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No. 587.

For the Week Ending April 2, 1887.

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SHAM FIGHTING SHAMS.

The sham sea fight now being arranged by the French naval authorities at Toulon will have an additional interest because of the controversy which followed a like engagement a year ago, when a Board of Admirals, acting as umpires, decided that the torpedo boats had won a victory over modern cruisers and great guns. The decision created no little indignation among the captains commanding the squadron engaged, not one of whom was willing to admit a successful attack on the part of the *flotte torpilleur*.

Last year's sham battle was brought on by an attempt by torpedo boats to destroy or disperse the squadron blockading Toulon, under cover of which several fast cruisers, detained in the port, were to make their way out. As the ships could not actually be blown up, nor shell nor shot be thrown from the land works or the shipping, certain rules were agreed upon to decide when a ship or torpedo boat had been successfully attacked; the Board of Admirals deciding that when a torpedo boat was sighted through the smoke at a distance of one hundred meters, and fired upon, she should thenceforth be considered disabled and out of the fight, while, on the other hand, should she be laid aboard without that the enemy saw her, the ship was her prize as though destroyed by a torpedo.

The engagement opened at 2 A. M., at the first sign of dawn, and by the aid of his electric search lights the enemy outside was beginning to get his ranges fairly in hand, when the smoke of his guns, added to that made by the protecting shore batteries, brought down an impenetrable cloud upon the surrounding waters, and the torpedo boats, having succeeded in getting the exact compass bearing, each one that of the enemy she had singled out, together with the set of the current, dashed boldly out to the attack. When the signals from the judges' station indicated that all hands were engaged the fast cruisers, waiting with steam up for a chance to escape, sped noiselessly out.

The French commanders insist that they should have been permitted to use torpedo boats to beat off the hostile torpedo boats; and, further than this, they say that even if the torpedo boat attack was successful, the fact should not have been made public, for that it only serves to dishearten the sailors, who, let them once believe in the effectiveness of torpedo boat attack and the vulnerability of their ship, and their efficiency in time of action is sure to be seriously lessened.

This view seems, also, to be shared by the English naval authorities, who last summer, at Milford Haven, arranged a naval battle with, apparently, the single purpose of showing the bluejackets how futile is the resistance of torpedo boats to modern ships. A great boom of logs supporting heavy chains was stretched across the mouth of the harbor, and inside, presumably to protect it, a fleet of torpedo boats were gathered. The big Polyphemus, under full head, made a dash for the boom, forced it below the surface, and rode over it. Then was affixed a torpedo which tore it apart, and the enemy, in column, sailed triumphantly in.

But supposing the torpedo boats had not been carefully cooped up inside by the boom, but permitted to go out to the attack, which is their purpose—if they have any—might they not have interfered somewhat seriously with the procession?

There is reason to believe that, when the time for real work comes, the torpedo boat will prove a great surprise to the sham fighters.

THE NEW GUNS FOR THE NAVY.

By the acts of Congress approved August 3, 1886, and March 3, 1887, the sum of $3,120,362 is available for armament of the new vessels of the United States Navy, the monitors, cruisers, and others. The acquisition of the largest and most powerful guns made is contemplated in the granting of these appropriations. The question arises, therefore, What type of gun should be chosen? If we look abroad for a model, the heavy artillery of England, Germany, or France at once are suggested. The works of Armstrong and of Krupp, and the French establishments at Ruelle, St. Chamond, and Le Creusot, present themselves as the great gun factories of the world. Their names seem to guarantee the quality of their product. Basing their qualifications largely on the material used by these producers, the authorities of this country have called for steel of certain definite strength and ductility. The tendency is inevitably to be guided by European practice.

But criticism of this method of dealing with the question is not wanting. Facts that seem undeniable are cited which go to prove that the construction of large guns is not yet perfected. If this is true, it would suggest a field for independent work by the ordnance authorities of this country. We hardly seem justified in following blindly the lead of foreign constructors. The successful gun of the future may yet be an American production.

