tain and between the water and the face of falling water. The total capacity of this plant is 125,000 horse-power.

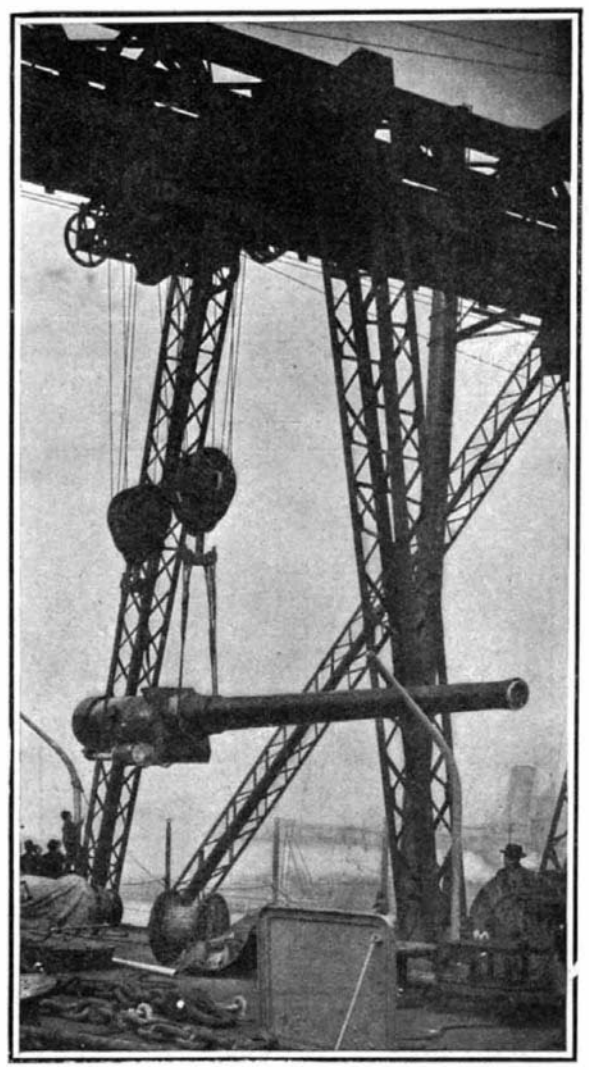
The great work which forms the subject of our illustrations has been built by the Canadian Niagara Power Company, a Canadian corporation which is controlled by the parent enterprise, the Niagara Falls Power Company. At its completion it will have a capacity of 110,000 horse-power. In the general arrangement of its wheel pit, turbines, power station, and tail-race tunnel, it resembles the company's plants upon the opposite side of the river; but in the details of its design it marks the progress which has been made during the decade which has intervened since the first plant was built upon the American side. The power station is located approximately parallel with the shore line of the river, and at a point about a mile from the point where the upper rapids commence. The entrance to the forebay is closed by a strongly-constructed iron screen, carried upon a line of masonry piers, which serves to prevent the entrance of ice and driftwood. Just inside the screen the entrance is crossed by a handsome masonry arch bridge, which has been built to carry one of the driveways of the park. Beyond the bridge the channel widens out into a broad basin 626 x 150 feet in extent, across whose waters one sees the dignified and impressive mass of the great power station. The water flows from the forebay to the penstocks through a series of arched openings, whence it is conducted by eleven great penstocks 10 feet 2¼ inches in diameter to as many turbines located in one long line on the floor of the wheel pit. The effective head of water is 133 feet. From the turbines the water is discharged through draft tubes into a discharge tunnel which measures 25 feet in height by 18 feet 10 inches in width. The tunnel extends from the wheel pit to the face of the gorge, a distance of about 1,700 feet, just below the Horseshoe Falls, where it discharges at the level of the river.

