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THE UNITED STATES' POSITION IN A DEFENSIVE WAR.

The recent diplomatic correspondence between the United States and Italian governments, in connection with the New Orleans riot, if such term may be applied to that outbreak, has awakened attention to the relative power of the different navies of the world. While there has been no well-founded apprehension that war between this country and Italy was imminent, the suggestion of a possibility of the menacing presence of Italian war ships in these waters has reminded us forcibly of our weakness at sea and on the coasts. To-day the three thousand miles of ocean are our best protection against European powers. They operate now, as they did in the Revolution, to make an energetic defense possible with apparently inadequate means. Fortunately the supposition of war at the present time or in the near future is entirely problematical. The necessity for actual measures of defense is no greater now than at any recent time.

In establishing a navy the United States has begun with the construction of unarmored cruisers, protected partly by deflecting steel decks and coal bunkers. Great success has been attained with these, and their speed and general reliability have been adequately proved. No country has surpassed them. The next step is in the direction of armored fighting ships.

The United States high-speed protected cruiser No. 12, now building, is the representative of the connecting link between the ships of the so-called White Squadron and the armored line-of-battle ships alluded to. It is to be 400 feet long, with 21 knots sustained speed and 20,000 sustained horse power. It can carry 2,000 tons of coal, disposed in part in lateral bunkers so as to protect the vital portions of the ship as far as possible. This amount of coal will keep the ship at sea for 109 days, steaming at a speed of 10 knots. Such a ship is a commerce destroyer, and would do immense damage to an enemy's shipping in a single cruise. Three line-of-battle ships, with heavy armor, are also in process of construction by the United States.

The efficiency and value in war of the heavily armored fighting ship of to-day is practically unknown. In the great navies each vessel has its rating. The armament, armor, and speed are the controlling factors to determine her position, offensive and defensive. But to obtain a more practical idea of relative capabilities, trial maneuvers have been instituted by different governments. While one object of these trials has been to try the defensive powers of coast batteries and harbor defense ships, the sea-going qualities of the squadrons have been subjected to the most exacting tests—to tests assimilated to the conditions of actual war.

The result of these operations has been to show that the war ship of the navies of the day, whose value in action is unproved, as a sea-going vessel is seriously wanting. In the English autumn maneuvers, ship after ship has broken down, boilers have leaked, difficulties in coaling have been experienced, and speed has universally fallen far below the rating deduced from speed trials.

It is this condition of things that emphasizes the value of the protection offered by the ocean that intervenes between America and Europe. A modern ship of war, in coming across the water, would seriously deplete its coal bunkers. When it reached our coast, a comparatively short range of travel would be left, especially if high speed were kept up on the voyage. There would also be a good chance of its machinery breaking down.

The coast line of battle ship illustrated in the present issue shows what the United States is doing to be prepared for the contingency of the approach of a hostile fleet. These vessels are the most formidable of any that the government has yet contracted for. Their tonnage and armor bring them in direct comparison with the more powerful vessels of foreign nations. While the dimensions of the ship, of her armor and armament, are impressive, they lose by comparison with the great war ships Italia and Lepanto of the Italian navy. These sister ships are 400 feet 6 inches long, and displace 13,480 tons. The armor in places is 21 inches thick. The side armor is 18 inches thick. The armor alone weighs nearly 3,000 tons.

The guns include four 110 ton guns of 17½ inch caliber, eight 6 inch guns, and a number of smaller rapid-firing pieces. The appearance of the ships is well shown in a cut published in our issue of May 26, 1888.

Again, the status of our new coast defense ships in the matter of armor is indicated by the fact that armor 18 inches and more in thickness is carried by 19 English, 13 French, 10 Italian and 7 Russian ships. The Duilio and Dandolo of the Italian navy, each of 10,960 tons displacement, and each including in its armament four 17¾ inch rifles, are good representatives of foreign practice. It is with such ships as these that our new vessels might be called upon to cope.

