mountain ranges ten miles in height measuring from the top of the highest mountain to the deepest abyss of the ocean. Many changes have occurred in the past millions of years since the dry land appeared, and doubtless many of the mountains were much higher; but nature is ever carrying on a fierce warfare, and slowly and imperceptibly the heights are leveled, the mountain peaks denuded, and the dry land washed down the great river courses into the sea; and theoretically, given sufficient time, assuming that no elevation occurs, the entire earth may disappear.

This wear and tear of nature is accomplished in many ways, and is productive of interesting results. Frost, snow, wind and rain are the principal erosive agents which are chiseling, cutting, grinding and wearing away the surface of the earth. The elements are all levelers, and the tendency is to reduce the mighty monuments of nature and level them in the dust. In the accomplishment of this, many remarkable natural monuments are made, splendid in their dignity and grandeur. Instances are found in the Garden of the Gods, in Colorado, where pillars, towers, monoliths, arches, gateways, titanic newel posts and forms and shapes of every possible kind and design are seen—the work of frost and rain.

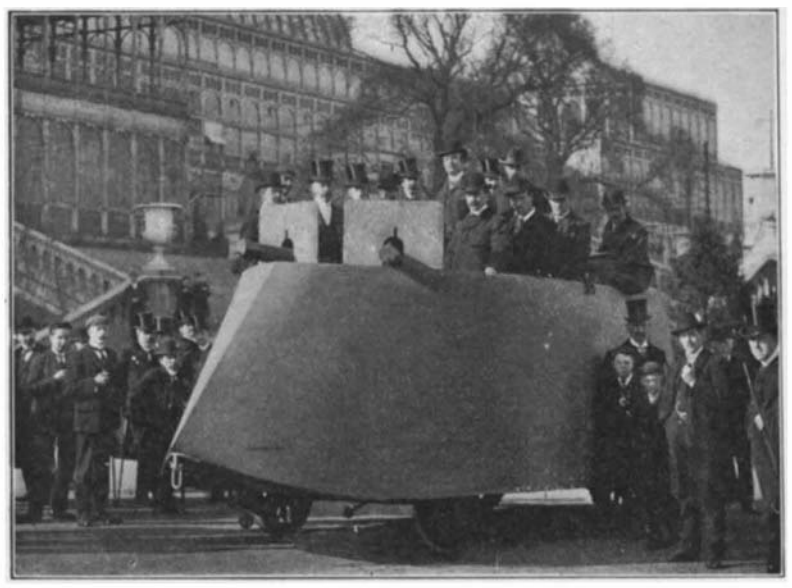
But it is further west that the most striking effects of erosion are found. In the region to the west of Salt Lake, and from there on, in what was formerly known as the Great American Desert, every overland passenger has been entertained by the weird and picturesque works of nature. Let but the fancy lead, and the eye rests upon cities, cathedrals, towers, minarets in the splendid buttes which rise everywhere along the line of public travel. They now appear silent and alone, gigantic monuments, or again in groups and clusters, rising on the horizon like ships upon the ocean; and it is not difficult to people these fantastic dwellings and imagine them the centers of human life. When the sun descends it paints them in marvelous hues—red, vermilion, yellow, and finally merging into purple and black in the quickening gloom. These strange forms, appealing so strongly to the imagination, are but the remains of past mountains, hills and plateaus. Rain floods have cut into and disintegrated them until all that remains is the core, or a harder portion that defies the elements and stands lofty and alone, a monument telling the story of the wear and tear of nature.

In New Mexico and Arizona there is still more striking evidence of this destruction. One should see it immediately after a contemplation of New England or the Middle States, where the country apparently has not changed materially in many centuries. The contrast is remarkable; the scenery bleak, rocky, barren, but with a charm peculiarly its own, a fascination few can resist. It is the land of the butte, and the lofty isolated mesa, the home of the washout, the cloudburst and violent outbreaks on the part of the elements, which in many regions appear to have wrecked the very face of the earth. Lofty buttes rise here and there, showing that in the past they have been the surface of a more or less level mesa which has been cut and worn by interminable floods until the very surface of the earth seems to have been washed away for hundreds of feet leaving the gigantic buttes, often acres in extent, to tell the story. Many of these are occupied by the native Indians who formerly used them as vantage points, and, when warfare and pillage are things of the past, still live there from mere force of habit.

