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NEW YORK, SATURDAY, FEBRUARY 11, 1905.

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.

CLOSING OF THE CROTON DAM.

The Croton Dam, which in some respects is the most notable among the large storage reservoirs of the world, was closed at 2 P. M. on January 28, by the shutting down of the gates controlling the two four-foot pipes, through which the Croton River had been flowing through the dam during the last few weeks of construction. Although the whole length of the dam has not been carried up to its full height, it is so far completed that by no possibility can the water rise at such a speed as to overtake the progress of the masonry to the level of the crest of the spillway. The incompleted portion is at the southerly end of the dam, and represents that section which was originally designed to be built of earth with a central core wall. The task of pulling down this portion of the dam and rebuilding it to conform to the solid masonry section has been carried through with great expedition under the present Chief Engineer, Mr. J. Waldo Smith, new methods of building the masonry having been employed, which have resulted in the bringing of this greatly-delayed work rapidly to its final completion. It will not take many months to fill the great reservoir to its full level, when there will be a depth of 160 feet of water at the dam itself. The lake thus formed will back up the Croton Valley for a distance of over 15 miles, and will present a shore circumference of 70 miles. When the reservoir is full, the water will rise over 30 feet above the crest of the old Croton Dam farther up the valley, and the total amount of water impounded will be 32,000,000,000 gallons. If the rainfall of the next few months should be normal, there will be about 4,500,000,000 gallons excess of inflow into the dam per month above the amount drawn off monthly by the aqueduct for the use of New York city.

VALUE OF THE TOWING TANK.

We do not suppose that even the most consistent follower of the old rule-of-thumb methods of ship modeling doubts any longer the value of the experimental towing tank or model basin, in determining the best under-water form of ships. Perhaps the only occasion on which model tank data has proved deceptive was that of the famous yacht races between the "Columbia" and "Shamrock II." Mr. Watson, it will be remembered, designed the "Shamrock" largely upon results obtained in towing a large number of models of varying form in the tank of the Denny shipyard. Mr. Herreshoff made no use of tank experiments, and great expectations were based upon the more scientific method that was supposed to have characterized the design of the challenging yacht of that year. The first attempted race was indecisive; but "Columbia" pulled out such a long lead that she seemed to have established, thus early in the contests, a pronounced superiority over "Shamrock." Rumor has it that as Mr. Watson was contemplating, somewhat thoughtfully, the rapidly-widening distance between the two boats, a friend asked him what he thought of the prospects; to which he replied, "I wish that Mr. Herreshoff had a tank." The story is good enough to be true; at least as applied to yachting. The work that is being done at the model basin at Washington is spoken of in strong terms of approval by the Chief of the Bureau of Construction and Repair in his annual report. As an instance of the great value of these experiments to our navy, it may be mentioned that the Chief Constructor states that in the preparation of the design of the new scouts, of which we give an illustration on another page, the information obtained from the model basin was invaluable; since for such vessels, not only the shape, but the length for a given speed, is a matter of great importance. Thus it was found that a scout of 4,000 tons displacement, 350 feet in length, required, in order to make 26 knots, more than double the horsepower of a vessel of the same displacement, but made narrower and shallower, and stretched to 450 feet in length. There is absolutely no method known by which such information can be obtained except through the model basin; and without it, the Bureau would be working largely in the dark concerning the majority of the problems of resistance and propulsion which require solution in the course of its work.

GROWING INTEREST IN FOREST PRESERVATION.

All of us who are concerned at the reckless way in which the magnificent forests of the United States are being cut down by the lumberman's ax, or burned up by forest fires, started by the carelessness of the settler and the hunter, will be pleased to take note that the National Forest Congress recently held at Washington, D. C., was attended by over eight hundred delegates, representing all sections of the country. It has taken time to stir the public up to an appreciation of the magnitude of this question; but it certainly does look as though we had reached, at last, a point where the public conscience has been thoroughly aroused, and the parties who are more particularly and immediately interested in the question are throwing their interest and powerful influence into the scale. Evidence of this was seen in the fact that leading railway officials, well-known lumbermen, managers of mines, and cattlemen and farmers were present in large numbers at the congress. This is as it should be. Time was when the interest in forest preservation was confined to people who had no practical connection with forestry, and were, therefore, drawn to the subject more by sentimental and philanthropic motives than by those of a practical character. At the recent congress, however, the most severe denunciation of forest spoliation came from the men who are interested in the preservation of our forests for practical and personal reasons.

STRENGTH OF PRESERVED TIMBER.