The distinctive feature of this power station is the unusual size of the turbines and the generating units, each of which is of a capacity of 10,000 horse-power, or exactly double that of the units established in the first power plant of the Niagara Falls Power Company on the American side. It was a notable step on the part of the company to increase the size of its units by 100 per cent, and no little credit is due to them for being the first to make so bold a move at Niagara. The advantages of the larger units are many and valuable. In the first place they occupy but little more space than units of 5,000 horse-power, and, consequently, for a given total capacity of plant, there is a great reduction in the length of the wheel pit and the power house. Moreover, 10,000 horse-power generators cost considerably less per horse-power than generators of 5,000 horse-power capacity. The turbines, which were designed and built by Escher, Wyss & Co., are of the vertical type and the power is transmitted by massive vertical shafting, 3 feet 4 inches diameter in the hollow portion and 14 inches in the solid portion, to eleven generators located on the floor of the power house at ground level. The generators are wound for three-phase, 25-cycle current of 11,000 volts potential, the speed of revolution being 250 per minute. This high voltage was selected because of the economy that it secured in local distribution of the power, the cost of underground distribution of three-phase, 11,000-volt current being about one-fifth of that of distribution of a two-phase 2,200-volt current.

The cable connections are so arranged that the Canadian power house can operate in connection with one or both of the American plants. The cables are carried across the Niagara River over the upper steel arch bridge, the total distance between the two plants being about three and one-half miles. The three-phase, 11,000-volt current is changed to two-phase, 2,200-volt current for paralleling, by means of step-down transformers; or, if desired, it is delivered direct to the various manufacturing concerns on the lands of the Niagara Falls Power Company. The output of this great plant will be available for Canadian industries in the Province of Ontario, so far as they lie within transmission distance, and subject to the Canadian demand for power it will be available for American consumers on the American side according as the demands may come in. Our thanks are due to Mr. W. D. Robbins, assistant engineer for the company, for courtesies extended during the preparation of this article.

MOUNTING THE 12-INCH GUNS OF THE "CONNECTICUT."

If it were not for the delay in the furnishing of the armor for her turrets, the United States battleship "Connecticut," which, as our readers are aware, has been constructed at the Brooklyn navy yard, would to-day be a completed ship. As it is, about three or four per cent of the work remains to be done and practically the whole of this relates to the mounting of the guns and the bolting on of the turret armor. The four 12-inch guns and the eight 8-inch are in place, and as soon as the twelve 7-inch pieces are delivered from the gun factory, the work of placing them on their central pivot mounts in the broadside battery will be quickly accomplished. With the exception of these last-named guns, everything below the upper deck is completed.