Many of Krupp's guns are known to have failed in war use. In the British House of Lords on April 30, 1876, the following statement was made by the Duke of Cambridge, Commander in Chief of the British Army: "Out of seventy heavy guns employed against the southwest of Paris (by the Germans), thirty-six were disabled during the first fortnight of the bombardment by the effect of their own fire." It is said that during the Franco-Prussian war two hundred Krupp guns burst, and that the German commanders thought that a week's further resistance by the French would have silenced the batteries bombarding Paris, as the attacking guns would have become disabled by their own discharges. The Italian government has rejected two of Krupp's 100-ton guns, after trying them at Spezia.

From France, similar accounts are received of the behavior of their ordnance under more recent trials. On June 4, 1884, a 24-centimeter (9 45-100 inches) steel gun burst at Havre on the fifth round. The breech was driven backward into an earthwork at the rear, while a portion weighing several tons was driven forward, and fell into the water. Other French guns cracked near the muzzle, and had to be reduced in length. It is reported, also, that during the past year several steel guns have failed, and produced disastrous accidents in their explosions.

In England failures have been numerous. A million of pounds sterling is annually spent upon artillery. Yet *Engineering*, one of the leading English technical journals, speaking of the English artillery says: "After all this, our guns are inferior to those of other nations, and are nearly as dangerous to those who fire them as to the enemy." In 1886 the English were making five 110-ton guns, eighteen 66-ton guns, and six 43 ton guns, in the words of *Engineering*, "all on the same plan as the gun which recently failed on the Collingwood with little more than half its proper charge of powder."

In last March, in the House of Commons, the following facts were cited: To one ship orders had been sent that her guns should only be fired under reduced charges; on another ship, out of nine guns, eight were unserviceable; an 80-ton gun had been sent home from Gibraltar to be repaired; a 9-inch 18-ton gun burst at Woolwich in testing powder; 135 guns were made on one plan, and seven of these burst, requiring a lower rating of charge and reduced initial velocity for the remainder. In a letter to the London *Times* last year, Capt. Robert H. Armit referred to the disabling of all of the 38-ton guns on the Ajax, and ended his letter by stating that "there does not exist a sound gun in the service." This was only one of his letters. So far had he gone in his condemnation, that an injunction was applied for by the makers of the guns, to restrain him, which relief was refused by the court, his criticisms being held to be "privileged communications."

These are some of the lessons furnished by foreign practice. They all possess one peculiarity: they teach us how "not to do it." But we cannot say that a successful and final type of heavy gun has yet been developed. The built-up guns are subjected to strains, molecular and mechanical, that tend to their ultimate disorganization. The powder heats the metal from the interior, expanding the tube and inner rings the most. These expand, not only radically, but longitudinally. On cooling, great resistance is offered to contraction by friction, so that a permanent injury is caused in many cases. The continual expansion and shrinkage have an inevitable tendency to disorganize the whole piece. The theory of the strength of a gun teaches that the metal nearest the bore does the most work in resisting the effect of the discharge. The useful effect of the metal, according to Professor Barlow, varies inversely with the square of its distance from the longitudinal axis of the piece. Thus, the outer layers do comparatively little, and should be, if anything, the softer and more expansible metal. To be of any effect, these layers should be in intimate contact with the inner. This statement would indicate a source of weakness in re-enforced guns. A ring shrunk on may be in such a state of tension as to be ready to part, yet its connection with the tube or ring below it is not as intimate as if it were part of the same metal.

As remedies for these evils, different cures have been suggested. Soft steel of low tensile strength is advocated by one engineer. Such steel is incapable of taking a temper, and is really wrought iron. It is naturally free from many of the defects of the higher steels. The latter crack more readily, and have not the lead-like toughness of the mildermetal. The lower tenacity called for seems a defect, but it is used as the index of the quality. A tough, weldable metal is inevitably of lower tenacity, and in defining this the other qualities go with it. A more radical remedy is proposed by a second engineer. He advocates the abandonment of all steel and the adoption of cast iron. This sounds like a step backward. Yet he fortifies his position with so many instances of what cast iron guns have done, that it is hard to resist the conclusion that they are at least worthy of a more extended trial. Their rifling may need special study, as the wearing of the bands has been one of their weak points. Other details may have to be worked up. But when it is considered that an integral piece is obtained at a minimum cost, the subject seems worthy of trial.