The increasing use of timber, that has been subjected to chemical treatment to preserve it against fire or decay, has led the Bureau of Forestry to make a series of tests for determining the effect which the fireproofing and preservative processes have upon the strength of the timber. Although these are not the first tests of the kind to be made, they are the first in which an effort has been made to determine how much the decrease in strength was due to the preliminary steaming process to which the material is subjected, and how much to the subsequent impregnation with creosote or preservative salts. For carrying out these tests, the Bureau put up a complete plant at the St. Louis Exposition, and the preliminary statement of the results which has appeared will have great interest for all workers in wood, whether in the large pieces used by the bridge and house builder, or in other structural work of a lighter character. Briefly stated, the method adopted was to use an 11-foot timber, which was first subjected to the preliminary steaming. Three-foot sections were then cut from each end, and the remaining 8 feet was treated with the preservative. Test pieces were then taken from the 3-foot steamed sections and the 8-foot steamed and preserved section for comparative tests. It was found that the steaming process diminished the strength of the timber in about direct proportion to the length of time that the steam was applied. There was a diminution of strength of 10 per cent when a pressure of 20 pounds was applied to the timber for four hours, and a diminution of strength of 25 per cent after a 20-pound pressure had been applied for ten hours, the variety of timber employed for the test being green "loblolly" pine. When a steam pressure of 50 pounds to the square inch was applied for four hours, there was diminution of strength of 25 per cent. Every worker in wood that is subjected to structural stresses will agree with the finding of the test committee when it states that it is well to avoid, if possible, the use of these preliminary steaming operations in the wood-preserving industry.

The tests further proved that the loss of strength is to be charged solely to the steaming, and not to the preservatives themselves. Thus, the strength of timber treated with a 2½ per cent solution of zinc chloride, subsequent to the steaming of the timber, proved to be the same as that of the steamed but untreated timber; and the same result was obtained with timber treated with an 8 per cent solution. The treatment with creosote has about the same weakening effect upon the timber as if it were treated with the same amount of water. In other words, creosoted and green timber have about the same strength; but with this important difference, that green timber gains strength as it seasons, whereas the creosote remains liquid in the timber. This has been proved by the analysis of a thirty-five-year-old creosoted pile.

A DESIGN FOR TURBINE CRUISERS.

The former Chief Constructor of the United States Navy, who is now the president of a large shipbuilding company, recently put in a bid for a 14,000-ton armored cruiser equipped with turbines. The proposition will attract worldwide attention, both because of the fact that it is made by the man who, more than any other, is responsible for the designs of the new United States navy, and also because of the daring nature of the proposition. Hitherto the largest warship to which the steam turbine has been applied is the "Amethyst," a 3,000-ton cruiser of the British navy. Mr. Bowles has always shown a disposition to be conservative rather than radical, in the matter of new design, and it is very significant that he should have been so perfectly satisfied with the performance of the new type of engine, as to be willing to commit his company to the venture of installing it on a big warship, whose estimated cost was over four million dollars. Furthermore, the faith of that growing school of naval architects and engineers who believe that the turbine is the coming motive power in all classes of ships except those that are intended to travel at very low speed, has received a strong indorsement in the comparative steam trials of the turbine-driven "Amethyst" and the sister ships of the same class, driven by reciprocating engines, a full account of which was given recently in our editorial columns. It will be remembered that, for speeds above 14 knots, the turbine showed a superior economy that increased with the increase in speed, and that with improvements to be made in the condensers of the turbine, and by leading the exhaust of the auxiliaries into the low-pressure receiver instead of into the condenser, the turbine-driven vessel is expected to show economy equal to that of the reciprocating-engine ship, at speeds considerably lower than 14 knots an hour. Incidentally, it is interesting to note that Mr. Bowles, who designed the armored cruisers "Tennessee" and "Washington," on which the "Montana" and "North Carolina" are an improvement, submitted an entirely different plan for the location of the secondary battery. The change consists in raising eight of the twelve guns on the gun deck to the level of the main deck, where they are mounted, together with the four guns originally carried on this deck, in pairs in six turrets, thereby increasing the command of these guns from 14 feet 6 inches to 23 feet above the waterline. The weight saved by the installation of turbines, moreover, is allocated to the side armor, the thickness of the main armor belt being increased from 5 to 6 inches. This last improvement remedies what we have always considered to be quite a serious defect in the design of the armored cruisers of this class.