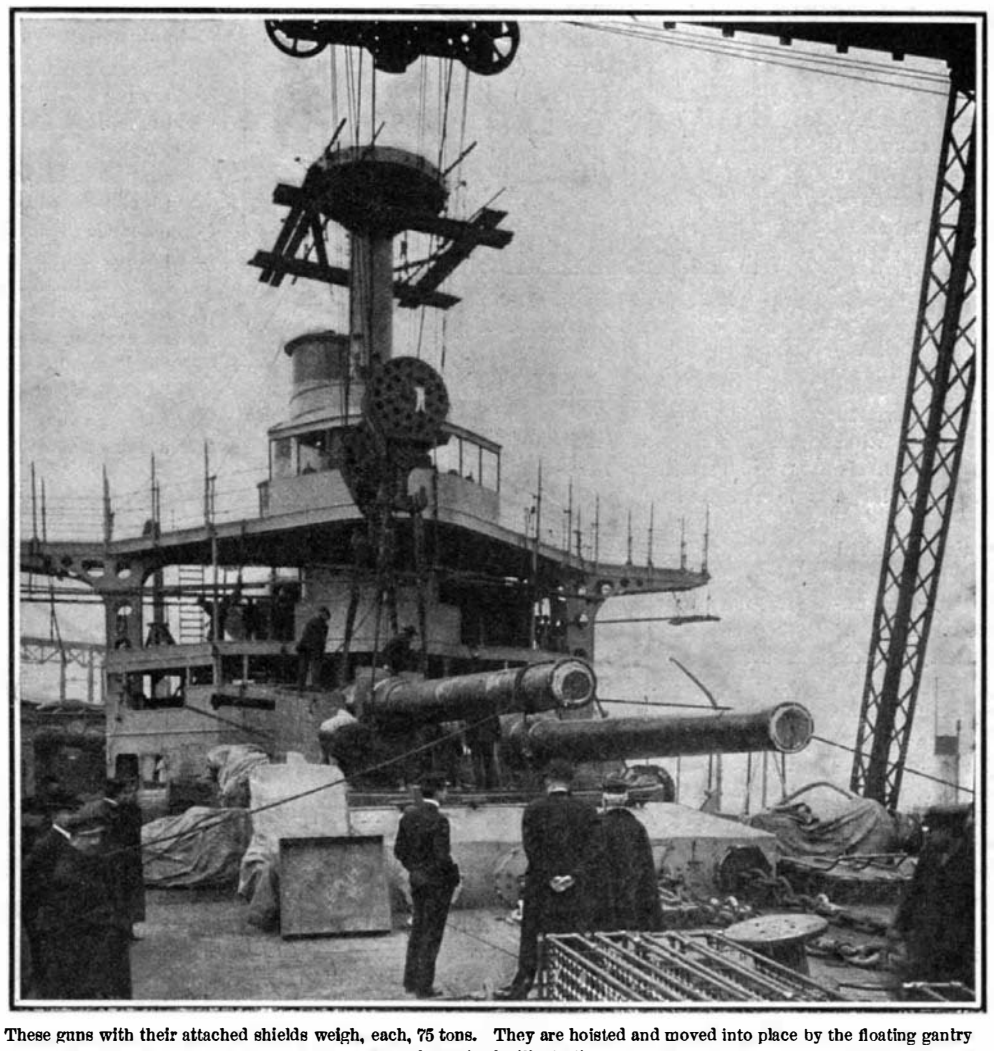


12-Inch Gun Being Transferred from Floating Crane to the Ship.

Pending the final determination and announcement of the plans for our new battleships "South Carolina" and "Michigan" (ships which will be of the same broad type as the "Britannia," carrying only 12-inch guns in the main battery), the "Connecticut" represents the highest development of warship construction in the United States navy. Furthermore, if the naval designers of the world have been too precipitate in the sweeping changes which they have made in their new designs, changes based on the so-called lessons of the Japanese war—if future engagements will not be the long-range affairs that is commonly supposed, and the opposing fleets, keen for the delivery of a crushing and conclusive attack, draw into closer range where the secondary armament can play on the enemy with telling effect—in such event the "Connecticut," with her eight 8-inch and twelve 7-inch guns in effective range, might well prove to be a match for one of the new type carrying a few very powerful, but slow-firing guns.

The "Connecticut" is 450 feet by 76 feet 10 inches, by 24 feet 6 inches, and displaces 16,000 tons. With 16,500 horse-power she is designed to make 18 knots an hour. Her full bunker capacity is 2,200 tons of coal. She carries a continuous belt, 11 inches thick amidships. Her 12-inch guns are protected by 12-inch armor; her 8-inch guns by 8-inch armor, and her 7-inch guns are mounted behind armor 7 inches thick. Her complete armament is four 12's, eight 8's, twelve 7's, twenty 3's, twelve 3-pounders, and fourteen small guns. She also carries four submerged torpedo tubes.

