The present invention may be termed its development.

A torpedo boat is fitted with two or more tubes that overhang the water far aft on either quarter. Their axes are approximately vertical. Each one holds a torpedo. From either torpedo a stout line is carried forward, and the ends are attached on starboard and port to snubbing posts that project over the water like catheads. If the torpedoes were fired from their tubes they would naturally descend, but by the rope would be forced to follow the arc of a circle, like the stone in a sling. The radius of this circle would be the length of the rope. The torpedo boat is fitted with a pole in the place usually occupied by the bowsprit. This projects a suitable distance from the bow, and is so arranged that if its end is pressed inward it will ignite the explosive and thereby expel the torpedoes. The latter do not depend entirely upon the original impulse for their speed. They are to be provided with four tubes containing rocket composition, each 6 inches in diameter and 32 inches long, with a 2 inch hole bored through the center of the composition, so as to expose a large burning surface. The composition in the tubes is ignited by the discharge, and forces the torpedoes through the water with greatly increased speed. It is calculated that their velocity may be as high as 30 knots an hour after and during immersion.



THE BERDAN TORPEDO BOAT.

The mode of using the system will be clear from what has been said. The torpedo boat, with her torpedoes in place, steams toward the vessel she is to attack. Her effort is to strike the discharging pole against it, by a species of ramming. This she must be able to do by being of high speed and easily handled. The instant she strikes the enemy the pole is driven back, and the torpedoes are discharged from their tubes. They dive down into the water nearly vertical. As they enter, the rocket powder begins to burn, and they swing around the arc of a circle with great speed, diving down under the torpedo net, rising within it, and striking the ship's bottom. The blow, by a percussion apparatus, explodes them, and the ship in almost any conceivable case would sink. All the conditions tend to the greatest possible efficiency of the torpedo s.

By adjusting the length of the pole, their period of release and discharge may be regulated. The inventor contemplates also the use of electricity or other supplemental means of firing them from the tubes, to be used in cases where it seems undesirable to wait for actual contact, or where it seems preferable to dispense with the discharging pole.

The tubes may be arranged a little off the vertical, so as to spread the torpedoes in their course. The system is not necessarily confined to a pair, as four or more may be used.

The connection with the snubbing posts is so arranged that should a torpedo miss the attacked vessel the fastening will give way as it rises to the surface, and it will fly away from the torpedo boat. In attacking a vessel at an angle, the outer torpedoes are disconnected and not discharged. The tubes from which the torpedoes are fired need not be very strong. They are made of metal heavy enough to resist machine guns. They are only calculated to impart an initial velocity of 50 feet per second. To prevent too severe a shock on striking a vessel, a pneumatic rammer is provided, capable of gradually resisting the impact for a range of about eight feet. The vessel otherwise is to be ram built, and to be provided with quick reversing gear for the screw. Smaller boats can be used as torpedo boat destroyers, in addition to large and powerful vessels for attacking ships. The size of the torpedoes as proposed is 8 feet long and 14 inches in diameter. They are to be charged with 200 pounds of compressed guncotton.

* See SCIENTIFIC AMERICAN, vol. liii, No. 13, p. 196.

Express Company's Liability—Loss of Package.

The Supreme Court of Pennsylvania recently affirmed a judgment of the Philadelphia Court of Common Pleas, sustaining a verdict for the plaintiff in the case of Holmes vs. Adams Express Company. In this case the plaintiff got a verdict for the full value of a lost package, although no value over $50 had been assigned to it and although the plaintiff offered no further proof of negligence on the part of the company than the non-delivery of the package. The Supreme Court said, in giving judgment in the case: If goods are lost or injured while in the custody of an express company, in the absence of evidence which rebuts the presumption of negligence it will be presumed that the loss or injury was occasioned by the company, and it will be liable for the actual value of the goods. In the present case no explanation was given for the failure to deliver the goods. So far as it is proved, they may still be in the hands of the company and withheld from the owner.

Mechanical News describes an ingenious means of repairing a break in a steam pipe: The break is bound with wood strips, laid close together, and well served around with stout cord or rope. Endwise separation is prevented by more rope crossing the break diagonally, and tied so as to draw the broken parts together. When the wood and the cord get wet with the steam, the joint is even tighter than before, for the wood swells and the cords shorten.