coloration with occasionally a series of small yellow patches, except under the head and body, which remain white. With the crustaceans the action is much slower and as yet only slight black patches have appeared on the skin. It is expected to make a series of experiments upon mammals in the underground laboratory as soon as a good system of ventilation is installed in order to supply the necessary fresh air.

THE CAVES AND DENE-HOLES AT CHISELHURST.

BY M. H. H. MACARTNEY.

Chiselhurst, the little Kentish town eleven miles out of London, is very proud of itself just now. And with good reason. Its long-despised chalk pits, of which nobody took any account except when from time to time somebody fell down them, now turn out to be ancient British cave-dwellings which can vie in extent with the Breton subterranean dwellings in La Vendée of which Victor Hugo makes mention in his great novel "Quatre-Vingt-Treize." The last summer was the first year that they have been recognized for what they really are, and therefore they have not as yet been fully explored. But enough has already been done to give the visitor a good idea of the haunts of the ancient British troglodyte, and to show that these caves are among the most marvelous triumphs of early engineering.

From the Chiselhurst station to the caves is only a few minutes' walk, but even in that short time I passed over historic ground; for close to the caves is a double rampart some twenty feet deep, the sole remains of the old covered way which led into the British camp, portions of which are still to be seen. Just beyond is a hill crowned with woodland which forms the extreme outskirt of the mighty Anderida Weald. In this hill lies the entrance to the caves. As I stood for a moment peering into the inky darkness, my guide switched on the electric light. Fancy electric light being installed in these old caves! It was hopelessly incongruous. But the effect was splendid. I looked down a long gallery some 150 feet long, 12 feet high, and 15 feet wide, the chalk walls of which took the green and pink tints of the light in a way which would have been impossible in a cavern of rock. The whole scene reminded me of a representation of Aladdin's cave at a Drury Lane pantomime, but there were no stalagmites and stalactites, which are indispensable to the stage cavern. The walls of this first part are roughly hewn with the pickaxe in a very different fashion to the walls of the Temple itself, which we afterward visited. We came almost immediately upon the first of the many dene-holes. These dene-holes are shafts, about 3 feet 6 inches in width, coming straight through the thanet sand into the chalk, and were made by the ancient Britons during the Keltic or Iron Age. The shafts serve a two-fold purpose. The Britons not only shot their grain down them, but in times of danger swarmed down them themselves either by means of steps cut in the sides or by a notched pole. At the bottom of each dene-hole were six or eight compartments, in which the people lived till the danger had passed away. An attack on these refuges must have been futile. For as only one man could possibly descend at a time he must have fallen an easy victim to the Britons awaiting him at the bottom. Or, again, to try and smoke out the refugees must have been equally futile, since the British wasps need only have given a few blows with their picks upon the soft walls to make an entrance into the next set of chambers, with which the ground is literally honeycombed. But to-day these sets of chambers are not the self-contained flats that they used to be, for when the Romans captured Kent they cut passages intersecting these chambers in the hopes of thus destroying the power of the Druids. The dene-holes too are almost all blocked up and built over, but I was shown one up which I looked to see the sunlight 85 feet away in a villa garden. It was like looking up a huge factory chimney.

By this time we had left behind the electric light and depended only upon a single hand-lamp. We had now come to the Druids' treasure-chamber, the size of which can be clearly traced upon the ceiling. But though the chamber has been broken down, the passage leading from it toward the Temple is still perfect. And a tiny, little zig-zag passage it is, only wide enough to admit one man at a time and not high enough to allow a fair-sized man to stand upright. On both turns it is guarded by a chamber large enough to allow the sentinel to swing an axe. The seat, too, on which the sentry sat and waited for "something to turn up" still remains, and I seized the opportunity to sit down and make a few hasty notes. The passage was once still more secure, the entrance being a hole at ground level, so that the sentinel had merely to bring his axe down on the head of the would-be Bill Sykes as he crawled along on his belly.

