

possible. This might be arrived at by using gearing as in the geared locomotives or motor carriages, or by using a gearless locomotive in which an elastic connection is employed between the driving axle and the motor; but the committee had no opportunity of experimenting with a locomotive of this type. In the trials carried out the motor cars were found to have an advantage in freedom from vibration over the geared locomotive. So far as the Central London Railway is concerned, the committee are confident that by adopting motor cars in place of the original locomotives the vibration produced by the running of trains can be reduced so as to cause no serious annoyance, although it is possible that the sound of the trains may still be detected, especially in the night. They are able to speak positively as to the motor cars, but they entertain little doubt that any method of driving in which the unsprung-borne load on each axle is reduced to a similarly small quantity might also be used with impunity. On the question of the best form of rail and sleeper the committee had no decisive evidence. They were disposed to prefer a stiffer rail than that in use on the Central London Railway, and advise in new undertakings that sufficient room shall be allowed for the introduction of a deeper rail.

Prize for Method of Drying Potatoes.

The German association of alcohol manufacturers and the association of agriculturists have jointly offered a prize of 30,000 marks (\$7143) for the best method of drying potatoes for feed for cattle, etc.

German agriculture has been increasing its potato crop very largely. The technical progress made in cultivating potatoes and the choice of certain kinds yielding a larger crop have made it apparent that Germany will continue to have a surplus of this vegetable.

Already, 40 per cent of the total crop is used as fodder; but as potatoes deteriorate after six or seven months, they must be fed within that time. Transportation also, is expensive, on account of the large percentage of water they contain. Three and one-half tons of fresh potatoes yield a ton of dried ones. It is predicted that a good method of drying potatoes will greatly benefit German agriculture, and it is intended to use the process on a large scale.

Particulars for this prize contest can be had by applying to the "Institut für Gährungsgewerbe," Berlin, N. 65 Seestrasse.

The Current Supplement.

An important article on the Braun-Siemens-Halske wireless telegraphic system which is so strong a rival of the Slaby-Arco system in Germany opens the current SUPPLEMENT. The article is illustrated not only by clear diagrams, but by handsome half-tone illustrations. Havelock Ellis, who is well known as one of the foremost living biologists and psychologists, tells us something of the mysterious plant mesal and of the peculiar visions which it calls forth when taken into the system. An article on volcanoes is of timely interest. Archaeologists will be pleased to learn something of the excavations in Crete and of the work done by the German Archaeological expedition at Babylon. Prof. S. P. Langley, in a thoughtful lecture, discusses the laws of nature. "Sleep-Producers" is the title of an essay by Dr. Kellogg. The recent paper read by Bion J. Arnold at the convention of the American Institute of Electrical Engineering on the practicability of using electric power for traction on the New York Central Railroad within the limits of New York city, is published in full. The Consular Reports and Selected Formulæ are given as usual.

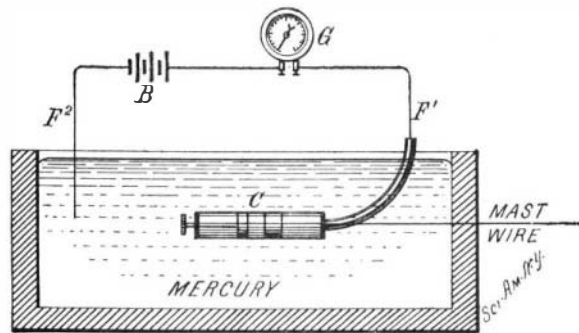
Shot by an Eskimo Hunter.

Wild geese and brants are known to travel, during the migratory season, very far south. Recently a large wild goose was killed not far from Spokane City, Wash., which had evidently winged its way from the remote Eskimo lands. When the hunter picked up the bird he was surprised to observe a slender piece of ivory protruding from its breast just below one of its wings. With much difficulty he succeeded in pulling out the piece, for the flesh had grown tightly around it. It proved to be an arrowhead, about eight inches long, which had some queer carvings on the stem where it had been fastened to the shaft. The carvings were delicate, though quite distinct. On a careful inspection by some Klondike miners the carvings were pronounced to be of Eskimo origin. No arrowpoint of that kind was ever known to have been used by the Indians of Washington or British Columbia. The head was of fine ivory, no doubt carved from a walrus tusk. Evidently the goose had been shot by an Eskimo hunter in the Arctic regions, the wound had healed, the flesh had grown around the weapon, and in its long flight the bird had no doubt broken off the arrowshaft.