OPENING OF DINOSAUR HALL OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

Eight years ago the American Museum of Natural History of New York city began a search for fossil reptiles in the Rocky Mountain States. The prime object of the search was to obtain skeletons of the Dinosaurs, those gigantic extinct animals whose fragmentary remains, discovered in that region and studied and described especially by the late Prof. Marsh, have excited the greatest interest among men of science. In order to place these marvels of an antique world before the public in tangible form, a Dinosaur Hall was planned, in which should be exhibited mounted skeletons of the principal kinds of these creatures. To obtain them, a series of expeditions into the regions of the arid West, where such fossils are to be found, was inaugurated and carried on under direction of Prof. Henry Fairfield Osborn, and the collections of the late Prof. Cope, containing three splendid skeletons of Dinosaurs, were purchased through the liberality of President Jesup.

This programme involved an amount of work hardly to be appreciated by outsiders, and it is yet far from complete. Nevertheless, the mounting of the largest skeleton, the Amphibious Dinosaur *Brontosaurus*, has been completed, the skeleton of a remarkable dwarf Dinosaur, the "Bird-Catcher," has been mounted and placed on exhibition, the preparation and mounting of complete skeletons of three other large and very extraordinary types (the Carnivorous, Duck-billed and Plated Dinosaurs) are well under way, and diligent search is being made for complete and mountable skeletons of other important kinds. Many other less complete specimens have been found, some of which are exhibited in the wall-cases around the hall.

The Dinosaur Hall will be opened to the public on February 16, 1905. The chief interest, of course, centers in the giant mounted skeleton of the above-mentioned *Brontosaurus*. In this hall visitors may see the largest fossil skeleton that has ever been mounted, and besides may obtain some idea of the variety and extraordinary character of the animals which populated the earth during the age of reptiles, millions of years ago, before the age of mammals had begun or the various races of quadrupeds which inhabit the world commenced their evolution.

In the issue of January 21, 1905, the SCIENTIFIC AMERICAN published an account of the mounting of the *Brontosaurus;* a few additional facts at this time may be of interest to the reader.

It will be remembered that the collection, preparation, and mounting of this enormous fossil has been a

task of extraordinary difficulty. No museum has ever attempted to mount so large a fossil skeleton, and the great weight and fragile character of the bones made it necessary to devise special methods to give each one a rigid and complete support, as otherwise it would promptly break in pieces from its own weight. The proper articulating of the bones and the posing of the limbs were an equally difficult problem, for the Amphibious Dinosaurs disappeared from the earth so long ago that their nearest living relatives, the lizards, crocodiles, and so forth, are extremely remote from them in either proportions or habits, and consequently they are very unsatisfactory guides in determining how the bones were articulated, and of but little use in posing the frame in positions that were probably taken during the creature's life.

So far as the backbone and ribs were concerned, the articulating surfaces of the bones were a sufficient guide to enable the experts to pose this part of the skeleton properly; but the limb-joints are so imperfect that it was not possible in this way to make sure of having the bones in a correct position. Therefore the following method was adopted: A dissection and thorough study was made by Dr. W. D. Matthew of the limbs of alligators and other reptiles, and the position, size, and action of the principal muscles carefully worked out. Then the corresponding bones of the *Brontosaurus* were studied, and the position and size of the attachments of the corresponding muscles marked out so far as they could be recognized from the scars and processes preserved on the bone. The limbs were then provisionally articulated and posed, and the position and size of each muscle represented by a broad strip of paper extending from its origin to its insertion. The action and play of the muscles on the limbs of the *Brontosaurus* could then be studied, and the bones adjusted until a proper and mechanically correct pose was reached.

The *Brontosaurus* was one of the largest of the Amphibious Dinosaurs, or Sauropoda, a race of gigantic reptiles which flourished during the Jurassic or Middle Period of the Age of Reptiles—some eight millions of years ago by a moderate estimate of geological time.

As mentioned in the previous writing, the construction of the vertebræ is truly remarkable; it can best be seen in the unmounted skeleton of *Camarasaurus*, another amphibious Dinosaur which has been laid out on tables beside the *Brontosaurus*.

Three views or opinions as to the habitat of Amphibious Dinosaurs have been held by scientific authorities. The first, advocated by Prof. Owen, who described the earliest specimens found forty years ago, and supported especially by Prof. Cope, has been most generally adopted. It regards these animals as spending their lives entirely in shallow water, partly immersed, wading about on the bottom, or perhaps occasionally swimming, but unable to emerge entirely upon dry land. More recently Prof. Osborn has advocated the view that they resorted occasionally to the land for egg-laying or other purposes; and very recently the view has been taken by Mr. Riggs and the late Mr. Hatcher, that they were chiefly terrestrial animals. Dr. Matthew, who has made as close a study as possible of the anatomy of the Dinosaurs, particularly in connection with the mounting of the *Brontosaurus*, inclines to the view of Owen and Cope, whose unequaled knowledge of comparative anatomy renders their opinion on this doubtful question especially authoritative.