But figures alone are deceptive. Immense advances in naval engineering have been made here and abroad during the last few years. Eighteen inch armor of nickel steel is far superior to the plates supplied to the ships now in commission. Two to four inches advantage could safely be allowed in rating the armor of the new ships. The speed will undoubtedly be far better, comparatively, than in the older ships, although it may be rated as less. Thus the Italia succeeded in attaining 17·8 knots on her speed trial. But if put in commission, it would not be surprising if a falling off of several knots were to ensue; at least this is the lesson of every practical trial of the great navies during a number of years.

Again, modern ammunition is far in advance of the work of even five years ago. The value of the largest Armstrong guns, such as are used on the Italian ships cited, is utterly problematical. The tendency now is to abandon the larger calibers and endeavor to secure sufficiently good results with smaller pieces. In the shock of action, heated by the combustion of their charges, with every vent rapidly scored by escaping portions of the charge, the large built-up guns rapidly deteriorate. It is more than probable that the modern 13 inch guns of the American ships would excel in fighting power the heavier pieces of the Italian ships.

The shallowness of our harbors and the narrowness of the entrances thereto protect our cities and coast to some extent. The Italia and Lepanto draw 30 feet, and could not well get past Sandy Hook at the entrance of New York Harbor, many miles from the city. Theoretically they might lie offshore and send shells into New York, but whether they could do so with any practical results is doubtful. A large number of shots would be required to do extensive damage, and it is uncertain how many discharges a 17½ inch gun may stand before disablement. It would not do to send a ship across to fire in a bombardment a comparatively small number of shots before being reduced to the smaller pieces and machine guns for protection, its career as an offensive element thus terminating.

SAMUEL PLIMSOLL.

Samuel Plimsoll, who is known in England as "the sailors' friend," recently arrived in this country. He is prosecuting an inquiry into the business of transporting live cattle across the ocean. In a letter dated in New York and recently published in the London *Times*, Mr. Plimsoll claims that a certain class of ship owners are so indifferent to the lives of the men that they load their vessels with three tiers of cattle. First the "'tween" deck is loaded from end to end and from one side to the other as close as the animals can stand. The main deck is similarly loaded with cattle which cannot lie down, so close are they, and lastly the upper deck is also loaded in the same way.

Mr. Plimsoll claims that a vessel thus loaded becomes "crank," rolls badly and is apt to become unmanageable. "I feared," he said, "such shocking recklessness would be discredited, and so besides inquiring of many people, obtained written testimony." He closes his letter to the *Times* as follows: "It is not quite a year since the Erin sailed, cattle-laden, from this port with 74 men on board, and never again heard from. I went down to the far east of London to see the poor widows and fatherless children of that portion of the crew which lived at Tidal Basin E, and shall never forget the anguish of bereavement and the misery of poverty I then saw."

Mr. Plimsoll also instances the case of the Thanemore, another cattle-laden ship which has recently been given up as lost, as sustaining his theory that such methods of transportation are dangerous to life and property.

This agitation attracts attention because of Mr. Plimsoll's past record. He originated a movement for the better protection of the lives of seamen and battled for it long and earnestly until Parliament passed an amendment to the Merchant Shipping Acts which became law in August, 1876. This amendment provides for the detection of unseaworthy vessels, is aimed to prevent overloading, provides that all deck cargoes shall be included in the tonnage, and that grain cargoes shall not be carried loose in bulk, but shall be kept from shifting, either by boards or bulkheads or by being carried in sacks. The latter object was further secured by the Act of 1880.

Mr. Plimsoll amassed a large fortune as a coal merchant and he has used his means liberally and devoted much time to his efforts for the protection of the men who go down to the sea in ships. He sought a seat in Parliament in order to further his reform, and was elected in 1868 and re-elected in 1872. Both Mr. and Mrs. Plimsoll were fond of the sea, and on one occasion they went from London to Hull on the Yorkshire coast, a voyage which skirts the most dangerous portions of the British shores. The steamer upon which they took passage seems to have been greatly overloaded, and a very severe storm was encountered, the vessel, crew and passengers being in great peril. In gratitude for their escape Mr. and Mrs. Plimsoll resolved to undertake the agitation which resulted in one of the greatest reforms of modern times, and which he still continues. Mr. Plimsoll's new crusade meets with very vigorous opposition. His opponents claim that the carrying of live cattle is not more dangerous than the carrying of other cargo, notably cotton. The business, however, has been made the subject of special inquiry by the department committee of the British Department of Agriculture, while Mr. Plimsoll is making exhaustive

