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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

## NAVY TO BUILD "OCTOPUS" TYPE OF SUBMARINE.

The submarine torpedo-boat board, which recently conducted a series of tests of submarine boats, has decided unanimously in favor of the superiority of the "Octopus" type. This view is indorsed by the Board on Construction, and is approved by Secretary Metcalf of the Navy. In agreement with the report, the award of \$3,000,000 authorized by Congress at its recent session for the purchase of submarine boats, will be made to the Electric Boat Company of this city. The competition upon which Congress decided, when it made an appropriation two years ago of \$1,000,000 for submarine boats, was recently concluded off Newport. This original appropriation was increased, at the recommendation of the President to the last Congress, to \$3,000,000, and the time fixed for holding the test was limited to the 29th of May of this year. Although the details of the report have not been given out, it is known that the "Octopus" was considered to have outclassed her competitors on all essential points. She was considerably faster both at the surface and in the submerged condition; showed better ability to maintain a constant level of submergence; and developed at least equal structural strength when sunk in great depths of water.

## ELECTRIC POWER PLANTS ARE RESPONSIBLE.

After a contest in the courts which has lasted for seven years, it has been decided by the Appellate Division that the responsibility for fires resulting from defective wiring and insulation rests upon the electric power companies. The legal contest which has just been ended was begun in February, 1900, when an insurance company brought suit against the New York Edison Company as being responsible for the burning of a block of buildings at Third Avenue and 190th Street in this city, the claim being made that the fire was caused by improper insulation. In this particular case, nine insurance companies paid a loss of \$100,000 on the fire; and, subsequently, sued the Edison Company. The first action was brought by the German-American Insurance Company, which won in the Appellate Division; and later in the Court of Appeals. The Edison Company was not satisfied to let the matter rest, and brought suit against the insurance companies, which, however, obtained a favorable decision. The testimony given at the trials proved that the wires had been put up on the building which was burned down, without the consent of the owner and in a negligent and reckless manner. It is estimated that there are in the United States damages every year amounting to about \$25,000,000, due to defective electrical construction and insulation. Henceforth the responsibility for this will be laid upon the electric companies, instead of falling as hitherto on the insurance companies.

## THE STEEL RAIL PROBLEM.

The agitation over the steel-rail scandal promises to bear fruit. A conference was recently held at the offices of the Steel Trust, at which were present representatives of the steel companies and of every important railroad in the country; and at the close of the conference the chairman of the trust, who presided at the meeting, announced that an agreement would be reached which would be satisfactory to the public. Although no official report of the conference has been issued, it is understood that the steel companies expressed their willingness to make a rail that would come up to the requirements of the railroads, provided

that the railroads would pay five dollars a ton more for the rails; or thirty-three dollars in place of the present price of twenty-eight dollars per ton. It was generally recognized that a change is necessary in the shape of the rail, and it is probable that the standard type adopted will contain considerably more metal in the base, with a view to securing a more even distribution of temperature in the various portions of the rail during the process of rolling, and also of providing a rail that will be better able to withstand the reverse bending stresses which occur at all times and, particularly, during the frosts of the winter months. Now that the manufacturers and the railroads have got together, and strong committees representative of each are engaged in a joint and friendly investigation of the subject, the public has some assurance that the future output of the rail mills will be more reliable, even if more costly, than that which has characterized the past few years. The question of price is one that does not concern the general public, which merely demands that railroad travel shall be made safe again; but we understand that the leading railroads have expressed their willingness to pay a higher price if they can only secure a thoroughly reliable rail.

## CONTRACT AWARDED FOR TWO "DREADNOUGHTS."

The awarding of the contracts for the two 20,000-ton battleships marks the beginning of a new era in the history of naval construction in the United States. It is true that the "South Carolina" and "Michigan," now under construction, embody the characteristic feature of the new type to the extent that they are armed exclusively with the 12-inch gun, of which each vessel carries eight. But the appropriation for these two ships, and their size, was determined by Congress before the one-caliber-all-big-gun battleship had been accepted as the type of the future; and hence, they are not strictly representative of the class. The new ships, however, are purely of the "Dreadnought" type, all the elements of their design being subordinated to their definite duty of carrying into battle the largest possible number of 12-inch guns. Of these each ship will carry ten, disposed in five separate turrets. It has ever been the aim of the naval constructor so to mount the guns that each one of them shall be able to cover the widest possible arc of the horizon, and do so without interfering with the training of the other guns, that is, without masking them or being itself masked. It was the determination of our constructors to abide strictly by this principle, that has enabled them to secure a concentration of fire from their ten guns which is twenty-five per cent greater on the broadside than that obtainable with the ten guns of the British "Dreadnought." This desirable result has been secured by mounting all of the five turrets upon the longitudinal center line of the ship, with the result that every gun can be trained through a wide arc on either broadside; whereas only eight guns can be so trained on the ten-gun British ship. It is true that the "Dreadnought" has a heavier end-on fire, due to the fact that two of the turrets are carried in the wings, or on the beam of the ship, an arrangement which enables her to deliver a fire of six 12-inch guns ahead, or astern, as against four such guns in our new 20,000-ton ships. But since these wing turrets mask each other in broadside fire, it follows that the heavier fire end-on has been secured in the "Dreadnought" at the sacrifice of broadside fire—and it is well understood in naval tactics that future battles will be fought by preference in the broadside rather than the end-on position. It will be evident, then, that the advantage of a twenty-five per cent more powerful broadside fire has been obtained without any extra cost of weights for gun emplacements, except so far as the extra length of ship necessary for this arrangement must be debited to that account.