The brain case occupies only a small part of the back of the skull, so that the brain itself must have been small even for a reptile, and its organization (as inferred from the form of the brain-cast) indicates a very low grade of intelligence. Much larger than the brain proper was the spinal cord, especially in the region of the sacrum, controlling most of the reflex and involuntary actions of the huge organism. So that we can best regard *Brontosaurus* as a great slow-moving animal-automaton, a vast storehouse of organized matter directed chiefly or solely by instinct, and to a very limited degree, if at all, by conscious intelligence. Its huge size and its imperfect organization, as compared with the great quadrupeds of to-day, rendered its movements slow and clumsy; its small and ow brain shows that they must have been automatic, istinctive, and unintelligible.

TWENTY THOUSAND DOLLARS FOR NEW INTERNATIONAL RACE.

The recent decision of the French Automobile Club regarding the Gordon Bennett Cup race and the founding of a new International Cup with a $20,000 prize, has awakened a considerable sensation. The present rules for the Gordon Bennett Cup are especially unfavorable to the French constructors, seeing that there are only three entries for each nation, and thus the French industry, which is represented by a great number of constructors, is placed on a par with nations having but a few leading makes. In this case France is obliged to select three cars out of a great number by eliminating trials, while another nation in which the industry is much less developed can also enter three cars, probably all of the same make. This year France is obliged to enter the Cup race under the existing rules, seeing that it now holds the Cup and is bound by its engagement. However, the Automobile Club decided that it would establish a new International Race which is to be run at the same time as the cup. These conditions hold good for 1905, but next year will see the condition of affairs considerably modified. There is no longer any engagement to fulfill, and the club decided that the rules for the cup race must be considerably changed to give a better chance for the constructors, or else it will not take part in the race. At the same time it establishes a race which will admit a greater number of competitors, and it will be known as the Grand Prize of the Automobile Club of France. It will no doubt become the leading event of the year. The club voted the Auvergne Circuit in the central part of France for this year's eliminating trials and the Cup Race. This is an elliptical circuit about 350 miles long. Immediately following the decision of the club, the journal L'Auto of Paris offered the sum of 100,000 francs ($20,000) to endow the Grand Prize, so that the event will be of great interest. The prize is to be awarded to the constructor of the winning car. It is probable that the race, which now includes the Cup and the Grand Prize, will be run in the latter part of June or the first of July. The following nations will no doubt be entered: France, Switzerland, America, Italy, Germany, Austria, Great Britain. As to the Grand Prize, it is probable that the Club will ask the leading constructors of different nations to take part, and there may be 42 entries in all, including the 21 for the Cup Race and an equal number chosen by the Club, with 12 from France.

SOME NEW COOPER HEWITT INVENTIONS.

Six new inventions have been patented by Mr. Peter Cooper Hewitt. Patent No. 781,606 covers a method for producing oscillating currents. Briefly, it is a method to prevent some of the loss in the spark gap of a wireless telegraph or other oscillatory system. To this end an auxiliary oscillator is provided, which is designed and arranged in such relation to the prime oscillator that the latter transfers all, or at least a large fraction, of the energy of the prime discharge to the said auxiliary oscillator. The function of this is elastically to absorb this energy in such a manner that it will oscillate persistently in its own natural period. The auxiliary oscillator has no spark gap, and oscillations therein once initiated will persist much longer than is the case where all the energy must cross a spark gap twice for each complete oscillation.

Patent No. 780,997 covers various forms and arrangements of the apparatus for producing oscillatory currents by the above method.

Patent No. 781,605 covers a method for producing light. This is substantially the method employed in the well-known Hewitt mercury-vapor lamps, with the difference that while in the earlier patent the vapor in the gap between the electrodes was made luminous by a flow of current of given value at a certain potential, the purpose in the present instance is to affect the gas or vapor by an intermittent flow of a current of practically the same value but of higher potential, the energy represented by the intervals between the impulses being intermittently withdrawn from action and reappearing in the form of an increased quantity in the rapid periodic currents. By the passage of current the voltage is lowered to a point where the usual resistance to starting reforms, whereupon the checked current rebuilds or re-establishes itself, its electrical pressure rising until the breaking-down pressure is again attained, after which the same succession of actions is repeated. The result is an increased brilliancy on the part of the lamp, due to this increased consumption of energy per unit of time, while the effect upon the eye becomes that of a light due to a continuous flow of current of greater quantity.

