The Fastest Boat in the World.

A new steam torpedo boat, 100 feet long, 500 horsepower, has lately been tried in England, the officially recorded maximum speed attained being twenty-six miles an hour. This is believed to be the fastest vessel afloat. The vessel is able to carry coal and supplies enough to steam 1,000 miles and remain at sea for a week. She has two bow tubes for delivering torpedoes. With a fleet of such boats in readiness for action it would seem to be not a difficult task to defend maritime cities like New York and Brooklyn from the approach of the most powerful invading fleets. The new steamer is thus described by the *Engineer:*

On Wednesday, January 18, Admiral Brandreth, Controller of the Navy, Messrs. Morgan, Butler, and Allington, of the Admiralty, and several naval *attaches* of European powers, visited a torpedo boat brought up to Westminster Pier for the purpose by Mr. Yarrow, of Poplar. This craft may be regarded as the latest example of torpedo boat construction, and thus deserves more than a passing comment.

The experience acquired by Mr. Yarrow during years of successful construction of this type of vessel he has utilized continually, with the result of making his designs more and more perfect. The boat of which we are now speaking has been built for the Italian Government, and is of the largest size, being 100 feet long. She is of what is known as the Batoum class, and is very similar to many sent by Messrs. Yarrow to the Mediterranean, which have reached their destination in safety. She is propelled by a pair of compound engines capable of indicating about 500 horse power, steam being supplied by a boiler of the locomotive type. She has a two-bladed screw, the results of the experiments carried out by Messrs. Yarrow, and reported in our columns, showing that the two-bladed screw is better for high speeds than either the three or four-bladed propeller. This boat has attained the highest velocity ever reached by any vessel fully equipped and ready for action. Her measured mile speed is the highest ever officially recorded, namely, 22·46 knots, or very nearly 26 miles per hour. We believe, however, that in a private trial even this performance was slightly beaten. She is fitted with a bow rudder, by the aid of which she can be turned round almost in her own length; and the screw has been so designed as to give great backing power. This is regarded by all naval powers as a most important qualification, because in consequence of the extended use of machine guns, it is of the utmost importance to present as small a mark as possible to the enemy, and this can only be done by keeping bows on to the ship attacked. Immediately after the torpedo is discharged the boat goes ashore as quickly as possible, out of gun shot. The new boat is fitted with two tubes in the bows for discharging Whitehead torpedoes, so that she is a much more dangerous foe than the ordinary spar torpedo boats. She is steered from a point near the bows, the steersman being in a bullet-proof conning room; while the sloping deck forward is made of steel plates which would probably resist any but very heavy Nordenfelt or Gatling projectiles, so that the men engaged in getting the fish torpedoes ready for launching would be tolerably safe. The enormous velocity of the boat gives her a great advantage. It may be taken for granted that at a distance of one mile from a ship to be attacked she would be safe, and she need not approach nearer than 300 yards to discharge her projectile. Thus she would certainly have to remain under fire only while she was attacking. If she did not succeed, she would of course still be exposed to risk, but the chances are that she would succeed, when of course little more attention would be paid to her. But steaming at 22 knots an hour, she would be only in imminent danger for about 2¼ minutes, during which time her range would be continually altering, and it would not be by any means easy to hit her.

We have said that she is the fastest craft afloat, and it might be supposed that this result is due in some measure to her comparatively large dimensions. It is ordinarily assumed that, other things being equal, the larger a ship is the more easily will she be propelled; that is to say, that the resistance of a steamship does not increase so rapidly as her dimensions. This law holds good with torpedo boats up to about 15 knots; and Mr. Yarrow has found that at that speed a boat 100 feet long and displacing about 25 tons can be propelled with absolutely—not comparatively—less power than a boat displacing 15 tons. But after 15 knots have been reached a new law appears to come into operation, and the resistance of the 25 ton boat is just the same proportionately, or nearly the same, as that of a boat of 15 tons. This is another of the anomalous results obtained at exceptionally high velocities.

