Tests of Holtzer Shot.

The initial test of Holtzer armor-piercing shot manufactured in the United States was made September 5 at Sandy Hook proving grounds. Two of the projectiles were fired at 9 inch armor plates. The Holtzer shot is the invention of M. Edouard O. Brustlin and the name Holtzer is derived from the name of the makers. The Midvale Steel Company, of Philadelphia, have obtained the exclusive right to manufacture the new projectile in the two Americas. The projectiles tested were 8 inches in diameter, 28·2 inches long, and weighed 300 pounds. The shot was fired from an 8 inch sea coast defense rifle, the armor plate being a nickel, oil tempered, and annealed steel plate, 8 feet 4 inches long and 6 feet wide. The plate was made by the Bethlehem Company. The approved charge was 100 pounds of brown prismatic powder, as this was found to produce the required velocity of 1,625 feet a second.

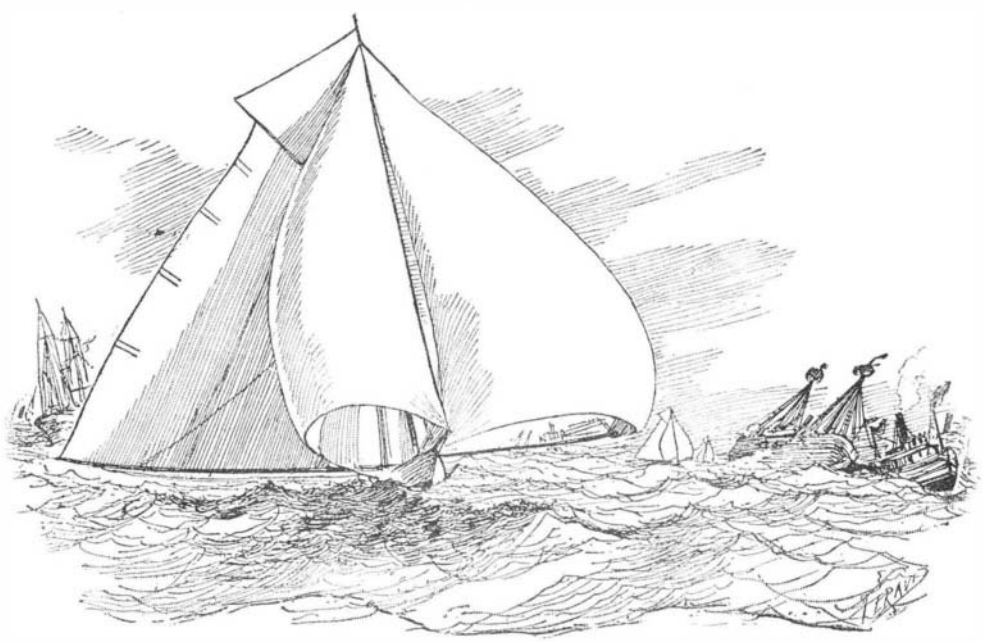
The first shot fired passed through the 9 inches of steel, 36 inches of oaken backing, and buried itself in the sand. The perforation in the plate somewhat resembled that made by an auger. Owing to the strain, some of the edges curled upward and outward and showed a blue tinge, which denoted that the force of impact had heated the plate to 600° F. There were no cracks radiating from the perforation, and the plate was regarded by the officers in charge as highly successful. The second shot developed the same chamber pressure as the first, 23,460 pounds to the inch, and the penetration was equally good. The workman found the second shot, and when measured it only showed a difference of five-thousandths of an inch in diameter and two-thousandths of an inch shorter. The sharp point was not blunted, and the shot could almost have been fired again if the rifling band of copper had not been injured. The test was considered highly successful, and a third shot was not fired. A series of lots of 8 and 10 inch shot will be submitted later on.

THE VIGILANT TO CONTEST THE INTERNATIONAL YACHT RACE.

