

SCIENCE NEWS-LETTER

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SCIENCE SERVICE

1701 MASSACHUSETTS AVENUE

TELEPHONE, MAIN 2615

WASHINGTON, D. C.

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No. 56

Edited by Watson Davis.

April 24, 1922

LIBERTY AERO ENGINE MODIFIED TO USE HEAVY OIL INSTEAD OF GASOLINE

Washington. April 25.- A substitute for the gasoline engine in aeronautical work has been developed by modifying the Liberty engine so that it will use fuel oil instead of gasoline, Dr. Joseph A. Ames, chairman of the executive committee of the National Advisory Committee for Aeronautics, announced at the meeting of the National Academy of Sciences this afternoon.

"A Liberty engine has been modified so as to work by an injection of oil," Dr. Ames said, in telling of the studies that are being made by the committee at its laboratories at Langley Field, Va. "The piston has been increased in size in order to produce a suitable compression. Air is admitted, rapidly compressed thus raising the temperature sufficiently to ignite the oil which is admitted as a jet, the pressure thus produced drives the piston back, etc. The advantages are: Small weight of oil required for a given distance, small cost, and diminution of fire risk. The horsepower per cylinder thus far obtained is not as great as that of the ordinary Liberty; but, with an engine designed for oil injection, better results will be obtained."

The perfection of this engine, which is being accomplished, is expected to result in a motor for lighter-than-air craft that will be safe from fire danger and economical. This new aero engine, operating on the same kind of fuel as now used by Diesel engines in ships and stationary power plant, together with non-flammable helium as the lifting gas, will make dirigible transportation practically possible in war and commercially practicable in peace. The heavy oil engine will also be

Two other important aeronautical problems are approaching solution, Dr. Ames declared. These are: To determine the shape and section of a wing which will improve the performance of an airplane and to replace the ordinary experiments on models of airplanes or their parts by a method giving complete information covering full-sized machines.

Apparatus has been devised to measure and record photographically the pressure on any part of an airplane at any instant while it is in full flight. From the information obtained in this way a new type of airplane wing has been made which offers marked advantages over all now in use, both aerodynamically and structurally, Dr. Ames said.

Experiments made in the past on models of airplanes have not yielded data that can be applied immediately to design of full-sized planes. From the nature of the forces on an airplane experts found that if the air around the model be compressed to 20 atmospheres the experimental results could be used directly for accurate design. In order to obtain these conditions the national committee has had a large tank 34 feet long and 15 feet in diameter built for use as a high pressure wind tunnel. Dr. Ames said that this is the only tunnel of its kind in the world, and the largest tank of its kind without internal bracing ever made in this country.

"All the balances and apparatus in this tunnel worked automatically, and the readings are taken through small windows. The results obtained from this new apparatus will open up entirely new fields in aerodynamics", said Dr. Ames.

BROADCASTS

Radio News of the Week

PLANS LAID FOR NEW RADIO LAWS AND REGULATIONS

Washington. The governmental radio conference is now framing the final draft of the laws and regulations that will govern the future radio activity of the country. A bill prepared by the conference will be introduced into both houses of Congress to provide new radio communication laws. The report of the general conference will not only give the draft of regulations, but will explain what kinds of radio broadcasting will be allowed, using some of the questions received in response to its preliminary report as examples. The new legislation will give the Secretary of Commerce much greater power over other communication than he now has.

NEWS OF THE STARSThe Complexity of Polaris

By Isabel M. Lewis,
of U.S. Naval Observatory.

One of the most remarkable stars of the northern hemisphere, and to navigators the most important, is our familiar pole-star, Polaris, Alpha in the constellation of the Lesser Bear, or Alpha Ursae Minoris as it is labelled astronomically.

