SCIENCE NEWS

Science Service, Washington, D. C.

SYNTHETIC OCTANE FUELS

STANDARD "octane," the engine fuel sold in recent years for industrial laboratory testing purposes at twenty-five dollars a gallon, is now available, mixed with common gasoline, at moderate cost as a greatly improved "aviation gas," which scores around 100 on the octane scale of anti-knock merit.

The octane itself, sometimes erroneously labeled "iso-octane," is known more precisely as 2, 2, 4-tri-methylpentane. By a strictly synthetic chemical process it is made from isobutene, a gaseous byproduct from petroleum cracking stills, and hydrogen gas. It is probably the first single species of hydrocarbon ever synthesized for use as a motor fuel in practical service. Other gasolines are mixtures of many compounds, most or all of which occur naturally in petroleum.

Operators of aircraft are greatly interested in fuels of very high octane rating. The terrific speed required of army planes calls for engine design necessitating fuel far above the ordinary 70 to 75 level which satisfies the common automobile driver. In long overseas non-stop service, any scheme which permits a huge airplane to get off the ground with an extra five hundred pounds of cargo means great increase in revenue. Fuels of high octane number, and thus with low knocking proclivities, permit super-powered engines to deliver terrific propeller action without intolerable vibration.

Although officially rated as the 100-par value in anti-knock rating, the trimethylpentane is not the best combustible liquid in such rating. A closely allied substance, hexamethylethane, tops the trimethylpentane by a comfortable margin. Unfortunately it is much more costly to produce by methods now known. It shares with its brother fuel, however, the qualification which seems to be connected with fine motor performance. That is, in each case the atoms in the molecule are closely grouped in a compact cluster, with a diagrammatic design suggestive of a tight bunch of grapes.

GEOPHYSICAL PROSPECTING IN CANADA

AT the meetings of the American Institute of Mining and Metallurgical Engineers the applications of methods of modern prospecting in Canada and the United States were discussed. In Canada, in particular, the method finds wide usefulness and its greatest development. Hans Lundberg, the Swedish engineer who has pioneered in the use of the equipment, pointed out that most of the great mineral wealth of Canada has been, in the past, discovered by geologists who prospect on the indications of surface rocks and their formation. And this, despite the fact that almost 99 per cent. of Canada's visible terrain is a layer of glacial deposits from a few feet to 120 and more thick.

It is the method of geophysical prospecting which allows science to penetrate beneath this overlying glacial drift layer and tell what the real nature of the bedrock below may be like. Since the rich ore deposits known in Canada are found in the one per cent. of the country where they are visible it is logical to assume that there must exist valuable and rich ore bodies in the 99 per cent. of the country where they are not visible, as we know that the geological conditions must be similar. Geophysical prospecting serves to supplement the findings of a geologist in the same way that x-ray studies add to the knowledge of a surgeon. Typical of success last year were surveys made in British Columbia where, for a cost of $6,000, deposits were found which in six weeks yielded gold ore valued at a million dollars. The same company in the previous year had spent $60,000 in prospecting to find deposits of a similar value.

STRUCTURE OF THE EARTH'S CORE

THE earth's heavy core as a great metallic sponge filled with hydrogen gas is the latest picture of what the center of the earth is like. The Reverend Joseph Lynch, seismologist of Fordham University, advances this idea in a new hypothesis. The speed of transmission and the reflection and bending of earthquake waves are about the only ways by which science can conjecture on the nature of the core of the earth deep below the outer solid, rocky crust.

For one thing, the earth has a density averaging about 5.5, or five and a half times as heavy as water per unit volume. But the density of the crust of the earth is only 4.2, so that the core requires something—liquid, solid or gas—whose density is close to the value 12. Iron, nickel and other heavy metals have previously been suggested to explain this high density.

But a study of the way earthquake waves travel through the earth shows evidence which demands other properties besides mere heaviness. Tidal phenomena require that the rigidity of the core be appreciably less than that of the crust on whose surface man builds the cities that earthquakes occasionally destroy. In addition the core must have the property of absorbing a special type of wave motion called shear waves, for it is observed that while compressional waves easily pass through the core, there are few known cases where the shear waves come out, once they are inside.

Experiments in his laboratory show that when the metal element palladium is packed, or occluded, with hydrogen gas to several times its own volume, its properties begin to approach those comparable with what is observed in the earth. Father Lynch merely used the rare metal as a convenient experimental sponge for "holding" the hydrogen.

The findings are suggestive, however, of the metallic sponge hypothesis on the nature of the earth's core. Experiments are now under way to study the effect of the absorbed hydrogen on the elastic properties of the material. When known these properties can be correlated with those observed in the earth and additional confirmation or rejection of the hypothesis will then be possible.