The most noteworthy novelty in the new boat is an arrangement extremely simple, but none the less ingenious, for preventing the fire being put out should the stokehole be drowned. In all torpedo boats previously built, if shot entered the stokehole, and made anything like a large aperture, the furnace would be quickly submerged, and the boat would be left a helpless log on the water. For those who are not well acquainted with the internal arrangements of torpedo boats, it is proper to explain that they are divided into watertight compartments, in which are inclosed the engines, the boiler, and the stokehole, in which the coal is carried in sacks. The stokehole is shut down by air-tight lids, and a fan forces air into it to maintain the draught, which is very intense. The end of the boiler is, so to speak, fixed in a bulkhead, and in this are made two flap doors. The pressure of air in the stokehole forces open these doors, and the air then enters the compartment in which the boiler is fixed and gets into the fire through the ash pit and bars. It will be understood that there is no communication whatever with the ash pan from the stokehole. If a boiler tube burst while the fire door was shut, the smoke-box doors might be blown open; but the rush of steam and water would be confined to the compartment in which the boiler is, and the firemen could not be hurt, because the flap doors before alluded to would close and shut off the stokehole from the boiler room. The last improvement introduced by Mr. Yarrow consists in carrying up the sides of the ash pan above the bottom of the boat for about 3 feet 9 inches. The utmost depth to which the water can rise in the stokehole is 3 feet 3 inches, representing about 11 tons, which sinks the boat some 7 inches. The water rises some way up on the fire door; but this door is made of the cupped form, and the edges are a good fit against the plate. The result is that but little water gets past it into the fire box, and what does is immediately evaporated, and gives no trouble. Thus, in case of accident, the stokers would have time to withdraw from the stokehole, leaving the fire door shut. The fire box readily holds half a ton of coal, and this will keep up steam for forty miles at a speed of ten knots.

As torpedo boats are not intended to go far from a harbor it is clear that an ample margin of power is thus provided to give the boat an excellent chance of escape. In the absence of this appliance, should water in quantity find its way into the stokehole, the fire would be extinguished, and the boat left to float like a helpless log, a ready prey to the most insignificant adversary. On Wednesday, as the boat lay beside Westminster Steamboat Pier, the stokehole was drowned several times without in any way affecting the fire. Indeed, the steam pressure kept rising, although much steam was needed for pumping the stokehole out, and the draught was of course not on, the hatch to the stokehole being open. This we regard as one of the most important improvements recently effected in torpedo boats.

We may add in conclusion that, as the little vessel is intended for service at sea, she has a neatly fitted cabin, with sofas, which will accommodate four officers, while forward as many as eight men can be berthed with tolerable comfort. It would be quite possible for such a vessel to remain at sea for a week; and it is worth notice that she can carry coal enough to steam about 1,000 miles at a moderate speed. She will probably go to the Mediterranean under steam.

ENGINEERING INVENTIONS.

An improved storage tank for petroleum has been patented by Mr. Francis H. Benton, of Renovo, Pa. A stationary tank, a washing reservoir, supported on top of the tank, a short pipe connecting the top of the tank with the bottom of the reservoir, and a conducting pipe extending from the top of the reservoir downward on the outside of the tank and underground.

An improved nut lock has been patented by Messrs. James C. Beamer and John M. Richardson, of Carthage. Mo. The invention consists of two plates of strong sheet iron or other suitable material, wide enough to cover the fish-bar, with each edge resting on the rail. Each plate is centrally slotted, and the edges of the slot are turned outward wide enough and long enough to stand out over both nuts in the end of a rail. These plates are connected at one end with a spiral spring, and their other ends are formed into hooks that go around and under the ends of the fish-bar.

Improved Steel Tire Car Wheels.

Mr. L. W. Washburn, of Allston, Mass., is the inventor of a mould and process for casting steel tire car wheels that is of late attracting considerable attention. The object of this invention is to cast wheels of two distinct metals in such manner that the difficulty experienced by wheelmakers from unequal contraction is entirely obviated. The operation consists in first casting the center or body of the wheel from anthracite iron. While this part of the wheel is assuming a semi-molten state and slowly shrinking, a metallic ring, forming the outside periphery or tread of the body portion, is removed and another metallic ring of larger inside diameter, having a small fire cope attached, substituted therefor, after which crucible steel, sufficiently high in carbon as to render its running perfectly solid, is cast through the small fire cope, striking the upper outside edge of the still white hot center or body, and partially remelting it, thereby enabling the cast steel tire to thoroughly unite with the soft iron center, completing a wheel that must of necessity shrink from the center or hub, thus preventing any liability of cracking from unequal contraction. Were it not for the difference in grain and color, the *National Car Builder* says, it would be an utter impossibility to detect the line of union between the two metals. These wheels have already made a record of 100,000 miles before the first turning, between Boston and Chicago, under Wagner sleeping cars, and are guaranteed to run 200,000 miles. Owing to its composition, this wheel can be made at a great deal less expense than the steel wheels, while it answers the same requirements. They are now made in Canada, but arrangements are being completed for their manufacture in the United States.

A Twenty-one-Inch Hawser.

A rope of extra large size has recently been made for a firm in New Zealand, where it is to be used in hauling up ships when they run aground on the soft mud bottom there, which they occasionally do. This rope is a 21-inch white manila hawser, 120 fathoms long, and composed of nine strands of 316 yarns to the strand. Another rope for the same purpose is a 15-inch hawser of the same material and length, and composed of nine strands with 164 yarns to the strand. When it is remembered that 12-inch ropes are the largest ordinarily made, the magnitude of those just described becomes apparent. The two ropes were manufactured by Messrs. Frost Brothers, of Shadwell, England.