One of the most interesting of the largest buttes is the famous Enchanted Mesa, which has been written up as a novelty by many modern writers and over which much discussion has occurred. This mesa is a type of extreme isolation and abruptness, the talus being so steep that ascent is extremely difficult to the average climber. This butte was inhabited ages ago, as all similar commanding positions, in all probability, have been, but, according to tradition, the means of descent were washed away by one of the cloudbursts, which made the mesa originally, and so it became uninhabitable.

A typical butte is well shown in the accompanying illustration—a rock pillar at Acoma, New Mexico, photographed by G. Wharton James. Harder than the rest of its surroundings, it has resisted the floods and rains of centuries, and stands, a gigantic monument to the resisting quality of certain portions of the surface. This pillar is merely a diminutive Enchanted Mesa. It may have been acres in extent at some early age, dwindling away with each successive year, the pillar being the heart or core of a sometime lofty and isolated mesa.

In the famous fossil forest of the Southwest the fossil trees often form interesting columns which have defied the elements. In Fig. 2 a pillar in this region is seen; not the trunk of a tree, but a column of shale piled layer upon layer which for some reason has resisted the elements and stands alone. Its base is fast disappearing, the talus even in the photograph being seen to be crossed and lined by the torrents which have poured down its sides and which ultimately will carry it entirely away, distributing it over the surface; and finally the column itself, weakened and undermined, will topple over and be reduced to its original composition of dust or gravel. Around the base of this pillar are seen the sections of fossil trees which have rolled down the slopes, telling a remarkable story of some change which has wiped out a great forest and devastated the land. In Mexico, not far from the island of Tiburon, there is a region undergoing a similar change and turning into a desert. The water is giving out; sand covers the land, but in it are found countless mesquite trees protruding here and there, showing that within the century the region has been well forested, as forests go in Mexico. But the land has been blasted, and the traveler over its burning and desolate areas may observe the actual change of a once fertile country into the typical desert.



THE SIMMS WAR-CAR.

An Interesting Discovery.

The German explorers in Babylon have made an unusually interesting discovery. Inscribed tablets of clay are common enough, and examples of them are to be found in the principal museums of Europe. But in the excavations at Nischan-el-aswad 400 tablets have been discovered, many of which are of a novel character. Several may be considered as of the belles-lettres class, says the Architect. They were evidently used for teaching, and therefore may be regarded as presenting examples of the Classic literature of Babylon. Some served as a dictionary, and on that account will be interesting to philologists. There is also a hymn which was chanted during the processions in honor of the god Mardik, whose temple has been brought to light by the German explorers. In another part of the same district the Temple of Adar or Ninev, the protector of physicians, has been discovered.

SERPOLLET'S RECORD-BREAKING STEAM RACER.

Automobile Department

THE NICE RACES.

Among the principal automobile events at Nice were the mile and the kilometer (0.62 mile) dash, the latter for the Henri de Rothschild Cup. These two events were run at the same time, and the automobiles after starting were chronometered at the kilometer and when required, at the mile points. The kilometer dash has been of especial interest this year owing to the record made by M. Serpollet of the kilometer in 29 4-5 seconds, and also of the general high speeds which were reached. M. Serpollet used a racing machine of special form, which will be observed in the engraving. It is a 12 horse power steam machine of the flash-tube boiler type, somewhat modified as to details. The front is formed of a sheet-iron cone which lessens the air resistance. The inventor considers that at such high speeds it is more essential to diminish the air resistance than to increase the power of the machine. Most of the racers used the machines which had been prepared for the Nice-Abbazia long-distance run, and it was interesting to see how these behaved on a short speed test. The best time for the mile was made by Osmont on a single-cylinder De Dion motocycle, which covered the distance in 57 4-5 seconds. The Mercedes 40 horse power machine built by the Daimler Company carried off the honors of the automobile class and the Darracq 20 horse power for the light automobiles.

The kilometer dash for the Henri de Rothschild Cup included automobiles from 1,430 to 2,200 pounds' weight, with two places occupied. The cup, a handsome work of art now on exhibition at the Nice Club, was won in 1901 by M. Serpollet, the time being 35 4-5 seconds.

THE SIMMS ARMORED WAR-CAR.

Vickers' Sons & Maxim, the well-known English armament manufacturers, have built a war-car, the invention of Mr. Frederick R. Simms, an expert who has devoted many years' experiments to this particular subject.