Some aluminum compounds could well be experimented with. The mitis castings might afford a good basis for work. Enough has been shown to indicate a good field for inventive genius, to which we hope our government will afford every encouragement. All we wish to suggest is that the field is still open for exploration; that, according to all accounts, the perfect gun has not yet been produced.

Black Birch an Ornamental Wood.

Three years ago, the writer built a dwelling house in the country. In selecting the woods for the interior of the house, his attention was called to some doors the builder, Mr. P. B. Fairchild, of Orange, N. J., had put into a house he had just finished for himself. Remarking that I had never seen black birch used before in the inside trimming of a house, but that I liked its fine grain and the handsome color of the wood, I decided that I wanted birch used at least in one of the rooms of the house about to be built. Mr. Fairchild thought the architect might object to its use, as it was not a wood much known to the trade; and then he related how he had selected it from a lot of odds and ends of lumber lying about his shop, more to get rid of an unsalable article than for its appropriateness or its beauty, and, that his new house was built principally out of odd lots of stuff which had been accumulating for a long time about his premises.

Subsequently, an interview with the architect resulted in getting him to go and see the house finished with birch doors and trimmings, which he admitted looked very well; but then he had never heard of birch being used before for any such purpose, and he had grave misgivings as to the result of the experiment if the birch was adopted. But without further argument, the architect consented to a trial of the new wood, and it was introduced into the wainscoting, doors, and fireplace of the dining-room, and it resulted most satisfactorily to all the parties having a voice in matter—the architect, the builder, and the owner.

Persons who may not know the nature and color of black birch after dressing and polishing may be interested in knowing that the grain of the wood is very close, the color mottled and slightly darker than satinwood. Black birch makes beautiful furniture, and the only complaint made against it for house trimmings is the care and extra time required in nailing the boards, to prevent splitting.

The above incident was brought to the writer's mind from seeing in a Western newspaper devoted to the lumber interests the following:

"The price of black birch of best quality has recently gone up from $7 to $95 per 1,000. The extraordinary advance is due to the discovery that boards cut out of the first logs are susceptible of a very high polish, and can be used for almost any purpose hitherto exclusively reserved for mahogany, which is worth about $250 a thousand. The advance has been expedited by the discovery that the best black walnut is giving out. Black walnut from Arkansas and the South is so porous that it is of very little use in furniture making. The best black birch is found almost exclusively on the barren copper and ore regions between Marquette and Ashland, where all other timber is stunted in growth and very poor. Here boards cut out of the butt, quickly assume a beautiful red tint on being exposed to the atmosphere, and can be polished up to a great degree of fineness."

Navigation of the Suez Canal at Night.

Art. 1.—From the 1st of March, 1887, and until further orders, steamers may be permitted to navigate the canal at night under the same conditions as are in force for navigation by day, and subject to the following regulations:

Art. 2.—Steamers intending to go through the canal at night must first satisfy the agents of the company in Port Said or Port Tewfik that they are provided—

1. Forward with an electric "projector," throwing a light 1,200 meters ahead. This projector must be placed as near as possible to the water line.

2. With an electric lamp and shade suspended above the upper deck, and powerful enough to light up a circular area of about 200 meters diameter.

The agents of the company will decide whether the apparatus fulfill the requirements of the regulations, so that ships provided with them may, without inconvenience, be authorized to navigate the canal at night.

Art. 3.—If a vessel, navigating by night, is ordered to get into a siding, she must, immediately on having done so, put out her electric lamps; but she must carry exclusively the regulation lights when in a siding at night, viz., forward and aft a white light, and a man on the lookout.

On the nearing of tugs, steam launches, hopper barges, etc., or of a ship empowered to pass her, she must show the side for free passage by exhibiting on such side two white lights.

