

SCIENCE NEWS

CALIFORNIA EARTH MOVEMENTS AND EARTHQUAKES

Science Service

SLOW movements of the earth's crust are in progress in California, Colonel E. Lester Jones, director of the U. S. Coast and Geodetic Survey, who characterized them as "remarkable," reports to Science Service. The eventual result of the precise surveys showing these changes may be the prediction of the time and place of earthquakes within reasonable limits.

Field parties this year found irregular movements of the coastal region within 200 miles of San Francisco amounting to as much as 16 feet as compared with accurate surveys made 30 or more years ago.

The discovery of the movements was made possible by the survey's field operations under special congressional appropriations, and the cooperation of the Seismological Committee of the Carnegie Institution of Washington, headed by Dr. Arthur L. Day. The field work consisted in the redetermination of the latitude and longitude of certain peaks, principally of the Coast Range, and of certain lighthouses, the positions being determined by reference to two massive peaks of the Sierras, Mount Lola and Round Top. The actual measurements were made by two triangulation parties, one under C. L. Garner in 1922 and one this summer under F. W. Hough.

The movements shown bear a general relation to the famous San Andreas fault line, a slip along which was the immediate cause of the great earthquake of 1906. Points south and west of this line have with a few notable exceptions moved in a northerly direction; while those to the north and east of the line have nearly all moved toward the south. There is little uniformity in the amount of the movements.

For example, San José peak, about ten miles southwest of the fault line and about 40 miles inland from San Luis Obispo, has moved north 16 feet while Santa Lucia peak, 80 miles to the northwest, has moved only 7 feet northwards.

Near San Francisco bay the differences in direction are most marked. The lighthouse on South East Farallon Island has moved westward 6 feet, while Point Reyes lighthouse, on the mainland 18 miles away, has moved 11 feet to the north. Mt. Tamalpais has moved south about 5 feet.

Loma Prieta peak, about 50 miles southeast of San Francisco, has moved southeastward $6\frac{1}{2}$ feet, while Sierra Moreno peak, about half way to San Francisco and on the opposite side of the fault line, has shifted 3 feet to the westward.

Major William Bowie, chief of the Division of Geodesy, under whose direction the work during the past two years has been done, says of the results:

"They are epoch-making and may lead to the eventual predicting within reasonable limits of the time and place of earthquakes. They will certainly have great influence on geologic thought in the study of the earth's crust.

The remarkable thing is that the peaks do not move the same amount for any given direction, the complicated movements seemingly indicating the action of local forces rather than one of a world-wide origin.

"The results have much interest and value to the engineer, the surveyor and map maker, the geophysicist and the geologist. It has long been known that the earth moves horizontally along a fault line, but how far back from the fault does the movement take place? Our surveys found decided movements for stations 15 miles or more from the fault and the creeping of the surface probably is going on at even greater distances. Field work carried on in the future will reveal this. I believe the theory of isostasy must be taken into account in the explanation of what is going on in California and in other active earthquake regions."

MERCURY ENGINES

Science Service

THE first mercury engine in the world for the production of power in commercial quantity is now in operation in the plant of the Hartford Electric Light Company, whose officials predict a saving of from 40 to 50 per cent. of fuel by its use. The invention is essentially a turbine engine run by mercury vapor. The whole electrical industry is interested in observations being made of its operation.

Incentive for a careful investigation of the properties of mercury vapor for power generation is given by the high cost of coal and its transportation, making it necessary to minimize fuel consumption. The mercury boiler was started successfully at Hartford early in September and has since been in regular operation, carrying a part of the commercial load of the local lighting system. Officers of the local lighting company say that it has carried approximately 3,500 K. W. of the Hartford load.

While the present installation is not of sufficient size to have any effect on total cost of power produced by the company at the present time, it is large enough to provide a working basis to calculate the results that may be obtained eventually from larger sizes. The manufacture of these boilers is so intricate that it will probably be several years before the larger boilers can be in operation.

It is expected that the mercury boilers will be a very material improvement over the most modern stations, even those contemplating using 1,000 and 1,200 pounds of steam pressure. The new process will require only about one quarter of the fuel that is used with the best reciprocating engines.

The mercury vapor exhausted by the mercury turbine is sent to a condenser where it is cooled by water, just as in any ordinary power system. But the mercury vapor is so hot that the "cooling water" is turned into high-pressure steam. This steam is not wasted, but is sent to a steam turbine from which additional power is obtained. This still further increases the efficiency of the system.

It is the object in making such installations in the future to replace the steam boilers in the large modern plants by a mercury boiler which will give nearly double the output in the same space. Consequently it will not be necessary for a general redesign of a station to obtain the benefit of better economy.

The process was invented and designed by Dr. W. L. R. Emmet, of the General Electric Company. As the characteristics of mercury vapor had never been thoroughly studied by other scientists, it was necessary for him to go into this general subject in great detail. It was found that no form of packing of the joints would resist the mercury vapor and a system of arc and acetylene welded joints was therefore developed.

