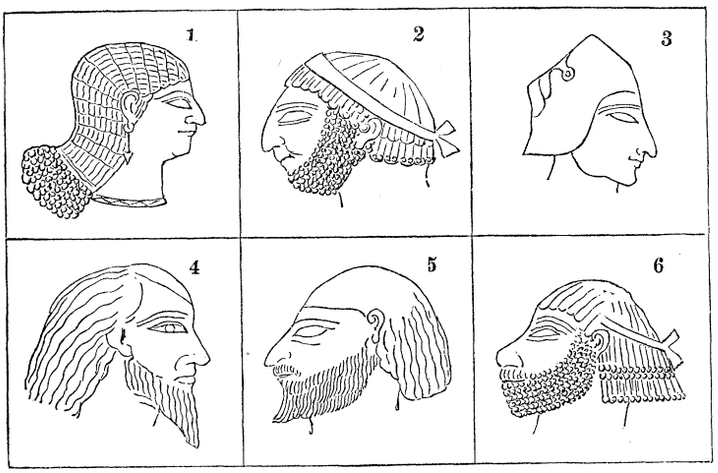
retreating. In many of these figures a marked prognathism may be observed. The nose is often large, and does not appear to have ever been flat and wide, as among the Tatars; hair and beard are frizzy; the stature, short. In some parts of Babylonia this type seems to have formed the great mass of the population. According to Mr. Bertin's theory, this people was the 'ground race' of western Asia, and he goes so far as to identify it with the European prehistoric races, which are by many authors believed to be of Berber origin. He adds, "An important point to notice is that this race is everywhere found in an inferior social position, and it was equally so in the remotest age. Nowhere did it rise to the rank of a dominating or ruling race, but everywhere it accepted the yoke of the conquering tribe invading its land. It is the race of the land, and accepts every new master with a passive obedience. This explains why this race has no language of its own, for it accepts willingly



that of its masters." The author believes that this people was conquered by Akkadians and by Semites, and that the mixture of these races, with the addition of some Armenian blood, resulted in a population showing the various types found on the monuments.

The study of the west Asiatic and Egyptian monuments from an anthropological and philological point of view has recently yielded most interesting results, and opened entirely new views of the early history of the ancient world. The intercourse between the various peoples, and their mutual influence upon each other, were so important, that a comprehensive and comparative study of all these numerous peoples is necessary to reach satisfactory results. The theories of Mr. Bertin are suggestive, and well worth a careful consideration; but they must be verified by a comparative study of the monuments of other races, and, what is still more important, by exact anthropometric researches.

ELECTRICAL NEWS.

Submarine Boats.

THERE are few books that have been read with so much pleasure by young and old as Jules Verne's 'Twenty Thousand Leagues under the Sea.' The submarine boat 'Nautilus,' propelled by electric motors, — very complicated ones, if the writer remembers the picture correctly, — the electricity furnished by powerful batteries, was able to move at a wonderful speed beneath the ocean at the will of her mysterious commander.

The folly of one generation is the wisdom of the next, and to-day we are in all seriousness trying to faintly rival the vessel of Captain Nemo. The boats that are being built are for torpedo purposes, and are neither large, nor do they attain a very high speed, nor can they remain long beneath the water; but we look for a steady improvement in their performance, and we believe that some day such vessels will be of practical use to mankind. The great difficulty in submarine propulsion is the obtaining of some propelling agent that can be used beneath the water. Hand-power was first tried, and later compressed air and carbonic acid have been employed. For automatic torpedoes, such as the Whitehead or Lay, the two latter agents are fairly successful, but the amount of energy that can be practically stored by either means is too small to be of use in a real submarine boat.

The history of the early experiments in submarine navigation is the history of disaster. There are stories of partial successes, but the sequel is usually tragic. A successful submarine boat is said to have been made by a Chicago shoemaker, who was in the habit of going out in it and spending his afternoons in the bottom of the lake. One evening he failed to return, and, as he had not communicated the plans of his boat to any one, his experience is lost to us. The writer remembers, in the war between Chili and Peru, that a submarine boat was built by the latter government to destroy the Chilian fleet, at that time blockading Callao. It was to have been run by compressed air, and was calculated to attain a speed of four miles an hour. An unfortunate miscalculation resulted in the weight of the vessel being greater than her displacement; and, on being launched, she immediately went to the bottom, where, owing to the characteristics of her builders, she was allowed to remain. During the late war a number of experiments were tried with submarine torpedo-boats; but, excepting in one case, they resulted in failure.

There is no inherent impossibility in navigating boats beneath the surface for any length of time. The atmosphere can be purified and its oxygen renewed by chemical means, and the depth that can be attained depends only on the ability of the boat to resist the enormous pressures to which it is subjected at any considerable depth. The distance beneath the surface can be regulated in a number of ways, for the density of the water is practically the same at any depth. The only drawback has been in the difficulty of obtaining power. In the last few years electricity has promised to remedy this.