Art. 4.—When two or more ships having electric lights are navigating at night in one and the same direction, and any one of them stops, she must at once hoist a red light at her mizzen-mast head, sounding at the same time her steam whistle sharply three times in close succession, repeating this at a few moments' interval until the ship following her repeats this signal, which shall be taken as an order to slacken speed at once, with a view to stopping, if need be.

Art. 5.—Dredges working at night must carry a red light at their head as long as they are not in a siding.

Art. 6.—As soon as a ship navigating by night finds herself three miles from a dredger at work in the canal, she must signal her approach by sending up three rockets in succession. This signal must be repeated until the dredger has replied. The dredger must reply with one rocket. As soon as the dredger is in the siding, she must replace the red light at her head by a white light, and place two additional white lights on her bulwarks on the channel side.

Dredges lighted by electricity must extinguish all their electric lights as soon as they are in a siding.

Art. 7.—The signals from sidings to ships navigating at night will be as follows:

1. Slacken speed.—Three white lights one above the other.

2. Get into the siding.—Two white lights one above the other.

3. Pass on.—One white light.

When the above signals are intended for a ship coming from the north, a fixed red light will be shown above them. On the contrary, this red light will be placed below them when intended for ships coming from the south.

FERDINAND DE LESSEPS,
President-Director of the Suez Maritime Canal Universal Company.

Heating Cars by Gas.

In applying his skill to the heating of railway carriages, Mr. William Foulis, M. Inst. C. E., the manager in chief to the Glasgow Corporation Gas Commissioners, takes advantage of the fact that large numbers of them are already fitted with various forms of gas lamps for supplying light; and his aim has been to bring the heat that is developed in the roof of the carriage while the gas is alight down to the floor of the compartment, so as thereby to keep the feet of the passengers comfortably warm, and the whole atmosphere of the compartment at an agreeable temperature. He uses water as the medium for transmitting the heat of the gas flame from the one place to the other. A boiler is placed in the roof of the carriage over the flame of the gas lamp. It is of very simple construction, and the principle on which the heater works is that the heat from the flame comes into contact with the boiler at the point where the water is hottest and leaves it where it is coldest. From this boiler there descend two pipes about ¼ inch in diameter, which are connected to two annular tubes placed underneath the carriage seat. The course which the two pipes take is down through the wooden partition separating the contiguous compartments. Hot water circulates through these pipes and annular tubes, and it returns to the boiler after having given off its heat. The reversal of the current is accomplished by allowing the hot water from the boiler to ascend in a tube a few inches in length, on the top of which there is a small valve. Having passed up this tube, and being unable to return to the boiler, the hot water is made to circulate downward through the pipes. The annular tubes already referred to are about 3½ inches in diameter and about 8 inches long. They are laid at an angle under the seat, the upper end being raised as far as practicable. The pipe which conveys the hot water is connected to the top of these tubes, and that which carries the return current is connected with the bottom of the same.

Owing to the fact that the tube is placed at an angle and that it is heated, an induced current of air is made to pass through it; and as the air enters the tube at the cold end and leaves it at the hot end, it absorbs the maximum amount of heat from the water. The air flows from these tubes or heaters in a constant stream at a temperature of from 80° to 90°. It has been found that the ordinary size of gas flame is quite sufficient to do the heating of a compartment, though the consumption of gas is less than one cubic foot per hour, and even during the coldest days of winter.

As regards the probability of the water in the apparatus freezing in cold weather when the carriage is not in use, it should be mentioned that congelation is completely prevented by mixing a given quantity of glycerine with the water. By way of testing the efficiency of this non-freezing mixture, the experimental carriage which has been placed at the service of Mr. Foulis was left exposed at night on a railway siding during the coldest weather of the past winter, without the slightest indication of freezing taking place in the water to which the glycerine had been added.