Our illustrations represent the emplacing of one of the four heavy, long-caliber, 12-inch guns, each of which with its saddle and attached port-shield weighs 75 tons. The guns were lifted and lowered into position by the large floating gantry crane which was built three years ago specially for the Brooklyn navy yard for doing this kind of work. The gun is lifted by means of two wire cable slings attached to the lower sheaves of two separate hoisting cables. These hoisting cables lead up to and over a traveling car, which runs upon tracks laid on the lower chords of the cantilever boom. The gun is lifted from the deck of the crane until it is high enough to clear the top of the turret. The carriage is then hauled out by means of cables that run in a sheave at the outer end of the boom, until it is in the correct position over the turret, and the gun is then lowered into position. A new feature in these pieces is the provision of a massive port-shield with parallel, vertical edges, the width of the shield being such that when the gun is in position, the clearance between the shield and the gun port is only about sufficient to allow the insertion of a lead pencil. The shield gives a perfect protection to the gun detachment inside the turret against fragments of bursting shell, and incidentally, it serves to prevent the entrance of gases from the 8-inch guns which are mounted a pair on each beam, astern of the 12-inch turret. The 12-inch gun is an exceedingly handsome piece, and its great length of 45 calibers, or nearly 50 feet over all, gives it an appearance of perfect proportion that is not possessed by the earlier pieces of shorter length. The initial service velocity is 2,700 feet a second, and its 850-pound shell leaves the muzzle with an energy of about 44,000 foot tons—sufficient for the penetration of 16½ inches of Krupp steel at a distance of 5,000 yards, providing, of course, that the projectile carries the usual soft cap.



These guns with their attached shields weigh, each, 75 tons. They are hoisted and moved into place by the floating gantry crane shown in the illustrations.

MOUNTING THE 12-INCH GUNS IN THE FORWARD TURRET OF THE BATTLESHIP "CONNECTICUT."

Through the courtesy of Capt. William J. Baxter, chief naval constructor at the yard, we were given an opportunity to make an inspection of the great battleship, which has left a strong impression of the skill with which the interior arrangements have been planned, and of the absolutely first-class character of the work. The great size of the ship has enabled the designers to provide accommodations for the officers and crew which are exceedingly liberal and comfortable, and marked by careful attention to the latest sanitary requirements. Particularly interesting is the care with which this provision has been car-

ried out as far as it affects the living quarters of the crew. Immediately above the boiler room is to be found a long line of shower baths for the use of the firemen; steam-heated drying racks, for their working clothes; a plentiful supply of wash basins and other essentials to cleanliness and decency. The same provision is made further forward for the crew; and mention should be made of a lofty, well-ventilated hospital and of a special room for patients having infectious diseases, while is tiled throughout, ceiling, floor, and walls, so that it can be subjected to thorough washing and disinfection after the patient has been removed.

As regards the working of the guns, all of which, by the way, are electrically-controlled, the most interesting features are those having to do with the speedy and safe delivery of the ammunition supply to its proper destination. This contains many new features which are of such a character that it is not advisable that they should be made public. Suffice it to say that the ammunition hoists, and the methods adopted for the transportation and distribution of the ammunition from the various magazines to these hoists, have been so skillfully designed and placed, that the mechanism is practically secure against shell fire. As long as any gun is in action, the gun captain need have no anxiety on the score of a failure of the supply of powder and projectiles.

Finally, as regards the very interesting competition in the construction of the "Connecticut" and the "Louisiana" (a competition, by the way, which the parties concerned in the construction of the two ships deny as having any existence), it may be said that at the present time the two ships stand about level. When the proposition was made to have the "Connecticut" built at a government yard, those who objected to such an arrangement declared that if the government built the ship she would cost from anywhere from 30 to 40 per cent more and take far longer to build, than if she were constructed at a private yard. As a matter of fact she has been built in the same time, and has cost only about 15 per cent more than her sister ship "Louisiana"; and this in spite of the fact that the government employees have shorter hours and receive higher pay than the employes in private yards.

THE NEW WATER SUPPLY FOR NEW YORK CITY.

In the choice of a new source of water supply for New York city, the engineers of the present Board of Water Supply have been obliged to exclude from their investigations certain desirable water sheds and rivers that had been shut out by prohibitory legislation. The sources of supply in the Catskill Mountains recommended by the Board have been chosen as presenting the most quickly available and the best and cheapest large sources that can be obtained under present conditions. The Housatonic River is ruled out because of its location in the State of Connecticut. Ten Mile River, a tributary of the Housatonic flowing into Connecticut, is ruled out by the uncertainty of the law governing the diversion of interstate waters; and the watersheds adjoining the Croton watershed on the north are ruled out by the prohibitions of the Legislature in 1903-04.