J. MAYNE BALTIMORE.

EXPERIMENTS WITH ELECTRO-MAGNETIC WAVES ON MONT BLANC.

M. Charles Nordmann, in a paper read before the Académie des Sciences, gives an account of some experiments which he made at the Mont Blanc observatory in order to determine whether waves of an electro-magnetic nature are given off by the sun. It seemed possible that a source of luminous and calorific energy should emit electro-magnetic waves, as these are now recognized to be of the same nature. M. Nordmann chose an elevated point for carrying out the researches in order to eliminate as much as possible the absorbing action of the atmosphere, and especially that of water vapor, and installed an experimental post at the Grands-Mulets, a point at 9570 feet altitude. To receive the waves he used a horizontal mast wire 550 feet long which was laid along the Bossons glacier upon wood insulating supports so that the sun's rays would fall directly upon it. The choice of the glacier for the support was of considerable importance. The ice can be considered as a reasonably good insulator; M. Janssen has shown this in his recent experiments on Mont Blanc. Ice is transparent to the electro-magnetic waves. The ice in this case was 80 feet thick and the sun's rays (at the autumnal equinox) were inclined from the vertical, thus avoiding a possible error arising from interference. Nordmann used a coherer which was placed in a vessel of mercury which formed an opaque medium for outside disturbances. The coherer, *C*, has one pole in contact with the mercury and the other, *F*, insulated from it and passing above to a galvanometer and battery circuit, with a return wire, *F'*, to the mercury. The wire, *F*, is surrounded by a metallic sheath which acts as a screen. The mast-wire is uninsulated and passes through the mercury to the coherer. Thus the coherer was carefully sheltered from any external disturbance. It was then regulated while still under the mercury by a regulating screw and the galvanometer brought to zero. The mercury was then allowed to run out by a tap and the coherer left free. Under these conditions the experiment was repeated several times on the 19th of September during fine



NORDMANN'S APPARATUS.

weather, but all the results were negative and no deflection of the galvanometer could be obtained. This seems to prove that the sun does not emit such electro-magnetic waves as can be propagated along a wire and act upon a coherer; or in the contrary case such waves must be absorbed by the sun's atmosphere or the upper atmosphere of the earth. It is well known that rarefied gases have a powerful absorbing action upon such waves, but the object of the experiment was to see whether a part of the waves did not escape this absorbing action and penetrate to the surface of the earth.

Periodic Comets of 1902.

Astronomers expect the appearance of two periodic comets during the present year. The first of these was discovered by Temple at Marseilles on the 27th of November, 1869, and returns every 5.5 years. Its period was only known, however, after the rediscovery of the comet on the 11th of August, 1880, by L. Swift, for in 1875 it was not favorably placed for observation, and the same on its return in 1886 and 1897. In 1891 it was but feeble, and was observed for the first time on its return by Barnard on the 27th of September, with the Lick telescope. It will be in a better position for observation in the first part of December next, when it is expected. The second of the periodic comets has an interesting history. It was discovered by Swift on the 20th of August, 1895, and calculation assigns it a period of about seven years. It is remarkable that this comet seems to be identical with the one discovered on the 14th of June, 1770, at Paris by Messier, who was called the "ferret of comets," because he had observed a greater number than any astronomer of his time. Lexell had calculated its orbit and supposed that as its period was 5.5 years it would come back at the end of 1775; but he did not find it, in spite of all his searches. Schulhof is of the opinion that the comet in passing near the planet Jupiter, whose mass is considerable, has undergone great modifications in its movement, and that the comet described by Swift is the same as the so-called "lost comet" of Lexell. Its return is expected in November, when it will be near the sun and in a good position for observation.