investigations on his own account. He went from New York to Montreal, and has since been reported at several points in the West gathering information about the cattle trade in the same indefatigable manner which characterized his efforts when he was laboring to secure the great reforms which have made him famous. He is now 67 years of age.

METAL AS A SUBSTITUTE FOR WOOD IN RAILROAD TIES.

The report of the Forestry Division of the United States Department of Agriculture on the consumption of wood for railroad ties seems to establish the fact that this consumption is a leading factor in the depletion of our forests. Besides many interesting statements regarding the destruction of young trees, the report also contains the results of an exhaustive inquiry as to the use of metal by railroad managers in this and many foreign lands, and this method of construction is suggested as one remedy for the denudation of our forests, which is generally acknowledged to be going on at the present time.

This portion of the report was prepared by E. E. Russell Tratman, C.E. The statistics are given of 25,000 miles of railroad laid with metal track out of a total mileage of the world (exclusive of the United States and Canada) of 187,721 miles, or a relation of 13·12 per cent to this total mileage.

In foreign countries the use of metal for wood on railroads has passed beyond the experimental stage. Practical tests are now being made in this country, and interest in the subject among railroad men is increasing.

A section of track on the New York Central and Hudson River road, about a quarter of a mile in length, was laid with the modified "Hartford" tie. Mr. Walter Katte, the engineer of the road, reports as follows regarding this experiment:

"The ties (metal) were laid in November, 1889. The line has the heaviest kind of freight and passenger traffic.

"Passenger engines, with a weight of 36 tons, on four driving wheels and a driving wheel base of 6 feet, pass over these ties at speeds of 40 to 55 miles per hour. The ties have not been in use long enough for the expense of maintenance to be determined. Apparently it is thus far no greater than with wooden ties. The reason for using these ties was the desire to secure economy over wooden ties, and to obtain a superior attachment of the rails to the ties. The result has so far been quite satisfactory. I am of opinion that the rolled metal tie is essentially a requisite for first class permanent way in this country. Having investigated the relative economy of metal and wooden tie systems for a term of fifty years, I am led to believe, as the result thereof, that upon the basis of 55 cents for a wooden tie and $3 for a steel tie, and under the conditions of traffic and maintenance expense existing on this line, the relative economy is from 8 to 12 per cent in favor of the metal system."

The general adoption of metal in place of wood for railroad ties would check the enormous consumption of the young growth of our forests. On this point Mr. Fernow, of the Forestry Division, makes this forcible statement: "The use of wood, and the method of using it, are largely matters of custom everywhere. In the United States the enormous supplies which the native forests yielded have not only induced a very extensive, but also a very wasteful use of wood, until now we have reached a point when the prospect of reduced supplies makes the study of economics a matter of national concern, and within a not too distant time private interest will also awaken to the need of it."

To inventors, a wide field of study and usefulness is open, in devising good and economical applications of metal for ties and rail connections.

The Lick Observatory.

The Lick observatory, with its large number of instruments and its famous telescope, is now one of the best equipped observatories in the world. The great telescope has proved to be all that was expected, and has repeatedly proved its unsurpassed power. A recent circular issued by the director, Prof. E. S. Holden, discloses the work in hand there, the great opportunities for future investigation, and unfortunately makes clear its absolute need of funds. It has only five observers, a small number when compared with twenty in the Greenwich, England, observatory, seventeen in Harvard College observatory, nineteen in the Washington observatory, and so on. The great glass, the triumph of Alvan Clark's life, needs better support than this. The demands specifically made are very modest; a computer and an assistant photographic astronomer are all that are asked for. An endowment of $60,000 would secure these and provide for the increase of their rather limited salaries in the future.