We may mention that the carriage used is a composite one of four compartments, the property of the Glasgow and Southwestern Railway Company. The internal construction of the carriage was entirely rearranged under the superintendence of Mr. Foulis. During the past two months or so, numerous experimental runs have been made with this carriage as part of a regular passenger train, several of them being to and from Carlisle. On one or two occasions the patentee has been accompanied by Mr. Smellie, locomotive engineer, and other leading officials of the Glasgow and Southwestern Railway Company; and in all cases they have expressed themselves as highly satisfied with the results achieved by Mr. Foulis. The present writer had the pleasure of joining in one of the runs from Kilmarnock to Carlisle and back, when the weather was wintry in the extreme, all the hills for many miles being covered with snow. Inside the carriage the temperature was most agreeable, and in marked contrast to the outside. A thermometer hung in the compartment, in which there were only three persons, never fell below 52°, and the extent of the range was only 2°. On other occasions the temperature ranged from 56° to 60°.

Of course, in carriages heated on the "Foulis" system the gas must be constantly burning—by day as well as by night; but if heating for the comfort of the passengers is to be done, it matters not though the heat is obtained from a luminous flame, provided that it is comparatively inexpensive. In this case it is remarkably economical, while as soon as darkness sets in the gas flame does double duty, providing both heat and light. What could be more absurd than the idea of carrying gas in tanks on the cars, to warm a railway train, and what a funny idea of comfort it is to ride in a close compartment, fouled by gas jets, with a chilly temperature of 52°! *Engineering*, however, says: So far as can be seen at present, it must be unhesitatingly declared that Mr. Foulis has made a most important invention; and much credit is due to the directors of the Glasgow and Southwestern Railway Company for giving him facilities to enable him to bring it to its present perfect stage.

Zenas Crane.

The Dalton, Mass., Paper Mills have, for more than a generation, been among the most prominent in the country for the variety of high grade stock they turned out, under the proprietorship, and largely from the personal direction, of Zenas M. Crane, who died on the 12th ult. of apoplexy, aged 72 years. Besides fine stationery and parchments, the mill were particularly distinguished for their bank note papers, of which they made all the kinds used by the United States and several foreign governments. To Mr. Crane is attributed the idea of first introducing into the fiber of bank bills numbers corresponding to their value, to prevent the fraudulent raising of their denomination. He is said to have been dissuaded from patenting this idea, at least he never did so; but as it was largely adopted afterward, both here and abroad, his failure to obtain a patent thereon probably causes the considerable fortune he leaves to be much less than it otherwise would have been. The deceased leaves a widow and five children.

The French Exhibition.

In its capacity as official gazette of the Exhibition of 1889, *Le Genie Civil* gives many interesting indications of the character of the future exhibits. Among other things, an historical exhibit of methods of artificial lighting is to be prepared, showing the progress of this great modern art from the rush-light and the pine-knot torch to the first-class electric lighthouse lanterns of the present day. The buildings and grounds of the Exposition itself will furnish a striking example of the present state of the science of illumination at its height. It is decided that the main exhibition building, including the whole of the Champ de Mars, shall be fully lighted every night, leaving the palace of the Trocadero to be illuminated only by lines of exterior gas jets, as a pretty object to close the perspective view across the river. So far as the buildings themselves are concerned, everything is already being pushed to the utmost. The enormous structures of the Champ de Mars, with their roofs of two hundred and fifty feet span, are to be ready for beginning the setting of the glass roofing on the first day of next July, and in a few days the seed will be sown, in a reserved portion of the Parc aux Princes, which is to furnish turf for the *pelouses* of the Champ de Mars and the Trocadero garden. Hitherto, the grass intended to beautify the grounds about exhibition buildings has usually been either a scanty vegetation, raised on the spot from seeds sown a few weeks before, or a fictitious turf, produced by Mr. Olmsted's clever device of sowing rye and keeping it closely mown; but the Paris grass of 1889 will be cultivated by itself for two years, until it has formed a close, well-rooted sod, and will then be stripped off and transferred bodily to the place intended to receive it.—*Amer. Architect.*

Industrial Exhibition at Worcester, Mass.

There is now open in Worcester, Mass., at the Rink, a splendid industrial exhibition, which attracts much attention. Space and power are free to exhibitors. It is under the auspices of Mr. H. B. Bigelow, and remains open until the middle of April.