The choice of the Catskill sources was made largely as the result of a study of the very full data found in the report of the Commission on Additional Water Supply (the so-called Burr-Hering-Freeman Commission) appointed by Mayor Low in 1902. The elaborate studies of that commission, included in their report and published by the city, were carried on by a corps of engineers and assistants comprising in all about two hundred men, who spent an entire working season in the field, and very carefully examined the quality and feasibility of all available sources in the State of New York. This same commission was reconvened by Mayor McClellan and after further investigation recommended, without reserve, the Catskill Mountain sources as being now the most available for a large future supply.

In other independent investigations the Catskill Mountain sources have been repeatedly considered and proposed, notably as the result of a study of the subject under the chief engineer of the Department of Water Supply, Gas and Electricity of this city during years 1902 and 1904.

Catskill Sources to be Appropriated.—The Commission on Additional Water Supply recommended that steps be taken at once toward the building of reservoirs, aqueducts, and filters, sufficient to store, purify, and convey to New York city 500,000,000 gallons of water daily from various new sources; and the report of the present chief engineer of the Board of Water Supply, Mr. J. Waldo Smith, recommends that the following sources be appropriated for New York city, these being those for which authority is now being sought in a bill before the legislature: 1. Esopus Creek, to be taken at a point near Olive Bridge; 2. Rondout Creek, to be taken at a point near Napanoch; three small streams tributary to the Rondout, to be taken as shown on the map; 3. Schoharie Creek, to be taken at a point near Prattsville; 4. Catskill Creek, to be taken at a point about one mile north of East Durham, and also six small streams tributary to aqueduct from Catskill Creek to Ashokan reservoir. The total available yield of these Catskill sources, exclusive of interstate tributaries, is 660 million gallons daily, and 511 million gallons if we exclude the Catskill supply of 149 million gallons. Although there is no immediate call for the total amount, the present rate of growth of the demand in this city renders it certain that New York city will, within twenty-five years, need substantially all the waters that these sources can supply *in years of extremely low rainfall.*

The Great Ashokan Reservoir.—The scheme of construction proposed is to build at once that portion of the system which will give the city, in the near future, a sufficient additional supply, to safeguard it against any danger of a water famine. The first section that it is proposed to construct in accordance with this principle is the great Ashokan reservoir with a capacity of 250 million gallons daily, and an aqueduct of 500 million gallons daily capacity, to extend from the reservoir to a crossing beneath the Hudson River at New Hamburg, from which place it will be carried to New York by way of the new Croton reservoir. The

MAP OF NEW YORK CITY'S PROPOSED NEW WATER SUPPLY.

Ashokan reservoir will carry its full water line at an elevation of 600 feet above mean sea level.

Rye and Kensico Reservoirs.—From the Croton reservoir the 500-million-gallon aqueduct will be continued south to Kensico reservoir, which will be enlarged to include Rye Pond and form an emergency storage reservoir at an elevation of 355 feet above mean tide containing 25 billion gallons, or fifty days' supply at 500 million gallons daily. Continuing south for about four miles, the reservoir will lead to a large filtering plant at Scarsdale, and six miles to the south of this there will be another storage reservoir at Hill View. The advantage of these two reservoirs is that should any mishap occur anywhere along the 69 miles of aqueduct to the north, ample time would be given to make repairs without interfering with the regular city supply.

Brooklyn and Staten Island Connection.—For the supply of Brooklyn and Staten Island a tunnel of 200 million gallons daily capacity will be driven below the East River, with connections suitable for delivering 100 million gallons daily to Brooklyn, this connection terminating in a large reservoir in Forest Park. Another line, capable of delivering 20 million gallons daily, will be built by way of Brooklyn, its course being indicated on the accompanying map. In view of the fact that it will be from five to eight years before the first water can be brought in from the Catskill region, it is recommended that immediate relief, which is even more necessary in the case of Brooklyn than Manhattan Island, be sought in the more easterly sources of Long Island, which have been as yet undeveloped. The connection to Staten Island will probably consist of a 48-inch main leading to a terminal emergency reservoir built on high ground on Staten Island.