How to Soften Hard Water.

At the recent Health Congress at Brighton, the Mayor (Alderman Hallett) read a paper on the above subject, in the course of which he said the benefits to arise from softening chalk water for drinking purposes was often discussed, but unless a water company undertook the task, consumers continued to drink the hard water as though no remedy was within their power. His object was to state a means by which softened water could be obtained with little trouble and at small expense.

It was more than a quarter of a century since Dr. Clark, of Aberdeen, made known his valuable invention, and, as the patent had expired, the application of the system was open to all who were disposed to make use of it. His description was substantially as follows:

The invention was a chemical one for expelling chalk by chalk. Chalk consisted—for every pound (16 oz.)—of lime, 9 oz.; of carbonic acid, 7 oz. Nine oz. of lime, which could be obtained by burning in a kiln, required at least 40 gallons of water to dissolve it. This was called lime water. Chalk was very sparingly soluble in water, so that one pound would require 5,000 gallons to dissolve it; but if there was combined with it an additional 7 ozs. of carbonic acid, the chalk became readily soluble in water, and when so dissolved it was called bicarbonate of lime. If the quantity of water containing the one pound of chalk, with 9 oz. additional of carbonic acid, were 400 gallons, then the solution would be a water of the same hardness as well water from the chalk strata, and not sensibly different in other respects.

Thus it appeared that one pound of chalk, scarcely soluble in it by either of two distinct chemical changes—soluble by being deprived entirely of its carbonic acid, when it was capable of changing water into lime water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate of lime.

Now, if a solution of the 9 oz. of burned lime, forming lime water, and another solution of the one pound of chalk and 7 oz. of carbonic acid, forming bicarbonate of lime, were mixed together, they would so act upon each other as to restore the two pounds of chalk, which would, after the mixture subsided, leave a bright water above. The water would be free from bicarbonate of lime; free from burned lime, and free from chalk, except a very little. A small residuum of the chalk remained, not separated by the process.

Of the 17½ grains in a gallon of water only 16 grains would be deposited and 1½ grains would remain. To soften water on a small scale, it was necessary to provide lime water about one-tenth of the quantity of water to be treated. He had used during the last twelve months two gallon stoneware casks with wooden taps. The casks were placed near a constant service tap; 1½ pints of lime water being first put in, the cask should be filled up to two gallons. After standing twenty-four hours, the supernatant water would be as clear as before, and at the bottom of the vessel would be found a precipitate of chalk.

The shape of the vessel would be better if cylindrical, with a tap hole a short distance up the side. This form of vessel would allow the process to be completed in twelve hours. The second cask or vessel was to form a reserve of the clear water which was being treated. He had been thus supplied without any difficulty.

There was no weighing of the lime required. If it was objected that the quantity was small, he answered, more casks could be used, or larger ones, so as to meet the requirements. This softening might easily be applied by laundresses by using larger casks, and the saving of soap would repay them for the little trouble.

Three years ago, when the Warren Industrial Farm School well was under discussion, it was said that soft water was a saving of many pounds per annum, compared with what would be the cost of using the town water. The town water was used now, and the time seemed to be come for the guardians to consider the use of a softening apparatus fitted for extensive use—Porter Clark's or the Atkins process.

The Sixth Report of the Rivers Commission (1874), page 205, put the saving in soap by the use of lime as follows: One cwt. of lime will do the work of 20¼ cwt. of soap; cost of one cwt. quicklime, 8d.; cost of 20¼ cwt. of soap, £47 1s. 8d. There was, therefore, very little question that the adoption of some mechanical means of mixing and rapidly filtering off the separated chalk would soon be paid for by the saving of soap.—*Journal of Gas Lighting.*

Antiseptic Properties of Essence of Wintergreen.

We see in the *Concours Médical*, that Professor Gosselin and Dr. Bergeron have experimented with oil or essence of gaultheria (*Gaultheria procumbens*), wintergreen, and have obtained good results from it, as an antiseptic in the dressing of sores. Essence of wintergreen is much used in perfumery; it has an agreeable odor, and is insoluble in water, but soluble in alcohol.

Two solutions are used by Professor Gosselin:

No. 1. Oil gaultheria, f. ʒ i¼; alcohol, 60°, f. ʒ xiiss.; and No. 2. Oil gaultheria, f. ʒ ⅝; alcohol, f. ℥ iij.–f. ʒ j; water, f. ʒ xiiss.