The latest and largest submarine boats are being tried in Toulon and at San Fernando respectively. Let us first describe the French boat, the 'Gymnote.' She is driven by an electro-motor coupled directly to the armature shaft, and supplied with electricity from storage-batteries. The motor absorbs 52 electrical horse-power at 280 revolutions a minute. The total weight of the motor is about two tons. The electric energy is furnished by a battery of 564 storage-cells of the Commelin-Desmasures-Baillehache type, described in this journal (No. 305). Each of the cells weighs about forty pounds, making over ten tons for the weight of the battery. They have furnished 58 horse-power for four hours. The experiments made on this set of cells show that to store one horse-power of energy requires about eighty pounds, while energy can be taken out from them at the rate of a horse-power for four hundred pounds. The 'Gymnote' has been tested in the roadstead of Toulon to determine her behavior, but so far the experiments have only shown how long she can safely remain beneath the water. Half an hour is the longest time as yet, but it is hoped that the time of submersion will be considerably increased. What the speed of this vessel will be, how easily she can be controlled, and what depth she can safely reach, are questions yet to be determined.

The boat being tested at San Fernando, 'Le Peral,' has been constructed from the designs of Lieut. Isaac Peral of the Spanish Navy. It is about seventy-two feet long, by nine feet and a half at its greatest diameter. It is driven by five electro-motors, — two of twenty, three of nine horse-power, — furnished with current from 600 cells of storage-battery. No experiments have been made on this boat, but it is calculated that she will have a speed of twelve knots at the surface, and of ten knots when half submerged. It is also calculated that she can remain below the water for two hours without requiring a fresh supply of air.

Germany is not behindhand in these experiments, and has built at Kiel a boat one hundred and twelve feet long. Its immersion is regulated by two vertical screws driven by a six-horse-power motor. What the propelling power is, and what its performance may be, we have no data that will enable us to guess; but that the motive power is furnished by electricity there can be little doubt.

These three boats, the most ambitious yet constructed and the most probable of success, contrast but meanly with the 'Nautilus.' The immense size of the latter, her speed of fifty miles an hour, the depths to which she descended, will be for many years, if not always, the imaginings of a story-writer, with no practical counter-

part. But that we shall at no very distant day be able to explore the shallower parts of the ocean, and recover some of the enormous wealth that lies hidden in wrecked vessels, there is little doubt. Already powerful electric lamps are used to illuminate the oyster-beds for the pearl-divers, being lowered to any depth required; and it is easy to predict that before long some submarine boat, propelled and powerfully lighted by electricity, will be searching for the wrecks of galleons and treasure-ships. The things most needed are faith in the success of the plan, daring, money for equipment and experiment, and, what is so often needed for a new application of electricity, a more perfect storage-battery.

ANOTHER NEW STORAGE-BATTERY. — Patents have just been granted to Louis Duncan of Baltimore for an improvement in secondary batteries. A great objection to the present battery lies in the fact that the inactive support-plate is heavier than the active material, — only one-third to one-fourth the total weight of plate is active in the ordinary cell, — while the limited surface prevents a heavy discharge-rate. With ordinary lead supports, an increase in surface causes an increase in the local action and depreciation of the cell, while any decrease in the thickness of the support also decreases the life of the cell. In this patent it is the intention to get a large surface, and a large proportion of active material to total weight, without decreasing the life of the cell. Broadly the idea is to coat the support-plate — a thin sheet of copper, washed with lead, in one of the claims — with a very dense layer of an oxide of lead, deposited on it from a solution of litharge in caustic potash, by means of a weak electric current. The deposit is so dense that it completely shields the sheet underneath from contact with the liquid: so, when the plate is put in sulphuric acid, there can be no local action between this coating and the lead beneath. By increasing the strength of current in the solution of litharge, the character of the deposit completely changes, becoming porous, and having a considerable electrical capacity. The positive plate, then, has four layers, — first, an outer active layer of peroxide of lead; second, a layer of dense peroxide that has no capacity; third, a thin coat of lead; and, lastly, the copper plate. Between the first and second layers there is no local action, because they are of the same chemical constitution; between the second and third there is no local action, since there is no liquid between them, while of course there is no action of the lead on the copper. We have no data as to any actual results. If the protective action of the dense peroxide claimed in the patent is really perfect, then a cell can be made with an immense surface for a given weight, and an excellent capacity. Such a cell should be of the greatest value, especially in traction-work; but no opinion as to the practical value of the cell is worth any thing unless supported by experiments carried on for a considerable time.