RADIO METEOROGRAPHS

RADIO meteorographs, sent aloft by balloon, have been used abroad for several years, but the foreign models are too expensive to compete with airplane reports in this country and also do not meet U. S. radio restrictions. At Blue Hill Observatory, where Dr. Charles F. Brooks is director, A. E. Bent has devised a tiny five-meter radio transmitter and Dr. Karl O. Lange a toy-like meteorograph which promises reliability at a cost which will meet airplane competition. The transmitter fits into a balsam-wood case and the meteorograph, on top of it, is protected by a semi-cylindrical metal cover. The whole thing measures only $8\frac{1}{2} \times 5\frac{3}{8} \times 4$ inches, and weighs exactly one pound.

The meteorograph uses the Olland principle of rotating contacts. It is based on an upright metal cylinder hardly larger than a match, on which is an infinitesimal platinum helix. The cylinder revolves by a clock mechanism and four small horizontal silver arms touch it at four different heights. Every time the helix passes under an arm it closes an electric current which sends out a radio signal which, received and amplified at the ground station, is heard in a good loud "clump."

One of the arms is fixed and the "clumps" it sends out come "as regularly as clockwork." The three other arms move higher or lower according to tiny mechanisms measuring temperature, air pressure and humidity, and the variation in the time-interval between the "clumps" they send out is what records the conditions.

Besides coming through audibly, the radio signals are recorded on a moving plate by an ingenious arrangement of typewriter ribbon and moving pointer which results in a time base-line and three graphs analogous to the routes traced by the three fluctuating arms on the revolving cylinder of the machine aloft.

Radio meteorographs are preferable to aviator-reporters because they go higher, report quicker and are never kept grounded by bad weather. The U. S. Navy has asked the National Bureau of Standards to devise instruments of similar ability which would meet the high standards of accuracy demanded by the nautical arm of the nation's military forces.

H. Diamond, W. S. Hinman, Jr., and F. W. Dunmore, of the radio division, have developed a balloon radio device which not only tells upper air temperature and humidity for an altitude up to 12 miles, but also tells the thickness of clouds and the altitude a pilot must reach to come out "on top." Moreover, it is possible to tell wind velocities above or even inside of clouds with the apparatus.

Technically the new apparatus of the Bureau of Standards differs from previously made instruments designed for telling upper air weather in that all clockwork devices are eliminated and the switching mechanism operates from power obtained by the changing air pressure as the small balloon rises.

Cloud thickness is obtained by carrying up a photo-electric cell to measure light brightness. It is darker within a cloud and the boundary between the top of the cloud and the clear sky above is easily determined on the ground by the character of the radio signals which the radio meteorograph transmits.

A NEW TRIBE OF LIGHT-SKINNED NATIVES IN NEW GUINEA

DISCOVERY of a new tribe of light-skinned natives, in the treacherous depths of New Guinea, is stirring anthropologists to ask if roving seafarers, some primitive branch of the white race, found their way to New Guinea in the South Pacific, there to lose themselves in the heart of an island jungle? That this did happen long ago, giving pale-face ancestry to a tribe that now numbers some 50,000 people, is the conviction of Jack Hides, discoverer of the tribe. Mr. Hides is a resident magistrate of New Guinea. His discovery has awakened much interest among anthropologists. It suggests that New Guinea was settled by both whites and blacks—some branch of the Indo-European race, as well as the negroid people from Asia.

Mr. Hides gave the following description of these unknown people to Science Service:

"These people were short in stature. They were light-skinned, something similar to the Malays. They had large mops of brown-tinged hair, high cheek bones, and yet rather good features. They were bow and arrow people and made beautiful axes of stone. They call themselves the Tarifuroro.

"Their methods of agriculture were the best I had ever seen. Their terraced gardens of an unusual squareness, marked off by pretty hedges of croton and hibiscus, were not unlike the Chinese market gardens we see in Australia. They grow sugar cane, ginger, bananas, sweet potatoes, spinach, mimica and native asparagus. There were no taro or yams. They often brought us pretty baskets of brown salt, which they obtained by burning logs of certain wood.

"I believe that further to the westward of these people in the adjoining valley, which is even larger than the Tarifuroro, we will find an even larger population and a more clearly defined Asiatic type. My reason for stating this is, as I traveled eastward across the Tari and Purari tableland, I found the light-skinned people merging into the darker-skinned Papuans, until just before I crossed the limestone barrier again, I found the real black Papuan men using the same methods of agriculture as the light-skinned Tarifuroro. It rather suggested to me that, at one time, these light-skinned people inhabited the whole of this tableland and were driven back westwards by the more virile Papuans."

Mr. Hides found the light-skinned tribe when he made an exploring journey, accompanied by a patrol officer, nine native policemen and 28 native carriers. Traveling up the Strickland River in a schooner, and thence up an unknown river to its source in dugout canoes, the party then climbed a difficult limestone barrier and found themselves on a high plateau inhabited by unknown thousands of New Guineans.

Matthew W. Stirling, chief of the Bureau of American Ethnology, says that there is an anthropological theory that an early wave of white migration swept across southern Asia to the Pacific. It is not impossible, if this be true, that traces of it might be discovered in the East Indies. Such an explanation has been offered for the Ainus of Japan and for the Polynesians. It is his opinion, however, that Mr. Hides probably encountered a new

branch of the short-statured, light-skinned mountain peoples of the interior of New Guinea and passed from these to eastward toward the decidedly black-skinned Melanesians and was impressed by the contrast in skin color.