In general appearance the car can be described as a "mobile conning tower." It measures 17 feet in length, by 6 feet 2 inches in width over all, and has been designed to carry a maximum weight of 12 tons, though the actual weight to be carried will rarely exceed 6 tons. It consists of a rectangular frame constructed of heavy steel channels of U section. It is built with the intention of combining the maximum strength with the minimum of weight.

The special frame on which the motor, and speed differentiating gears are supported, is mounted on the car frame, and is built of Mannesmann steel tubes, the motor frame being supported to the main frame of the vehicle by suitable brackets and stays. The car is propelled by means of a 16 horse power four-cylinder light hydrocarbon motor of the Daimler type, fitted with the Simms-Bosch magneto-electric ignition and timing gear, with constant-level float-feed carbureter and governor acting on the exhaust valves. The bore of the cylinder is 90 millimeters, the stroke is 130 millimeters, and the compression 60 pounds per square inch. The motor is placed in the center of the car deck.

Petroleum of a specific gravity of 0.680 to 0.700 is the fuel used, but ordinary common kerosene of a specific gravity of 0.860 can also be burned if desired.

The cooling is effected by means of the Cannstatt marine type cooler—a copper tank containing about 5,000 copper tubes, through which air is induced by means of a fan rotated by the engine. The circulation of the air-cooled water between the cooler and the engine is kept up by means of a rotary gear driven pump. The water capacity of the cooler is four gallons, which is considered to be sufficient for at least 1,000 working hours. The engine runs normally at 750 revolutions per minute, but when the accelerator, with which it is equipped, is brought into action by means of a foot lever the velocity can be increased to 1,000 revolutions or more per minute.

The transmission of power is effected by means of a friction cone direct through a short end of shafting to the speed-changing gear, the female cone being developed as the flywheel of the engine, the male part being movable, and operated by means of a foot lever

throwing the power in and out of gear. The car is provided with a special gear of four definite speeds, i. e., 1½, 3, 5, 9 miles per hour. With the accelerator, however, the speed of the car can be increased 25 per cent.

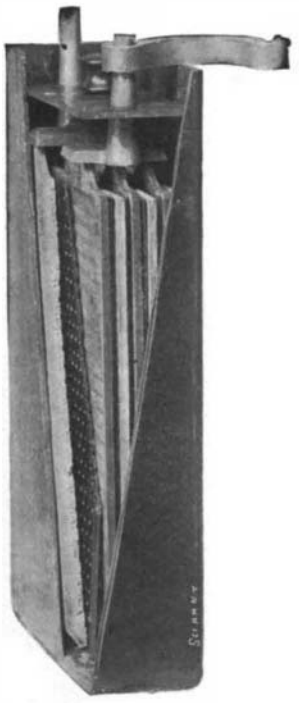
The steering gear is of the Ackermann type, controlled by a hand wheel and worm gear. The car is equipped with ample braking arrangements. The car, in spite of its weight, may be brought to a dead stop when going at full speed within six or eight yards. The road wheels are protected in case of war by chain mail, although this precaution is scarcely necessary, as the main armor belting is only 18 inches off the ground.

The tank contains sufficient fuel for 200 miles.

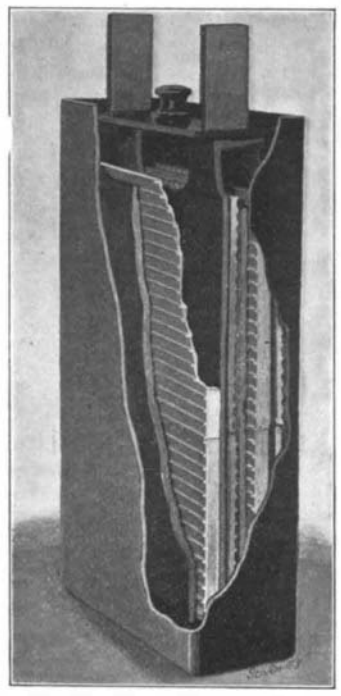
The most important feature of the car is the armor protection. The armor is so designed and constructed as completely to encircle the car frame. The bow and stern of the car are ram shaped, the angle of the nose being about 45 degrees. The extreme length of the armor, which is 18 inches off the ground, from point to point of the ram, is 28 feet. The extreme beam is 8 feet, and the extreme height 10 feet. The armor is of 6-millimeter Vickers steel, and is impervious to small arms. It is attached to the car frame by means of semi-elliptical springs, onto which it is hung by stout brackets. The four semi-elliptical springs are mounted on steel trestles, suitably braced and stayed to the main frame. By this it will be seen that the armor is not rigidly fixed to the frame. On the contrary, it has been the aim of the designer to separate the armor from the car frame itself in order to obviate the detrimental vibration imparted by the road wheels to the frame. The front and the rear of the armor serve as stores for ammunition, being boxed in underneath. Both rams are fitted with couplings, and are connected with tie rods direct to the main axles, so that in case the war-car is used for haulage almost a straight axial pull is obtained. The inside top edge of the armor is provided with half-embedded rollers, so as to prevent boarding, it being impossible owing to these rollers for any hand to obtain a hold on the top of the armor.