Just a little way beyond the end of this passage my guide suddenly stopped and turned his lamp upon a cranny in the roof. "Look up there," he said in an awe-inspired tone; "there are the petrified remains of an ichthyosaurus who was caught here when the sea receded from this part of the land." One great dark leg is all you see, the body of the creature being imbedded in the chalk. My guide now showed signs of giving me some statistics "pitched in the key of emotion" based upon the fact that the sea takes 100 years to form an inch of chalk, but providentially we had now come to the well supplying the place. The present depth of the well is 53 feet. I lit a piece of paper and dropped it down. As it fluttered down I could see how carefully the sides had been "flinted-in," if I may coin the expression, while the steadiness of its flame testified to the purity of the air.

We were now in the very Temple itself, built in the Druidical sign of the circle. The walls here are exquisitely made, and still bear the marks of the triangular iron pickaxes with which they were fashioned over 2,000 years ago. The floors, too, are much harder in this part than elsewhere. Apparently a cement was made of burnt flints and chalk and the floors were then flooded. There are six altars still surviving, which seem to be arranged in pairs. The first and the last are single altars, two are double altars, and two have priest-chambers attached to them. These priest-chambers also are beautifully made and are semi-circular in shape. In one the natural understratum of the chalk has been washed by iron pyrites which has given the roof a lovely color rather like that of a copper-beech. It is a significant fact that these altars follow the sun, being almost exactly orientated; which certainly seems to indicate solar worship as the religion of the ancient Britons. The altars themselves bear no traces of any ornamentation. It has been conjectured that they were used for human sacrifice. The caves beyond the Temple, which were our furthest point (though my guide told me that he had explored another five miles), are, curiously enough, built in the rough sign of a cross. Whether this is accidental or not is unknown. The nave, as it were, has innumerable dwelling rooms and passages opening off it. This part in fact is a regular labyrinth and may have been designedly made so. The part of the Minotaur was played by my guide's pet dog, which had missed him and came tearing out of the darkness after us in a very eerie fashion. An interesting point about these dwelling rooms is that they are never placed exactly opposite to one another, so that the inmates of one could not have overlooked their neighbors across the way. Another remarkable thing is the extraordinary acoustics of the place; the whispering gallery of St. Paul's is not in it. And so back again through the Temple, and the treasure-room passage, and the first great gallery, out into the bright sunshine. For me to attempt to criticise the various theories which have been put forward about the place, would be out of place here. I have contented myself with jotting down the history as told me by the guide. One thing may be confidently predicted: we do not as yet know anything like as much about these caves as we shall after further exploration. And experts are now hard at work upon them.

NEW PROCESS OF MANUFACTURING OZONE.

For the past few years the great importance of ozone for hygienic and industrial purposes has been more and more recognized. The general use of this potentiated form of oxygen was, however, restricted on account of the expensive method of its manufacture. The English engineer Elworth is now said to have found a process for manufacturing ozone that is much simpler than those used heretofore and that permits of a larger production.

Ozone is by him produced in an apparatus into which atmospheric air is forced by means of an air pump. An electric alternating current of 3 amperes at 130 volts, transformed to a potential of 1,100 volts, is then introduced. Through electric discharge in the apparatus, ozone is engendered. The air introduced into the apparatus is forced through an ingenious system of pipes; and, having become highly ozonized, escapes with great velocity through a pipe which conducts it *ad libitum* to the places and the objects intended to be treated with ozone.

The firm of Koelle & Held, of Stuttgart, has for some time past made interesting experiments with these apparatus, which are still continued. It has been proven so far that a much larger quantity of ozone is obtained than by previous methods. The apparatus works very quietly and without any interruption.

It is evident that such an increase of production means a cheapening of the price of ozone and, therefore, a more extended use. The apparatus takes up but little room and can be used wherever the necessary alternating electric current of sufficient power is available, either through a small motor or from larger electric establishments.

Ozone, on account of its great oxidizing power, is well adapted for supplying oxygen to closed rooms, such as theaters, hospitals, manufacturing shops, etc., for purifying drinking water, for the purification of sewage, bleaching of leather, treating oils, etc.

If the new apparatus fulfills expectations, it may result in new possibilities for public hygiene, as also for many industries.

SCIENCE NOTES.