Polaris, as nearly everyone knows, is the second magnitude star at the end of the handle of the Little Dipper. It is found most readily by the aid of the Pointers of the Big Dipper which are the two stars in the bowl of the dipper located farthest from the handle. A line drawn through these two stars and extended a distance equal to about five times the distance between them brings us to Polaris which is yellowish in color and stands apart from any other bright star. In the spring of the year the Greater Bear or, as we call it, the Big Dipper, appears high in the early evening sky east of the meridian. We can then more easily find Polaris with the aid of the Pointers than in the late fall and winter evenings when the Big Dipper lies nearly on the horizon and is usually hidden from view by trees or buildings.

A small telescope will separate Polaris into two stars. The companion star is a faint, white star of the ninth magnitude distant from Polaris only eighteen seconds of arc. The least distance between two stars that the unaided eye can detect is about four minutes of arc.

Twenty years or so ago it was discovered by means of the spectroscope that the brighter star was also a double star. The two components were too close together to be separated visually in any telescope. Later investigations showed that the brighter star was triple, that is, it consists of three suns. The faint white companion star forms with these three a system of four suns revolving about a common center of gravity.

Still more recently it has been discovered that the brightest of the stars varies regularly in brightness in a period of nearly four days. It belongs to the important class of stars known as Cepheid variable stars whose changes of light, it is believed, are caused by periodic internal disturbances. With one exception Polaris is the nearest to the earth of all the Cepheid variables which are in general at great distances from us. Latest measurements of the distance of Polaris show that the light of this star takes two centuries to travel to the earth at the rate of 186,000 miles a second, that is, its distance is about two hundred light years.

Like all Cepheid variable stars, Polaris is a giant star. It gives forth about

five hundred and twenty-five times as much light as our own sun. If Polaris and the sun were placed at a distance of thirty-three light years the sun would be a fifth magnitude star just within the range of visibility of the naked eye while Polaris would outshine Sirius, the brightest star in the heavens.

As a practical aid to navigators and explorers Polaris is unsurpassed in importance by any other star in the northern hemisphere. It is now located within one degree and fourteen minutes of the true north pole of the heavens which lies on the line connecting Polaris with Mizar, the star at the bend of the handle of the Big Dipper. Its distance from the pole will decrease until the year 2095 when it will be a little less than half a degree away from it. After that its distance from the north pole of the heavens will gradually increase again.

As is well known to navigators the altitude of Polaris above the horizon is equal to the latitude of the place of observation.

PROOF OF MAN BEFORE ICE AGE GIVES NEW CONCEPTION OF HUMAN ANTIQUITY

Washington. April 24.- Evidence that man existed before the great Ice Age, at least over 520,000 years ago, was presented by Dr. Henry Fairfield Osborn and Dr. C. A. Reed of the American Museum of Natural History to the National Academy of Sciences at its meeting this afternoon.

The recent discovery of Tertiary man near Ipswich, England, known as the Foxhall man, led Professor Osborn to visit the locality and to make a very careful study of the animal life which surrounded this man. Unlike the now famous "Cave Man" of the mammoth and reindeer period, the Foxhall man was surrounded by relatively primitive mastodons, rhinoceroses, and saber-tooth tigers, also by two kinds of elephants, the straight-tusked elephant and the southern elephant. This was long before the Ice Age, when England, even in latitude 53°, was enjoying a very mild climate. Since it is known that the Foxhall man was capable of making ten or twelve different kinds of flint implements, of providing himself with clothing, and of building a fire, he sets a new and very remote date for the antiquity of man, because he is separated from the Recent period by the whole stretch of Quaternary time, or the Ice Age.

Scientists have estimated the duration of the Ice Age from 100,000 to 700,000 years, but Prof. Osborn is inclined to accept the intermediate estimate of 520,000 years made by the great German geologist Albrecht Penck.

The Foxhall man is at present known only by the flint instruments that he has left behind. Unlike *Pithecanthropus erectus*, the Heidelberg man, the Piltdown man, and the Neanderthal and art-loving Cro-Magnon races, parts of his skeleton have not yet been revealed to modern eyes.