In this connection it is of interest to recall that the Hartford Electric Light Company installed the first commercial size steam turbine in this country.

A SCIENTIFIC FUR FARM

Science Service

A NEW experimental fur farm, stocked in part with unscented skunks, has just been established by the United States Biological Survey on a twenty-acre tract of wooded land in Greenfield Township, Saratoga County, New York. F. G. Ashbrook, of the Bureau's Division of Economic Investigations, has charge of the transfer of the animals from the former and more inaccessible site at Keeseville.

Present plans call for a series of modern pens to accommodate silver, black and red foxes, martens, minks, fishers and skunks. The breeding habits of these fur bearers will be studied and methods of combating disease among them will be worked out.

At Keeseville last year martens were successfully bred in captivity for the first time. This work will be continued at the new site and efforts will be made to discover how to breed the fisher, another beautiful fur animal which has hitherto baffled the commercial raiser.

Experiments in fighting disease, such as distemper and hookworm, will be carried forward. Hookworm is one of the most prevalent diseases among captive foxes, and the bureau has worked out an effective means of killing the parasites which produce it by use of the chemical, carbon tetrachloride.

Much trouble was formerly had in administering this remedy, however, as the capsules in which it was given were often broken in the mouths of the foxes with the result that the carbon tetrachloride was liable to go down their windpipes, causing suffocation. Recently the investigators found that by use of a more gelatinous capsule, which would mash without breaking, this trouble could be largely prevented. Methods of artificial respiration, similar to those used to revive an apparently drowned man, were also worked out by which the accidentally gassed foxes could be resuscitated.

The skunks raised on the farm have all had their scent sacs removed. This gland operation does not injure the breeding or fur value of these animals which have been held in such bad odor, but makes them more agreeable from an olfactory standpoint.

CHINESE FOSSIL MAMMALS

DR. W. D. MATTHEW, curator of the Department of Vertebrate Paleontology of the American Museum of Natural History, has published in the *Museum Bulletin* a description of the fossil material collected by Walter Granger, the paleontologist of the Third Asiatic Expedition, during his first season in China. The collection covers a series of skulls and innumerable jaws, bones, teeth or other fragmentary material of many kinds of animals, probably of late Pliocene age. *Stegodon*, an extinct proboscidean intermediate between mastodons and elephants, is the largest animal present; a rhinoceros related to the living Indian species, a gigantic tapir about the size of a horse, a "buffalo" related to the Gaur of India, a large pig, larger and smaller deer and antelopes of several kinds, are the chief hoofed animals. The carnivora are represented by a tiger, a hyena, a "parti-colored bear" (*Ailuropus*), a sun-bear, sand badger, a "wild dog" (*Cyon*), and a civet; the primates by a langhur and a new genus allied to the gibbon; while a large bamboo-rat, very abundant, is the sole representative of the rodent tribe. There are no horses, no true dogs, and other animals of the open plains are conspicuously absent, so that the collection is believed to represent the fauna that then inhabited the forests and foothills of south China. Some of the animals or their descendants still survive in south China, some have retreated to India or the Malay states, while other races have become wholly extinct.

According to the views held by some of the best authorities on the ancestry of man, it is in just such a fauna as this that we might expect to find his ancestors of the late Tertiary time. The possibility of such a discovery was well understood, but as yet nothing of the kind has been found in China.

China is one country where fossil teeth and bones have a considerable value, quite aside from their scientific interest. Fossils have been used as fertilizer, it is true, where they occur in cave deposits, or rich pockets, and have been ground up and used for their phosphates. But in China they have quite another use as medicine and have been mined for centuries to supply the Chinese drug-shops with "dragons' teeth" and dragons' bones," a regular article of the Chinese pharmacopœia. There are, it appears, four ways of administering them. They may be ground to powder in a mortar and eaten raw. Or they may be ground and fried with oil in a skillet. Or the powder may be stirred up with sour wine and either drunk off fresh or the mixture left to settle, decanted, and the clear liquid drunk. They are specific for certain nervous diseases, heart troubles and disorders of the liver. Without recommending the remedy for adoption in this country, it is perhaps permissible to point out that mixing with sour wine would result in a combination of bicarbonate and acid phosphate of lime that might really have some medicinal value—just what, may be left to physicians to decide.

Packets of the fossil teeth or bones were purchased in the drug stores by travelers in China and sent to paleontologists in Europe. They were reported to have been brought down the rivers by traders, but it is only in the

past few years that the principal localities where they are mined have been discovered, mainly through the activities of Dr. J. G. Andersson, geological adviser to the Chinese Government. Dr. Andersson has made collections at some of these localities and secured fine series of complete skulls of Pliocene and Pleistocene animals. Other localities he has very generously handed over to the American museum explorers, and Mr. Walter Granger spent two winters on the Upper Yang-tse-Kiang collecting fossils, chiefly at a locality near Wansien in the province of Sze Chuan. The fossils are found in fissure deposits in the limestone rocks, and the Chinese have sunk pits into these fissures in the richer pockets, sometimes to a depth of a hundred feet, using crude ladders and handmade windlasses that remind one of the medieval mining methods described by Agricola and other early writers.