The armament of the war-car comprises two pom-poms and two automatic quick-firing Maxim guns fitted on proper gun mountings, either in turrets or without. In the latter case the guns are equipped with shields, and the mountings are so constructed as to lower or raise the gun in or out of action. If necessary 6-pounder guns may be carried. The ammunition stores carry some 10,000 rounds or more. The car is worked by three or four men, the number depending on the number of guns carried. There is sufficient platform room, however, for 20 men.

Only one man is required to drive and steer the car. The hill-climbing capacity of the vehicle is 1 in 7½ with a full load. Sufficient fuel for 500 miles may be carried. The total weight of the car complete, with armor, guns and fuel, is 5 tons 12 hundredweight.



THE PORTER CELL.



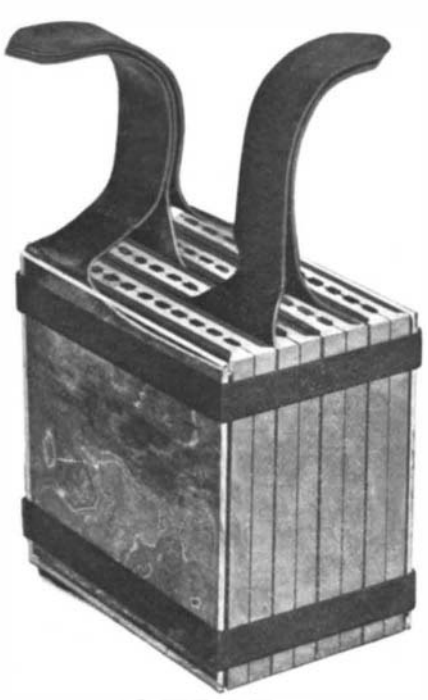
GOULD AUTOMOBILE CELL WITH EARTHENWARE SEPARATOR.

SOME MODERN AUTOMOBILE ACCUMULATORS.

The accompanying illustrations give a good idea of the construction and appearance of some typical storage battery cells used in the present-day electric vehicles.

Heretofore all practical storage cells have been constructed of lead, either from solid lead sheets or by pasting a grid with oxides of lead. These were called the Planté and Faure types of plates after their respective inventors. Another kind of storage cell is now being perfected by Mr. Thomas A. Edison, in which the active material is composed of iron and superoxide of nickel, which are formed into briquettes and pressed into very thin sheet steel frames. The plates are assembled in an electrolyte of caustic potash. The first machine-made cells of this new type have just been completed, and, after they have been thoroughly tested in vehicles, the Edison Storage Battery Company expects to place them on the market. The principal advantage of the nickel-iron cell over the lead one is that in it there is no rotting action due to the successive oxidation of the positive plate, and hence, theoretically at least, there should be no deterioration, while the weight of the cell is nearly half that of the most durable lead cells, the capacity in watt-hours per pound of total weight being about 14. A disadvantage is found in the lower electromotive force, however, which averages 1.25 volts against 2 of the lead cell. This means that nearly double the number of cells will be required to obtain the necessary voltage than are at present needed with the lead battery.

UNPASTED GRID.



THE COMPLETE BATTERY.

PASTED GRID.

THE INTERNATIONAL BATTERY.