SCIENTIST TELLS HOW HE
TRANSMUTES METAL INTO GAS

Washington, April 25.- The recent announcement that Dr. Gerald L. Wendt had broken down the barrier between the elements by transmuting the heavy metal tungsten into the light gas helium caused scientists to anticipate with eagerness the details of his work. The experimental methods by which these results had been obtained were for the first time revealed this morning when Dr. W. F. Hillebrand read the report of Dr. Wendt's work to the National Academy of Sciences.

The fact that Sir Ernest Rutherford of Cambridge University had questioned the discovery when it was cabled to the London Times gave peculiar interest to Dr. Wendt's explanation of the precautions he took to avoid the errors that the British scientist had suggested. The only evidence of the decomposition of the atoms that Prof. Rutherford had been able to get is the photographic tracks of the hydrogen nuclei expelled from single atoms but Dr. Wendt claims to have obtained a quantitative transmutation of metal into gas in measurable amounts. This indicates that he has attained in the Mount Wilson Observatory laboratory, where the work was done, temperatures comparable to those of the hottest stars where helium predominates and the heavy metals are not found.

Science Service has obtained Dr. Wendt's account of these remarkable experiments:

HOW TUNGSTEN ATOMS WERE EXPLODED

By Dr. Gerald L. Wendt

The method of converting tungsten into helium consists in charging an electrical condenser to 25,000 volts or more and then discharging this large quantity of energy as rapidly as possible through the finest obtainable wire. The wire explodes with a brilliant flash that lasts less than $1/20,000$ th of a second and is practically confined to $1/300,000$ th of a second. The flash is some 100 times as bright as direct sunlight, the pressure developed by the vapors is some 50 atmospheres and the temperature is momentarily above 20,000 degrees. The explosion wave is propelled at ten times the velocity of sound and the mechanical effects are very violent. Dr. J. A. Anderson of the Mt. Wilson Observatory showed two years ago that very fine metallic wires can thus be electrically exploded at temperatures between 20,000 and 30,000 degrees.

The application of this method involved simply the conducting of the explosion in a glass bulb especially designed to withstand the violence of the explosion and the collection and analysis of the gases produced. Two general methods were employed. In one the explosion was produced in a bulb exhausted to the highest possible

degree, the gases produced then remaining in the bulb for spectroscopic examination in a side-tube attached for this purpose. In the other the explosion was produced in pure carbon dioxide at atmospheric pressure, the gases after explosion being passed into a nitrometer filled with strong potassium hydroxide solution to absorb the carbon dioxide and leave the residual gas produced in the explosion. The former is more rigorous in excluding impurities but the latter permits the collection of the gases from successive explosions into a large volume for chemical analysis. Wires of various metals, including iron, nickel, copper, silver and platinum, were exploded, but in all the experiments here described tungsten was used both because its high atomic weight enhanced the possibility of decomposition and because it has sufficient mechanical strength to be readily supported between electrodes even in extremely thin wires. Wires about 4 cms. in length and 0.03 mm. in diameter were used in these explosions.

For the explosions in vacuum it was essential to produce the highest attainable evacuation both in order to exclude residual gaseous impurities and to prevent the discharge from arcing through the gas. A powerful double mercury vapor diffusion pump with a good oil-immersed mechanical fore-pump was therefore used, with a liquid air trap between it and the rest of the system to prevent back diffusion of mercury vapor. Exhaustion was continued for fifteen hours with the bulb encased within an electric furnace and maintained at 350 degrees Centigrade in order to drive off gases adhering to its inner surfaces. Meanwhile a current was passed through the wire maintaining the wire at white heat in order to remove absorbed gases. At the end of fifteen hours a large side-tube which was attached just above the bulb and which contained thoroughly out-gassed coconut charcoal, was immersed in liquid air for ten minutes in order to complete the evacuation. The bulb was then sealed off at a constriction from the pump system.