Correspondence.

Cheap X-Ray Tubes.

To the Editor of the SCIENTIFIC AMERICAN:

It may be of interest to some of your readers to know that experimental X-ray tubes can be made out of ordinary lamp globes. The two electrodes are made of sheet aluminium, and are about $\frac{7}{8}$ inch in diameter. The aluminium may be got for these from any dentist's supply house. About No. 20 gage is best, and should be soft. They are hammered out until they very nearly fit the tube. Then they are shellacked onto the outside of the tube at as nearly opposite points as possible, and held in that position by weights until they are dry. After it is perfectly dry, the tube should be run until the shellac is melted, and then allowed to cool, while the electrodes are pressed tightly against the tube. After the shellac has solidified, the tube may be run for short intervals until it is working properly and generating X-rays.

These tubes work best on a high-frequency coil, although they may be run on an induction coil. When run with the latter, the anode should be a little larger in diameter than the cathode. The connection to the coil is best made by means of stiff wires held by binding posts. An ordinary socket will serve as a support for the tube while it is being used. With a tube made from a 32 C. P. globe (it would make no difference if it is burnt out) the bones of the arm and hand may be plainly seen.

M. EASTHAM.

Oregon City, Ore., June 9, 1902.

Lord Kelvin on the Molten Earth.

To the Editor of the SCIENTIFIC AMERICAN:

I have doubted if many of us have recognized the deep significance of Lord Kelvin's contention that, "when the earth was in a molten state, it was surrounded by an atmosphere of nitrogen and carbonic acid gases, but with no free oxygen." I for one am happy to take this learned man's word on this problem, for he seems to have unlocked the gateway into a marvelous field for the scientific adventurer.

If the earth had no free oxygen during the igneous era, we stand face to face with the time and place of primitive oil-making. Assuming that the earth's immeasurable fund of carbon and hydrogen, which it now has in store, was in that great world-furnace then, how are we to avoid the conclusion that it was the one grand opportunity for the formation of a world's hydrocarbon such as we find in the earth's crust to-day?

The less oxygen our furnaces and coke ovens get, the greater the deposit of sooty, oily carbon matter in our smokestacks, which as miniature oil and fuel depositories, take fire and burn. From this it is but a scientific step to the conclusion that a vast amount of the carbon and hydrogen of a world, made hot by the implacable heat of chemical and mechanical processes, went, through mineral fire-mist, to the terrestrial heavens as an unburnt hydrocarbon fuel. Even with free oxygen present it could hardly have prevented the molten earth from posing as a smoking world, which means oily carbons sent to the skies.

Now we find an almost limitless fund of unconsumed allotropic carbon among the aqueous formed strata, and I presume Lord Kelvin knows this as well as anyone, but the great problem was, and is, how to account for the existence of these igneous distillations so far above the igneous beds. If we can leave old paths long enough to see all these and other fiery exhalations sent to the skies and formed into a Saturn-like annular system, as a revolving earth appendage, where they lingered till the earth grew cold and then came back in grand installments as the ages rolled on, the first decade of this twentieth century may see a happy solution of this tantalizing problem. As annular world-deposits they are philosophically in place to harmonize with Kelvin's matchless deductions.

In the strictest sense this is not a secession from the current school of geologic thought. It is simply a hesitation longer to follow the empiricism which makes the organism the only source of the hydrocarbons, discarding the basic fact that millions of years before a fish or mollusk lived in the seas, there was an all-competent oil-making furnace, as far ahead of the secondary organic source as the energies of a molten earth surpass the puny efforts of the decaying organism. The contest is between Lord Kelvin and the organic school.

ISAAC N. VAIL.

Pasadena, Cal., May 26, 1902.

The Western Automobile Endurance Test.

The Automobile Club of Chicago will conduct a 100-mile endurance test open to all kinds of self-propelled vehicles on July 12. The course will be along the shore of Lake Michigan to Waukegan and return. The endurance run will be the first to be held in that section of the country, and it should offer excellent opportunities to the many new Western automobile firms to demonstrate the good qualities of their machines in an actual test on the road.