UNDERGROUND CONDUITS. — A meeting of the committee on underground conduits and conductors, of the National Electric Light Association, was held at the association headquarters, 16 East 23d Street, New York, on Tuesday, Dec. 11. The meeting was called to order at 2 o'clock P.M. by Mr. E. T. Lynch, jun., chairman. A preliminary discussion as to the present state of the art was entered into by the members present, and there seemed to be a very general impression that one of the most important things at present was to ascertain more fully and accurately than had heretofore been done, just what has so far been accomplished in this country touching upon the undergrounding of arc-light conductors. Several plans for accomplishing this were discussed, and the committee adjourned until Monday, Dec. 17, when definite plans for carrying out the work of the committee will be consummated. The members of this committee are E. T. Lynch, jun., chairman; F. B. Crocker; Gen. C. H. Barney; and Walter C. Kerr.

NOTES AND NEWS.

OBSERVATIONS have been made in India, South Africa, and Australia, which led to the conclusion that certain carboniferous rocks were formed by the action of ice. Conglomerates were found which contain large bowlders of various materials, some of which have characteristic scratches and striæ. Recently A. Derby found similar rocks in southern Brazil. The general appearance of these rocks is much like those of India and South Africa, and it seems probable that their origin is due to the same causes which formed the latter. So far, no striæ have been observed; but, as the region has not yet been investigated thoroughly, their existence is quite possible. The wide distribution of strata of this character is an undoubted proof that their origin is due to a general, probably a cosmic, cause; and among these, glacial action seems to be the most probable.

— It will be remembered that a number of elements had atomic weights which seemed not to be in correspondence with the demands of Mendelejeff's periodical system. Recent experiences have shown that these discrepancies were due to inaccurate determinations of atomic weights. K. Seubert has proved that the last of these discrepancies is due to the same cause. The theory demanded that the atomic weight of osmium be smaller than that of iridium, while former experiments gave the opposite result. Seubert has shown that the determinations which had been made by Berzelius and Frémy were inaccurate. He finds the atomic weight of osmium to be approximately 191, while that of iridium is 192.5.

— Hypnotism thrives in Washington. Two gentlemen interested in psychological studies, Mr. W. A. Croffut, executive officer of the Geological Survey, and Gov. N. J. Colman, commissioner of agriculture, give occasional *soirées hypnotiques*, at which they hypnotize numbers of "sensitives." During some recent experiments by Mr. Croffut, two young ladies, temporary victims of the hypnotic hallucination, were taken into an imaginary picture-gallery and there left, while the operator turned his attention to a young man who was engaged in the dangerous pastime of catching crocodiles. On returning to the ladies, Mr. Croffut found that he could not make them cognizant of his presence. They did not appear to see him, or hear his voice, and when he stood directly in front of them they took no notice of him whatever. It was a new and somewhat alarming experience, and a quarter of an hour passed before the hypnotizer re-established his domination, and brought them back from the land of dreams.

— Prof. J. P. Lesley has sent out a few final proofs of the first signatures of his report on the fossils of Pennsylvania, in the form of a dictionary, for the convenience of students and collectors of fossils in that State. It will be useful to them, and perhaps to others; but Professor Lesley claims no scientific merit for it, excepting that it contains a small number of new species discovered in the State collections, and named and figured by Mr. G. B. Simpson, in consultation with Prof. James Hall of Albany. The book itself is a compilation, which Professor Lesley made from various sources, mostly classical, and much of it old, and of difficult attainment by students of the present day. In the preface, when printed, all these sources will be fully recited. The book is going through the State Printing-Office at Harrisburg, will be bound in two volumes, and each volume distributed, when bound, separately.

— Mr. George F. Kunz, Hoboken, N.J., will purchase or take in exchange meteorites for fine crystallized or rare minerals. Intact falls, all the pieces of a fall, and newly found and undescribed ones, are especially desired; also aboriginal objects made of jade, jadeite, chlormelanite, pectolite or other allied minerals, or new occurrences of same; facts in regard to and specimens of American pearls, and American amber from all localities, especially if containing enclosures of wood, vegetable, or other living matter; gold and silver ornaments from the United States, and data concerning them. He is also desirous of securing the gem writings of certain ancient authors.

— It has long been known that rails of tracks in actual use oxidate much slower than those of dead tracks, but so far no satisfactory explanation has been found. W. Spring, in the Bulletin of the Royal Belgian Academy, shows that this is due to the formation of a coating of magnetic oxide of iron under the influence of humidity and pressure. In order to prove the correctness of this view, Mr. Spring has brought moistened rust and a clean plate of iron under a pressure of from a thousand to twelve hundred atmospheres, which corresponds to that of the wheels of a locomotive of a thousand hundredweights. He found that the rust-powder had penetrated the iron, and formed a coating of magnetic oxide.