The wire was then exploded. There was at once abundant gas in the bulb and the capillary, when electrically excited, showed a bright and complex spectrum, the characteristic yellow line of helium being especially bright. The green mercury line was always faintly visible. Two red lines, one bright blue and one violet line were also characteristic. The nitrogen bands formed a background. Neon and other noble gases were absent.

The circumstances under which the explosions were conducted by this method were such as to reduce to a minimum the four possible sources of contamination with helium, namely leakage inward of external air, release of adsorbed gas from the glass surfaces, release of gas adsorbed in the wire and the electrodes, and contamination of the tungsten with helium-bearing thorium. The second method of explosion, however, shows that the volumes of gas obtained were far larger than can be accounted for by these sources.

In the second method the wire was exploded in a bulb filled with pure carbon dioxide gas which was afterwards absorbed by potassium hydroxide solution. In 21 such explosions volumes of gas averaging over one cubic centimeter were collected. The weight of the wires used varied from 0.5 to 0.8 milligram and if this were converted completely into helium the volume of the latter would be from 2.5 to 4 cc. If helium was the only product the yield was therefore between 25 and 50 per cent of the entire weight of tungsten. Since the hydrogen spectrum was uniformly absent, other gases which may have been formed would reduce the theoretical volume obtainable and thus bring the yield of gas to still a higher figure.

This is a preliminary report and is published only because failure of my health prevents its present completion. Atomic decomposition is by no means proved but is rendered so probable as to make further study by this method imperative. Credit is due Clarence E. Irion for the experimental work, including construction of the transformer, rectifier and condenser, and thanks are cordially expressed to the American Association for the Advancement of Science, whose research grant provided funds for the apparatus.

CAST DOUBT ON TRANSUTATION
AND CHALLENGE NEWNESS

Washington, April 25.- This is not the first time that helium has been reported under similar conditions to those of Dr. Wendt's experiments, it was learned here today.

Some ten years ago, Prof. R. A. Millikan, then of the University of Chicago, reported that helium lines could be detected with a spectroscope after a strong electrical discharge had been passed between tungsten points in a high vacuum. Prof. Rutherford at that time interpreted this as due to a small amount of helium gas occluded in the metal rather than to a decomposition of tungsten. In commenting on earlier reports of Dr. Wendt's work, Prof. Rutherford in a London periodical, has again suggested this explanation, and adds: "On modern views, we should anticipate that the disintegration of a heavy atom into lighter atoms, that is, into atoms of helium, would be accompanied by a large evolution of energy, a much more definite and more delicate test of disintegration of heavy atoms into helium than the spectroscope." He also points out that in Coolidge tubes used in producing X-rays an intense stream of electrons of energy about 100,000 volts is constantly employed to bombard a tungsten target for long intervals, but no evolution of helium has so far been observed.

LOUD SPEAKING TELEPHONE
NEW TOOL IN HUMAN RELATIONS

Washington, April 25.- The loud speaking telephone was described as a "new tool in the conduct of human relations" by Dr. Frank B. Jewett of the Western Electric Company when he demonstrated this apparatus to the National Academy of Sciences.

"The loud speaking telephone has within the past two years been brought to a state of perfection far in advance of anything existing heretofore," Dr. Jewett said. "In the present state of the art it is possible to employ the loud speaking telephone for the purpose of addressing vast audiences either immediately in the neighborhood of the speaker or separated from him by thousands of miles. There is no substantial limit to the number of auditors who may be addressed simultaneously."

A loud speaking telephone was installed on the platform during the sessions of the meeting.

MAN WILL REGULATE WATER
LEVEL OF GREAT LAKES

Washington. April 25.- That man will be able to regulate the level of the Great Lakes at will and so save millions in transportation charges is the prophesy of Prof. John F. Hayford of Northwestern University made at the meeting of the National Academy of Sciences here this morning. For eleven years, working with the aid of grants from the Carnegie Institution of Washington, Prof. Hayford has been studying the levels and evaporation of the Great Lakes.