FISHERY PATROLS BY SEAPLANE

PEOPLE have grown accustomed to hearing of the use of aeroplanes in survey work, forest protection and other land work, but the successful carrying out of air patrols of the fishing areas of northern British Columbia by the Royal Canadian Air Force during the past season has opened up a new field for aircraft with many unique features. So successful were the experimental patrols instituted in July by the Department of Marine and Fisheries in British Columbia that it was decided to continue the patrol until the end of September. The introduction of the seaplane patrol resulted in greatly increased efficiency in the work of detecting breaches of the fisheries regulations and much better observance of the laws.

The seaplane and its crew engaged in the work were stationed at Prince Rupert and trips were made north, south and inland of that point. The work of the patrol included the detection of irregularities in the use of gill-nets; a sharp lookout during the closed period between 6 P. M. Friday and 6 P. M. Sunday; a constant watch to see that fishermen keep outside the boundaries of the mouths of rivers and inspection of the exposed parts of the coast which are inaccessible to the patrol boats.

As a result of information supplied by the patrol several fishermen were prosecuted for adding what is known as "handy billies" to their gill-nets. The regulations allow the use of gill-nets 200 fathoms long. However certain fishermen added small nets or "handy billies" 50 to 75 fathoms long, with little fear of detection owing to the inability of the patrol boats to keep close watch on all the nets. From a height of 3,000 to 4,000 feet in the air, the seaplane observer can count the corks, set three feet apart, and note any excessive length. During the closed periods from Friday to Sunday, the seaplane can do the work of twenty patrol boats, it is estimated, while in checking up delinquent fishermen who fish within 400 yards of the mouths of streams and rivers, the speed with which the seaplane arrives on the scene after it comes in sight prevents the offender from raising his nets and concealing what he has been doing.

Exposed portions of the British Columbia coast which can not be inspected by the patrol boats owing to the waters being uncharted were visited by the seaplane.

The area covered by the patrol extended from Cape Caution, on the north end of Vancouver Island, to the Alaskan boundary, while periodical visits were made to operations on the Naas and Skeena rivers, Douglas channel, Gardner canal, Dean and Burke channels, and the Portland canal. Distances were covered in a few hours by the seaplane that would have taken a number of patrol boats days to accomplish, and as a result of the great expanse patrolled it was found possible to reduce the number of boats by four.

ITEMS

THAT natural gas gasoline may be used to advantage as a refrigerant is asserted by L. D. Wyant, chemical engineer of the Bureau of Mines who has recently completed an investigation of its possibilities in those lines. In the experiments conducted it was shown that a temperature in a "cold room" of 14 to 16 degrees above zero Fahrenheit was easily obtained. Natural gas gasoline has the advantage over ammonia, the commonly used refrigerant, in that its vapors are not poisonous in low concentrations, while those of ammonia are dangerous in the concentration of half of one per cent. It requires less pressure than when liquid carbon dioxide is used as refrigerating agent, and produces more cold than does liquid sulphur dioxide, which also is poisonous. These advantages are believed to offset its inflammability, as danger from that source may be avoided by ventilation. It is asserted that a concentration of gasoline vapor equivalent to a fatal concentration of ammonia would not be inflammable.

WHEN it comes to an example of industry in the brute creation, man should no longer consider the ant, but the gopher, according to Professor Joseph Grinnell, of the University of California, who has been making a careful study of these little animals. As a result, he has estimated that in Yosemite National Park alone they bring to the surface from their burrows enough dirt to fill 160 freight cars of 50 tons each, and that in so doing they expend 5,500 foot-tons of energy. Dr. Grinnell has many kind words to say for the gopher, which is generally considered as a pest by western farmers. He declares that so long as the busy little digger stays on wild, uncultivated land he is performing a useful part in the economy of nature. He turns over the soil to a depth of about six inches, helps to keep it fertilized, counteracts the packing effect of large animals on grazing land, and, by making the soil porous, helps to minimize danger from floods. Dr. Grinnell estimates that there are a billion gophers and other burrowing rodents in California alone.

THE last surviving members of the Chemakum tribe of Indians have been discovered living in one of the old villages of the Clallam tribe along the straits of Juan de Fuca. They are an old man and his sister of about the same age. They have forgotten nearly all their own language, but Professor Franz Boas, of Columbia University, succeeded in 1890 in extracting 1,200 Chemakum words from them. It is believed that centuries before white men came to Puget Sound the Chemakum inhabited the whole northern part of the Olympic peninsula and were a powerful tribe.