Mr. F. V. Coville, in the National Geographic Magazine, gives an interesting account of how the Indians of the desert obtain drinking water from the barrel cactus. It was among the desert hills west of Torres, Mexico. The Indian cut the top from a plant about five feet high, and, with a blunt stake of palo verde, pounded to a pulp the upper six or eight inches of white flesh in the standing trunk. From this, handful by handful, he squeezed the water into the bowl he had made in the top of the trunk, throwing the discarded pulp on the ground. By this process he secured two or three quarts of clear water, slightly salty and slightly bitter to the taste, but of far better quality than some of the water a desert traveler is occasionally compelled to use. The Indian, dipping this water up in his hands, drank it with evident pleasure and said that his people were accustomed not only to secure their drinking water in this way in times of extreme drought, but that they used it also to mix their meal preparatory to cooking it into bread.

Uranium is one of the rare metals for which there is a limited demand. The present world's consumption amounts annually to about 300 tons of uranium ore, yielding from 3 to 13 per cent of the metal. For several years Colorado has supplied the United States output, nearly all of which goes to Europe. France, England, and Germany are the principal markets. Uranium is a hard, very heavy (9.184) moderately malleable metal; it resembles nickel and iron, and has the color of nickel. At ordinary temperatures it is not affected by air or water; at red-heat, however, the surface oxidizes. The chief ore of uranium is the oxide, called pitchblende or uranium. It occurs also as the phosphate and arsenate. The ores are found in Gilpin and other counties of Colorado; in Cornwall, England; and in Saxony, Germany. Buyers of the ore generally pay from $15 to $20 per unit, according to the percentage of uranium contained. Until recently uranium salts were used chiefly as a pigment in painting on porcelain, in photography, and as a coloring ingredient in glass manufacture. It is now being used experimentally in the manufacture of alloys of iron and of aluminium. Uranium increases the hardness and elasticity of steel, also the hardness of aluminium, but this use has not yet become sufficiently important to cause an increased demand for the metal.—Engineering and Mining Journal.

The trustees of the Carnegie Institution, founded at the city of Washington by the munificence of the well-known philanthropist, Andrew Carnegie, at their annual meeting in December, 1903, took the necessary steps to establish what is now to be known as the "Department of International Research in Terrestrial Magnetism." An allotment of $20,000 was made, with the expectation that, if the proposed work should be successfully organized, a similar sum would be granted annually for the period requisite to carry out the plan submitted by the writer and published in Year Book No. 2 of the Carnegie Institution. It is proposed to set aside $10,000 for office expenses (reduction, discussion, etc., of existing observational data) and $10,000 for observational and experimental work; a portion of the latter sum may be reserved annually and allowed to accumulate for some large undertaking. The general aim of the work is "to investigate such problems of world-wide interest as relate to the magnetic and electric condition of the earth and its atmosphere, not specifically the subject of inquiry of any one country, but of international concern and benefit." The prime purpose, therefore, of this department is not to supplant any existing organization, but rather to supplement, in the most effective manner possible, the work now being done, and to enter only upon such investigations as lie beyond the power and scope of the countries and persons actively interested in terrestrial magnetism and atmospheric electricity.

THE CURRENT SUPPLEMENT.

Mr. Emile Guarini opens the current SUPPLEMENT, No. 1477, with an account of the Berlin telephone exchange. The excellent article by M. Danne, preparator to M. and Mme. Curie, on radium, is concluded. His series of articles may well be considered the most exhaustive discussion of radium and radio-activity that has thus far appeared. Another article that should attract some attention is Dr. Erlwein's discussion of the purification of potable water by means of ozone.

Mr. Frank C. Perkins begins an article on the development of the electric mining locomotive. "The Hospitalier Ondograph" is the title of an article which describes a new instrument for graphically recording current and potential variation of alternating currents. Mr. Hiram Percy Maxim furnishes some data, that are certainly startling, on the cost of operating automobiles for commercial purposes. Mr. Israel C. Russell's paper on "Recent Volcanoes of Southwestern Idaho and Southeastern Oregon" is concluded.