The yacht selected to defend the America's cup against Lord Dunraven's Valkyrie is shown in the illustration as she appeared when crossing the line at the close of the last of the trial races, September 11. The Vigilant is of the deep centerboard type, and was built at Bristol, R. I., by the Herreshoffs. Her length over all is 124 feet, water line 86·12 feet, beam 26 feet, and draught 14 feet. Her displacement is about 140 tons. While her framework is of steel, the plating on her from the sheer strake down is of Tobin bronze. The rivets are also of bronze. Her bottom is, therefore, very smooth. The surface is kept free from barnacles and weeds, and is capable of acquiring a very high polish. The Vigilant is widest at the deck. On the ways she appears to be a boat with a great depth of keel, an easy bilge, a shoal body and a small displacement considering her dimensions She has an immense spread of canvas. According to the official measurement, her boom was 100 feet long; gaff, 54·76 feet; mast to jib stay, 74·85 feet; mast to jib topsail stay, 75·90 feet; length of spinnaker boom, 74·62 feet; perpendicular hoist for determining sail area, 122·28 feet; length of topmast, 56·88 feet.

The British yacht Valkyrie, which is to sail against the Vigilant, arrived at New York September 22, after the rather long voyage of thirty days from Southampton, England. The Valkyrie was designed by Mr. G. L. Watson.

She has a long, well shaped body, and looks to be a thorough racer. Her construction shows a radical departure from all English precedents. Her spar and sail plan are unlike anything before attempted by English designers. Her estimated dimensions are: Length over all, 126 feet; water line length, 85 feet; beam, 22 feet 6 inches; draught, 15 feet 6 inches; boom, 90 feet. Her bowsprit is only 16 feet long. Her mast is stepped well forward. In her races on the other side the Valkyrie has shown up better in light airs. She is strong to windward and fast on a reach. The harder it blows, the better she seems to like it. It is expected that the race will come off October 5, the course being at the entrance to New York Harbor. The contention is for the famous prize cup won by the yacht America, in a contest with a fleet of British yachts, off Cowes, England, in 1851, and which has since remained as a standing challenge for British yachtsmen, the latter having never yet been able to win it back, although they have earnestly striven to do so in many spirited races, which have been fully illustrated and described in the SCIENTIFIC AMERICAN.

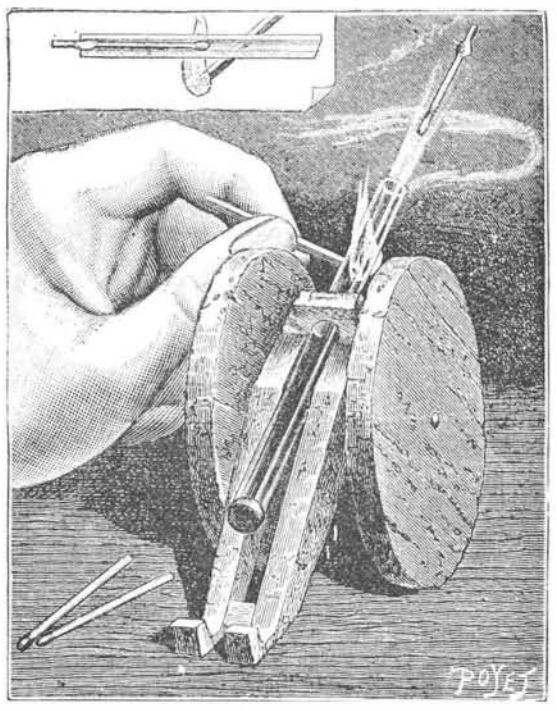


THE YACHT VIGILANT "CROSSING THE LINE," WINNER OF THE TRIAL RACES.

A TOY CANNON.

Let us take a glass tube three millimeters in diameter and about ten centimeters in length, and let us close one of its extremities with a little sealing wax. This will constitute our cannon.

On another hand, let us cut out from a sheet of cork a piece two centimeters square in which we shall form an aperture through which will pass our glass tube, the open extremity in front. Let us fasten this piece by means of pins to the extremity of two strips of cork cut into the shape of stocks, cheeks, and trail. Finally, by means of pins let us fix to the sides of the front square piece of cork two disks cut out of cardboard or



TOY CANNON.

sheet cork. Here we have our gun mounted upon its carriage. It now remains for us to procure the priming, load, wadding, and projectile. This will not take long, for we shall find the whole united in an object easily obtained, viz., a simple wax match. It is necessary to select wax matches with a blue extremity, which snap through friction, on account of the presence of a small quantity of chlorate of potash in the phosphorus paste.