THOMAS NUTTALL

WIDE-RANGING travels of an early American naturalist, Thomas Nuttall, who wandered and collected specimens all over the United States when most of the country was still "Wild West," have been traced by Dr. Francis W. Pennell, curator of botany at the Academy of Natural Sciences of Philadelphia. Although the most traveled of our early naturalists, and especially famous for his work in botany, the whole course of Nuttall's journeys has never before been traced. Sources of information include works of other early travelers, incidental contemporary notices, records of plants and birds scattered through Nuttall's own works, and a remarkable discovery of old letters and manuscripts recently made by Mrs. John R. Delafield at "Montgomery Place" in Dutchess County, New York.

For one who did all his traveling between the years 1807 and 1836, Thomas Nuttall covered an astonishing territory. He traveled extensively through the more settled parts of the United States, down the Ohio, through the southern Appalachians, through the Great Lakes to the Wisconsin River, down the Mississippi and up the Arkansas River to the present Oklahoma, up the Missouri only a few years after Lewis and Clark, and later by the Oregon Trail across the continent to the mouth of the Columbia River, thence across the Pacific to Hawaii and back again to California. He collected thousands of plants, was responsible for the naming of scores of species, and by gathering seeds introduced many native American flowers into cultivation. Nuttall was English by birth and a printer by first training. He was remembered by a fellow-printer of his youth as one who "always was reading books." His technical knowledge of printing helped toward the publication of his books. In 1841 the death of a brother in England left him heir to an estate, but under terms that made it necessary for him to leave America. Except for one six-months' working visit, he never again saw the land of his adoption before his death in 1859.

STERILIZING LAMPS

THE day when man will fight and conquer micro-organisms of disease and decay with the sun's rays or their laboratory-made equivalent seems to be drawing near. Steps already taken in this direction were described by A. R. Dennington, of the Westinghouse Lamp Company, at the Toronto meeting of the Canadian Section of the American Institute of Electrical Engineers. Sunlight can kill micro-organisms even when its ultra-violet and infra-red rays are filtered out. The rays of shorter wave-lengths, from 2,537 Ångstroms down, are the most effective germ-killers. Such rays harnessed in a lamp which has an extremely thin indrawn window or glass bubble are already being used by physicians to destroy the germs of skin infections. At the opposite extreme are the eight sterilizing lamps installed over the operating table at Duke University Hospital to sterilize air during surgical operations and thus prevent wound infections.

For keeping meat safe by preventing mold growth during the tenderizing storage period, and for keeping mold out of bakery products, there is the tubular lamp made of special glass and resembling the blue neon sign tube. Other lamps that give off sterilizing rays are being investigated in the hope of developing a ray method of sterilizing milk. The ultimate hope of investigators in this field is to find ways and means of purifying the air to offset the danger of breathing in germs that are constantly being breathed out into the air.

ITEMS

A SEVERE earthquake shook the ocean bottom near the northern end of the Japanese archipelago on February 20, at 2:03 A. M., eastern standard time. It was followed by two sharp aftershocks. The epicenter was in latitude 45 degrees north, longitude 148 degrees east. A strong earthquake was felt at College, Alaska, on Wednesday, February 24. Records on the instruments of the seismological observatory maintained in cooperation with the U. S. Coast and Geodetic Survey indicate that the epicenter was not far away, and somewhere on a line extending through College in a general northeast-southwest direction.

FLOODS in most places are caused by waters from the skies. Floods in Iceland have been caused by fires under the earth. Investigations by Dr. Niels Nielsen, of Copenhagen, show that two recent destructive floods in Iceland were caused by the eruption of volcanic vents opening under thick glaciers. The heat melted the ice rapidly and in such vast quantity that the total water volume of the larger of the two floods is estimated at over a billion cubic yards. Molten lava coming into contact with the ice was hardened into curious globular rocks. It had previously been suggested that similar subglacial eruptions might account for globular rocks forming some of the highest mountains in Iceland, whose formation dates from early Ice Age time. Dr. Nielsen's observations, published in *Nature*, are regarded as confirmation of this hypothesis.

ADOBE bricks from ruins of a Dominican Mission in Lower California have preserved evidence of a smallpox epidemic that ravaged the Indian population in 1781. Two California scientists, Professor G. W. Hendry, of the University of California, and M. K. Bellue, of the State Department of Agriculture, who have been examining bricks from old missions, made the discovery of bones in bricks from San Vicente Mission. It is supposed that builders of the mission must have shoveled in bone fragments from unmarked graves of smallpox victims when they were getting earth to make the brick. Mission bricks are yielding many clues to early western history. On some bricks are footprints of men, dogs, coyotes, birds; and in other bricks have been found nut shells, leather trimmings, pottery, copper fragments and seed of plants grown in early days in the West.