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.