Patent No. 780,998 covers an apparatus for starting electric lamps. It is for the purpose of producing the initial and temporary high potential necessary to start the flow of current through vapor lamps of this kind. Briefly, it consists of a transformer having two coils connected with each other, one coil being permanently in series with the lamps, and the other in shunt upon the source. Means are provided for closing and opening the circuit of the second coil for inducing a higher potential in the series coil. There is an electro-magnet in series with the lamp and the last-named coil, and an armature for the electro-magnet. This armature is normally included in the circuit of the shunt coil, whereby on the passage of current through the lamp, the circuit of the shunt coil is opened.

Patent No. 781,002 covers a method of amplifying electrical variations. The resistance of an inclosed vapor or gas carrying current in an electric circuit varies inversely with the current carried by the vapor. Accordingly, if a varying potential be applied, a variation of current will take place in the inclosed vapor or gas, and this variation will affect the entire circuit. If the circuit is so arranged that the gas or vapor apparatus represents a considerable portion of the total resistance, the variations of current thus caused in the conducting gas will cause comparatively large variations in the entire circuit. As the practical result of an increase of applied potential is an increased flow of current, the original electrical impulses in the circuit may produce magnified effects as compared with those which the same impulses would produce if applied directly to the receiver.

Patent No. 781,001 covers a means for amplifying electrical variations. Substantially, this consists of an electric circuit including a source of potential variations, a receiver adapted to respond to changes of current in the circuit, and an inclosed gas or vapor conducting medium.

Patent No. 780,999 covers a method of transforming electrical energy. This consists in producing intermittent or vibratory electric currents in a successively charged and discharged circuit, which contains a circuit controller which has a high initial resistance and possesses the quality of taking no current below a definite low limit of electromotive force. It consists in periodically impressing upon the circuit an electromotive force higher than that at which the controlling device starts, and successively opposing to the electromotive force thus impressed upon the circuit, the high initial resistance of the circuit controller, and a predetermined lower resistance. The application of the lower resistance is continued through a definite period until the lowermost operative limit has been reached, and then this cycle of operations is repeated. The circuit controller above mentioned consists of an inclosed vapor or gas which possesses the initial high resistance and the consequent definite low resistance after the current has once broken a path through it.

Patents Nos. 781,000 and 781,603 cover apparatus for transforming electrical enrgy. Substantially, this consists of a gas or vapor lamp, such as that invented by Mr. Hewitt, in combination with a source of electric currents, and means for periodically applying to the terminals of the lamp differences of potential varying from the higher, initial, starting potential of the lamp to a value less than the potential at which the lamp remains conductive.

PRIZES FOR ESSAYS ON CEMENT.

In June last the Prussian minister of public works, jointly with the Prussian ministers of war, agriculture, and trade and industry, the imperial secretary of the navy, and the German Society of Portland Cement Manufacturers, issued a call for a prize competition of scientific essays on the chemical processes which take place during the hardening of cements. Prizes to the amount of 15,000 marks ($3,570) are offered, and the prospectus specifies that contributions must be submitted in the German language, each signed with a pseudonym, and the name of the author inclosed in a sealed envelope marked with the same pseudonym, which latter will be opened only in case the paper bearing such pseudonym receives a prize. Thus prepared, all papers for competition are to be addressed to the "Ministry of Public Works, No. 80 Wilhelm-Strasse, Berlin," where they will be received until 3 P. M. December 31, 1906. The papers, immediately after the lists are closed, will be submitted to a jury composed as follows: Prof. Dr. Van Hoff, Berlin; Prof. Dr. Scheibe, Wilmersdorf; Dr. Michaelis, Berlin; E. Cramer, editor of the Clay Industry Journal, Berlin; Prof. Dr. Wilhelm Fresenius, Wiesbaden; Director Friedrich Schott, Heidelberg; Dr. H. Passow, Hamburg, and officials of the royal testing station near Berlin. The scope of the investigation is indicated by the following schedule which defines the questions to be solved: "Demonstration of the properties and of the hardening process of calcareous hydraulic cements synthetically, analytically, microscopically, mineralogically (hardening in air, fresh water, and sea water). (a) To prove whether silicic acid, alumina, and oxide of iron combine with lime as crystalloids in stable proportions, or as colloids in varying proportions. (b) To prove whether double combinations result between silicic acid, alumina, and oxide of iron with lime and in what manner these substances are engaged in the hardening process. (c) Consideration of the swelling phenomenon which accompanies the hydraulic hardening. (d) Consideration of the influence of the temperature and length of time of the burning process on the different kinds of hydraulic cements. (e) Properties of puzzolana and its hardening with lime; beginning with silicic acid as the most active and prevailing puzzolana, alumina, oxide of iron, and manganese, independent and in combination with silicic acid, as natural or artificial puzzolana. The competitors may choose for the purpose of investigation any or all of the foregoing questions.