The "Dreadnought" is of 18,000 tons displacement, therefore our 20,000-ton ships have some 2,000 tons advantage in displacement, much of which our naval constructors have been enabled to devote to protective and defensive qualities. Just what use has been made of this displacement has not been announced by the Navy Department, for it was not desirable that such important information should be made public. We are in a position to state, however, that our new vessels, being larger and being designed with all the valuable facts which have been developed during the trials of the "Dreadnought" available, are structurally stronger and stiffer, and are superior both in the thickness and area of their armor, and in the provision of bulkheads, double floors, and other structural devices designed to localize torpedo injury and preserve the buoyancy of the ship.

The experience of the Russo-Japanese war, particularly at the battle of the Sea of Japan, proved that it is better to provide a limited number of guns upon a hull that can be absolutely depended upon to keep those guns afloat, than to load double the number of guns upon a hull which can be riddled with high-explosive shells and sent to the bottom before the engagement can be said to have fairly begun. Other things being equal, it is the ship which can longest

preserve its buoyancy that will win the fight, and it is satisfactory to know that in our two new 20,000-ton battleships we shall have two vessels which will probably stand more hammering, with one exception, than any battleships designed at the same time as themselves.

Big as these ships are, however, they will be surpassed by the new Russian battleships, which are to displace 21,800 tons. It is authoritatively stated that the whole of this extra displacement (for they will carry only the same number of 12-inch guns as our own ships) is to be devoted to the protection of the buoyancy. Among other means adopted to this end is the complete armoring of the ships, from a level considerably farther below the waterline than has been the practice in the past, up to the level of the upper deck; that is to say, the whole of the hull is to be armor-clad. In this connection it is interesting to remember that the idea is not original with the Russians; for as far back as the year 1890 the French built a cruiser, the "Dupuy de Lome," whose whole hull from 4½ feet below the waterline to the upper deck is completely clad with armor. Evidently, when the Russian government turns over these monster ships to their commanders, she wishes to be in a position to say to them, "You have now beneath your feet a ship which cannot be sunk; fight her, therefore, as long as there is a gun that can be trained upon the enemy."

Of our two new battleships, one has been let to the Newport News Company for the remarkably low price of \$3,987,000, if she is built under the Department's plans, or for \$4,090,000, if built under the company's plans as modified by the Department. The other ship has been let to the Fore River Company, for a contract price of \$4,377,000. The former ship is to be built in thirty-six months; the latter, in thirty-four and one-half months. The ships will be identical, except for the fact that the Fore River Company will use the Curtis turbines, and the Newport News Company, turbines of the Parsons type. One of the ships is to be named the "Delaware," and the other will carry either the name "New York" or "Empire State."

## BOARD OF UNDERWRITERS ON CEMENT CONSTRUCTION.

With a view to determining the fire-resisting qualities of cement and concrete, and formulating a standard specification for their use, a special committee of the Board of Underwriters has been engaged in an exhaustive study of the subject. Because of the San Francisco conflagration, the past year, in particular, has been fruitful in knowledge of the fire-resisting qualities of these materials. The chairman of the committee refers, in his report, to one difficulty of the investigation arising from the fact that the action of concrete, when combined with reinforcing materials, has been hitherto only partly understood, and experimental data on the subject is, even at this day, comparatively scarce. The Board, however, has issued a revised edition of a model building code, which it is urging the municipalities throughout the country to adopt. One section of the code refers exclusively to reinforced concrete construction, and the committee strongly urges that the design of concrete buildings should be undertaken only by engineers of special training and experience in this line of work. In our opinion this is the most important recommendation made in the whole of this section of the report. We have always believed that the peril of concrete construction lay in the supposed ease with which it could be built, and in the common belief that the design of reinforced concrete structures was a very simple matter, and the building of the structure even simpler still. No greater mistake could possibly be made. The design of a reinforced column or beam calls for as much and even more technical knowledge and skill than the design of an ordinary steel column, plate girder, or truss, in steel bridge work. In bridge designing the well-established data and formulæ necessary to the working out of the problem are available; but in designing reinforced concrete work, there are no such complete data at hand. The art is a new one; and the exact behavior of reinforced concrete under certain conditions is, even to-day, largely a matter of theory. Hence, the question of the amount and proper position of the steel reinforcement is one that calls for the exercise of a judgment which has been ripened by experience. It is essentially a civil engineer's problem, and every architect who undertakes the design of concrete steel work should be master of the main principles of the civil engineer's profession.

Furthermore, it is a mistake to suppose that concrete-and-steel construction, because of its apparent simplicity, can be done by ignorant labor under the supervision of an unintelligent foreman. The report says that the experiences of the last year have given additional proof of the gross carelessness and incompetence which have prevailed in many important works. There have been several instances of the collapse, during construction, of large and expensive buildings, which have been traced in every case to the neglect of well-known rules of safety. In one case,