We can but hope that Prof. Holden will find his demand attended to, and that success will attend his efforts for the Lick observatory.

Audubon.

Under the auspices of the New York Academy of Sciences a movement has been inaugurated to erect a monument to the memory of the great naturalist whose name heads this article. An Audubon monument committee has been appointed by the Academy, a design has been prepared for the monument, and it is now the desire of that body to raise a sufficient sum of money to erect it. It is estimated that $10,000 will be required. Such sum is but a small tribute to the services of the incomparable Audubon, the prince *par excellence* of field naturalists, and one who combined with his scientific attainments the attributes of the refined sportsman. He studied bird-life in the field. He was not content to work within the closet, and to be a mere classifier of specimens. The scope of his researches included all the habits of birds, their food and even their characteristic positions. His unsurpassed illustrations were the result of study from life, not from specimens, and inaugurated a system of study of natural history that hitherto has had too few followers. Its laboriousness and the patience it exacts from its votaries have probably deterred many from its ranks.

To-day the remains of Audubon rest in Trinity cemetery, within a short distance of his home and of the park named after him. In 1851 the interment took place, and as yet there is no monument there. The neglect thus manifested should be soon disposed of. It is hoped that the monument may be erected this fall. The treasurer of the committee is Dr. Thomas Egglesston, of Columbia College, N. Y., who will gladly receive contributions from all interested.

Hindrances to Inventive Progress.

What are the chief discouragements to inventive progress? One of these is the hindrance imposed by the existence of inferior methods for accomplishing works of the same class to which improved means would apply. To this is allied the suppression of valuable patented devices in the interest of monopolies, their suppression in the interest of labor, and the competition among inventions themselves. Great as the influence of the patent system has been and is, in the encouragement of invention, it has nevertheless been very considerably abused in enabling the purchase and suppression of valuable inventions by parties interested in maintaining methods that the new means would otherwise supplant. Persons controlling corporations, or exerting, either directly or through connections, a powerful influence therein, are often enabled to secure a preference for one device over something that may be far superior. Great corporations enjoying monopolies of their business are likely to be indifferent to the improvement of their service in the interest of their patrons and the employment of better means for the convenience of the latter, unless they have been thoroughly taught that it is for their interest to do so. The telegraph and telephone monopolies in this country are instances of this; the former resting upon the assimilating capacity of a large accumulation of capital in one enterprise, and the latter upon the proprietorship of a basic invention. The practical adoption of any improvement in the telegraph or telephone would not at present be possible without the consent of these companies. The supplanting of one form of machinery by an improved form, and the injury or destruction of enterprises with their capital invested in the old, is one of the greatest elements of cost or waste in modern production, and manufacturers are obliged often to figure very closely to see whether it would profit them to adopt some improved method.

It frequently happens that no sooner has a new way of doing something been perfected and set in operation than some one else comes forward with still another means of reaching the same result, and either by his competition prevents the other from reaping fully the anticipated harvest of his skill, or supersedes the former method entirely and ruins the enterprise. The opposition of labor to the introduction of new inventions is very old. From the early days of the power loom and the railway down to the present time the story has been the same—on the part of the workers the most strenuous opposition to the employment of labor-saving devices, for fear of being thrown out of work. Experience has shown us that, on the whole, there has been no loss of occupation for the working classes from this cause, since the increased production attendant upon the use of labor-saving machinery and the creation of new industries causes a demand for labor under the new conditions at least equal to that existing before. Yet nearly every mechanical device that does the work formerly performed by several persons can hardly fail to effect great injury to many individuals, and even to large classes of workingmen, by reducing them from the ranks of skilled to unskilled laborers, and disturbing the equilibrium of industry.