A typical example of the lead battery formed from lead sheets will be found in the Gould cell. The plates of this cell are very finely grooved by rotating steel disks, which cut into the lead and crowd it up without removing any of it. An exposed surface 17 times that of the smooth plate is thus obtained, and this is what determines the capacity. The plates are made with fine or coarse grooves, according to their size and the work they are intended for. A cell built on this plan, the largest ever made, was exhibited at Buffalo, N. Y., last year. The dimensions of this cell were 9 feet long, 2 feet wide and 4 feet high. It contained 100 plates 15½ by 31 inches in size, immersed in one ton of sulphuric acid solution, and weighed 8,750 pounds. It gave 16,000 ampere hours at an 8-hour discharge rate or 8,000 ampere hours when discharged in one hour. The cut shows a 7-plate automobile cell, which has a capacity of 90 ampere hours at the 3-hour rate, and weighs complete 28½ pounds. This gives it a total energy value of 6.27 watt-hours per pound. Hard rubber perforated ribbed separators were formerly used in this cell, but at present an improved porous earthenware separator is substituted that is said to possess several advantages.

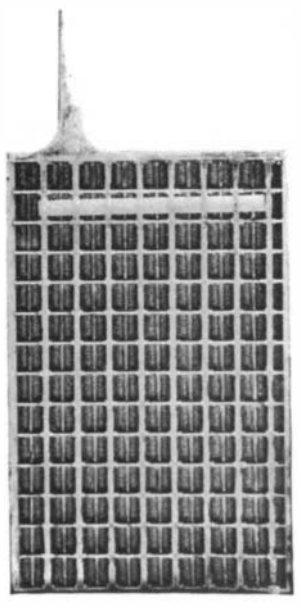
Mr. A. F. Maddern, the inventor of the form of plate used in the above described cell, has recently succeeded in stamping plates from lead sheets in an hydraulic press of novel design. The intricate lead grid and plate seen in the illustrations were produced under a pressure of 250 tons to the square inch. This gives a homogeneous conductor with the largest possible effective surface per unit of weight in contact with the active material. Such contact is always assured in cells of the pasted type, since the small figures or points of the grid can bend slightly to conform with the expansion and contraction of the active material. The grids are so rigid and the active material adheres so well, that the only separator used consists of four hard rubber strips which fit in grooves in the four vertical bars of the frame. These batteries have been manufactured by the Auto-Dynamic Company, and received a thorough testing in pleasure vehicles and delivery wagons during the past year and a half. At a three-hour rate of discharge, a 90 ampere-hour cell gives something over 8 watt-hours per pound. The company are now preparing to manufacture the Planté type of plate shown in one of our illustrations.

A battery that was invented three years ago by Mr. F. W. Barhoff, of Hartford, Conn., and which has been thoroughly tested in a vehicle for 13,000 miles, is constructed from lead rods which are grooved or cut into washers, leaving sufficient lead to form a solid core. These rods are then assembled so as to form plates. This battery has held up remarkably well in the endurance test given it, as it only fell from 8.47 to 5.049 watt-hours per pound during the three years it was in service. The Hartford Auto and Livery Company are preparing to manufacture this battery, which can be produced cheaply and yet is believed to have greater durability than any of the other batteries now on the market.

The National Battery Company have just completed a new lightweight cell of the Planté type which is said to have a capacity equivalent to about 14 watt-hours per pound.

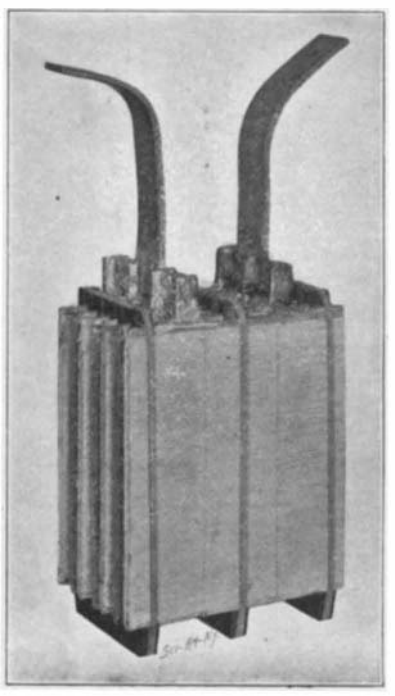
The American Battery Company, of Chicago, make a durable cell somewhat sim-

BARHOFF BATTERY PLATE.



REUTERDAHL PLATE.

REUTERDAHL CELL.



AMERICAN BATTERY ELEMENTS.