Pinch the match between the thumb and forefinger of each hand, very near the end opposite the head, and break it in all directions, so as to cause the stearine to fall from the part between the fingers and expose the wick. Then bend toward each other the small and large ends that remain rigid, and expand the uncovered portion of the match and form a sort of tampion of it, as shown in the upper portion of the figure. The match being thus prepared, introduce it head first into the glass tube, and drive it in until the expanded portion of the wick forming a tampion closes the mouth of the tube. The closing should not be absolutely hermetical.

The gun is now loaded and ready to be fired. In order to effect the firing, place the flame of another match under the glass tube, heating more especially the portion in which the head of the match is located in the gun. Quite a strong detonation will at once be heard and the projectile will be seen flying in the midst of a light cloud of blue smoke. This projectile is represented by the wick of the match, which, after describing its trajectory, falls, at a distance of from five to six meters from the cannon, upon the floor, where it should be received upon a piece of paper as a precaution against spots.

Care should be taken to fix the wheels upon a visiting card by means of pins in order to prevent a recoil, which, moreover, will be manifested by a backward sliding of the glass tube in the piece of cork that serves it as a support.

Despite its frail appearance, this little gun is capable of firing a hundred shots without being put out of service. In case the chamber becomes foul, it may, when cool, be cleaned out with the little device used by smokers for their pipes.—*La Nature.*

Welding Rail Joints by Electricity.

In the course of a paper read before the American Street Railway Association, Mr. A. J. Moxham gave the results of experiments made at Johnstown, Pa., in the electric welding of very long rails. These experiments were carried out with rails jointed solidly and held by heavy fishplates, and they demonstrated that for street rails buried in the ground expansion could be neglected. Subsequently 3,000 ft. of line was welded solid, and although the track has been subject to a range of temperature of 30 deg., no linear or lateral motion has been observed. This line was laid in May, and the welds were made with a specially designed Thomson welder. Now, as mentioned in a previous issue, 16 miles of track at Cambridge are being welded. The track has been in constant use for two years, and the welding is being done without disturbing the track or paving, except to remove a few paving blocks at the rail joint. The rail is a heavy girder rail about 8 in. deep. The old fishplates are first removed, and the ends of the rails freed from rust and scale by a hand emery wheel on a flexible shaft and operated by an electric motor. A thin piece of steel of the same shape as the rail section is driven tightly between the rail ends to insure contact. Then the joint is ready for welding. The current necessary to the operation of the car and plant is taken from the trolley wire over the track. This current is employed directly to propel the car, to operate the derrick by which the welding machine is moved, to run the emery wheels before mentioned, and to actuate a large dynamotor inside the car. This machine takes the 500 volt direct current of the trolley wire and converts it into an alternating current of 300 volts potential. This alternating current is in turn conducted into a transformer, which reconverts it into a current estimated at four volts and 40,000 amperes. This current is then conducted from the transformer though 1,000 strips of copper to the secondary poles, and through the fishplates and the web of the rail. The forcing of this great current through the plates and rail causes heating sufficient to produce a white welding heat in two or three minutes. The poles in contact with the white-hot fishplates are kept cool by a jacketing of water circulated through pipes. When a welding heat is obtained the pressure is applied by a few revolutions of a hand wheel, and the fishplates are forced against and cemented to the web of the rail. This pressure is accomplished by a system of levers. The poles of the transformer, the tie plate, and the web of the rail are between the lever jaws. By such an arrangement of levers and screws a small force applied to the hand wheel exerts a pressure of 400,000 lb. at the weld. Under this pressure a union of the pieces is obtained and the welding completed. The current is then cut out, the machine is lifted by the electric derrick, and the operation is repeated at another joint.

Photography Afloat.

Photographers who practice their art afloat during the yachting season may be glad to know that negatives can be safely and effectually freed from hypo by soaking in sea water. I have treated many plates in this manner during the summer with perfect success. I rinse off the negative on removing it from the fixing bath, and then leave it for some hours or all night in a washing box attached by a line to my yacht as she lies at anchor.

The box is a simple affair, loaded with lead on the bottom, outside, so that its top is level with the water. Half inch holes are bored through the sides, with wire netting nailed over them to keep out eel grass and other floating matter which might damage the film. The plate lies on the bottom of the box, secured in place by buttons that come about an eighth of an inch over the edge. After this sea bath I rinse out the salt with three changes of water in a tray.

I do not advise an experiment with which I began—towing the box while under way; as the film was found at the rear end of the box in a state of pulp.

Boston, Sept. 11, 1893. A. D.