The progress of invention would be, doubtless, very much more rapid were it not for this opposition on the part of labor, and production would be correspondingly cheapened. Organized labor has of late years exerted a powerful influence against the substitution of mechanical processes for the more slow and costly hand work. That strong organization in the boot and shoe industry, for instance, the lasters' union, forbids the employment of machinery to do any part of the work within its province, and, in consequence, some very costly devices in shoe shops have been compelled to stand idle. Owing to the objection of the Knights of Labor, the use of power presses in the engraving department of the National Bureau of Engraving and Printing at Washington is not allowed, although the cost of production is enormously increased to the government by the employment of hand presses. Labor cannot be blamed for this opposition in its own behalf, any more than capital can be blamed for combating any measures that tend to limit its liberty of action.—*Sylvester Baxter, in the Cosmopolitan for April.*

The Relation of Bacteriology to Nose and Throat Diseases.

At a recent meeting of the British Laryngological and Rhinological Society, Dr. John Macintyre, of Glasgow, gave an interesting lecture, introductory to the discussion on the relation of bacteriology to the diseases of the throat and nose. In the course of his lecture Dr. Macintyre discussed the general facts concerning bacteriology, such as classification, vital phenomena, etc., and stated the arguments for and against the vitalistic theory of disease. He demonstrated a large number of specimens of well known forms of micro-organisms under the microscope, as well as numerous micro-photographs on the screen, and made special reference to those of interest in throat and nose work. He showed several found in the mouth and nose of healthy people, which are apparently harmless, and others found in diseases where there is decomposing material such as in ozæna. He referred to the specific forms found in diseases of the lower part of the respiratory tract, as tubercle, lupus, diphtheria, pneumonia, and suppurative diseases. Lastly, he discussed the question how protection was to be got from the diseases associated with micro-organisms, noting the result of inoculation, and criticised the theory of phagocytosis. He explained some interesting experiments now being made in Glasgow with reference to the hypodermic injection of chemically pure carbolic acid, which bid fair to demonstrate the possibility of rendering the effects of certain pathogenetic micro-organisms inoperative within the body. In considering the possibility of rendering the tissues unsuitable for the growth of organisms after their entrance into the system, he cautioned his audience not to be carried away too hastily by Koch's or Liebreich's methods of treatment for tuberculosis.

[The above, is from *The Lancet*, London, considered good medical authority. The remedy proposed for ordinary throat and nose diseases may be worthy the consideration of physicians who have cases of la grippe under their charge. It is a fact that the latter disease is very prevalent in a great many of our populous places, and that it seriously affects the nose, throat and respiratory organs, and it is not improbable that the cause may be produced by some form of bacteria which the remedy proposed may relieve. But persons should beware of the use of carbolic acid in the manner suggested, except under the direction of a skillful physician.—ED.]

Dangers of Bad Steering Gear.

A decision given out recently by Judge Swan, of the United States district court in Detroit, contains a warning to vessel masters to look after their steering gear. On April 28 of last year, the steamship Cayuga, entering the St. Clair River, met the propeller Wilson towing the schooner Manitowoc. The steamers passed all right, port to port, but the Cayuga had hardly passed the Wilson when she suddenly sheered, until she caught the tow line of the Manitowoc on her stern. She then scraped down the line until she struck and sunk the Manitowoc. The Cayuga's defense was that the accident was unavoidable. It was claimed that the chain of the Cayuga's steam steering apparatus became suddenly and inexplicably out of order, and that as soon as this was discovered she was reversed at full speed. Upon these proofs Judge Swan decided that the Cayuga was entirely to blame. The Manitowoc showed that the chain of the Cayuga was very improperly adjusted to the quadrant. The latter is a fan-shaped device attached to the rudder shaft, provided with grooves for the chain to run in. It was shown that when the helm of the Cayuga was put hard over one way or the other, the free chain would become so slack as to slip out of the groove in the quadrant and became useless when called upon again in putting the helm the other way, unless replaced in the groove. This Judge Swan held to be very clear negligence.

DECORATING WALLS.—A rich and brilliant effect, according to *Furniture and Decoration*, is obtained in walls intended to be decorated by mixing an equal quantity of marble dust with the lime used in making the plaster. This gives a softness of tint which cannot be obtained with ordinary plaster. In Italy it has long been the custom to give a final coating of marble dust to walls intended to be treated by the wet process.