The estimated cost of constructing the Ashokan reservoir and aqueducts, emergency reservoirs, etc., but not the filter beds, as above outlined, is $112,092,000, and the time for its completion from five to eight years. The total cost of completing the whole system, including the Scarsdale filtration plant (estimated to cost $17,525,000) and the Rondout and Schoharie developments, is $161,857,000.

Artificial Albumen.—A New Condensed Food to Supplant Meat.

Consul Pike, of Zittau, reports that an interesting discovery is being discussed by the German press, which refers to the result of a recent investigation by Prof. Emil Fischer, of Berlin. He writes:

"It is contended that the principal nourishment required by the human body for its maintenance is alubpmen, according to the renowned professor of physiology, Pfeiffer, the source of all muscular strength. For this reason it has at all times been the endeavor of our learned men to obtain more knowledge of this important ingredient of our daily food. Up till now all such efforts have been in vain, but it was recognized that were it possible to make artificial albumen, a complete change in the present system of nourishing the human body would be brought about and would render the now so necessary meat foods to a great extent dispensable.

"Prof. Emil Fischer, director of the leading chemical institution, the Berlin University, has gained the credit of having accomplished the first analysis of natural albumen. He has established the composition of the various ingredients, some of which he has succeeded in producing artificially. The substance thus obtained he has called 'polypeptide,' and it is said to possess a large number of the properties characteristic of natural albumen. The vast importance of this discovery will be better comprehended when we realize that the introduction of this artificial food will reduce the disastrous effects of bad harvests, pestilence, etc., to a minimum, and cause famine to become a thing of the past."

The Current Supplement.

The current Supplement, No. 1577, opens with the first installment of a good article on Torpedo-Boat Destroyers. Clarence M. Barber writes instructively on fuel briquetting in America. The excellent article on "Cement Mortar and Concrete: Their Preparation and Use for Farm Purposes," is concluded. Recent advances in wireless telegraphy are reviewed by J. Erskine Murray. Of interest to the army of pilgrims who each summer return to New England to enjoy the beautiful excursions for which Boston offers a natural geographical and historical center, will specially wish to include in their itinerary a day at the Harvard Botanical Gardens, inasmuch as the centenary of this institution's conception has been celebrated. M. C. Crawford gives a comprehensive description of the garden, and illustrates it with many photographs. The scientific treatment of high-pressure explosives, both solid and gaseous, has left much to be desired. For that reason Mr. J. E. Petaval's treatise, published in the Supplement, may be regarded as the most valuable contribution to our knowledge of the subject. Among the minor articles which may be mentioned are those entitled "Starting the Engine," "The Brake Shoe Problem," "Water Power at High Pressure," "A Simple Camera Shutter," "Hybridization of Plants," "Star-Streaming," "Cost of Running a Motor Delivery Tricycle."

American Homes and Gardens for April.

The April number of American Homes and Gardens is one of the handsomest and most diversified issues of the periodical which has thus far been published. The "notable American home" which Mr. Barr Ferree picturesquely describes is the Long Island residence of Mr. W. K. Vanderbilt, Jr., at Great Neck. Beautiful photographic illustrations accompany the text. Other residences, not quite so large, although distinguished by architectural taste, are described and illustrated. Most interesting to the great majority of readers will be the account of some successful houses costing from $3,000 to $6,000. Photographs and plans of these dwellings are published. Instructive, too, as well as helpful are excellently illustrated contributions on "Weaving as an Occupation for Women," by Mabel Tuke Priestman; "Old-Fashioned Clocks in American Homes," by Mary H. Northend; "Modern Theory and the Bedroom," by Jay Wheeler Dow; "Construction and Care of the Hotbed," by Ida Bennett; "Garden Work for April," by Eben Rexford, as well as many other articles both timely and entertaining.