"If the depth of water at the St. Clair Flats in the path of the big lake freighters above Detroit were raised only one-tenth of a foot by a dam at Niagara River, it would save more than half a million dollars to the people of the United States by reducing the cost of carrying freight," Prof. Hayford said in giving one example. The information that Prof. Hayford has gained will be of great aid in power development and the St. Lawrence river project.

Prof. Hayford has been studying the effect of wind and barometric pressure on the levels of water in the Great Lakes.

"The surface of the water of any one of the Great Lakes is never level except by accident," he says. "It always has a slope in some direction, produced by the wind, by barometric pressures, or by the water of the lake oscillating as if it were in a great wash-basin. The correct knowledge of these things is a key to various scientific problems and ultimately will prove to be worth millions, in their application, to the people of the United States."

"It has long been known that a wind blowing over a lake tends to pile up the water on the lee shore and to pull it down on the windward shore. How large is this effect? Is the response of the water to the wind immediate? It has not been possible to answer these questions confidently in the past. Now it is known that the response is prompt and that the effect of a given wind in disturbing the water level at any point in the world may be computed in advance. It is known that the strongest winds that blow have almost no effect in changing the water level at various points, as, for example, at Milwaukee on Lake Michigan and Mackinaw City on Lake Huron. On the other hand, it is known that a wind of 50 miles per hour from the southwest piles up the water a foot at Buffalo and pulls it down simultaneously more than a foot at the west end of Lake Erie. The reason for this extreme contrast between different places and for the fact that the wind effect is greatest in

long shallow bays is now accurately known."

"The lake surface is also continually tilting up, first in one direction, then in another, in response to varying barometric pressures. The water tends to go toward a region of low barometric pressure and pile up there. Such effects at Mackinaw City and Milwaukee frequently amount to 3 inches or more, although wind effects at these points are almost inappreciable."

"Just as a piano string struck once, or the air in an organ pipe continuously agitated by a reed, vibrates with its natural period, so the water of each of the Great Lakes under the many impulses given it by the winds and barometric pressures oscillates back and forth. Sometimes the whole of a lake is concerned in an oscillation, and sometimes the lake oscillates in parts. Such oscillations in lakes are called seiches."

"The water of Lake Erie frequently oscillates back and forth lengthwise the lake with a swinging motion like the water in a wash-basin. It takes 13.1 hours for a complete oscillation of this kind. An oscillation once started sometimes continues for several days. In contrast to this deep bass note, so to speak, Lake Erie has two treble notes. The deep part in the eastern one-third of the lake oscillates by itself with a short period, 3.7 hours. Near Cleveland the water frequently oscillates back and forth crosswise the lake between Cleveland and the Canadian shore."

Prof. Hayford can now make observations for one day that tell as much about the level of the lakes as sixteen days' work formerly did.

The thirst of the sky has also been measured by Prof. Hayford. He finds that on many summer days more water is evaporated from Lake Michigan and Lake Huron than flows past Detroit on that day.

SUNSHINE EACH YEAR WOULD
MELT 424 FEET OF ICE

Washington. April 24.- If there were a layer of ice 424 feet thick completely surrounding the sun, the sun's rays shining on it continuously at right angles only one year could melt it and thus give up as many heat units as the burning of 400,000,000,000,000,000,000,000 tons of anthracite coal. These were figures announced by Dr. C. G. Abbot, assistant secretary of the Smithsonian Institution, at the meeting of the National Academy of Sciences here this afternoon as the result of

twenty years of observations on the solar constant of radiation.

Since 1902, about 2,000 observations of the sun's heat have been made at eight widely separated places, and the final mean result has been 1.94 calories per square centimeter per minute. This is the scientific statement of amount of heat that in a year would melt the 424 foot layer of ice, which if it were around the sun would weigh 40,000,000,000,000,000,000,000,000 tons.

"This is a measure of the sun's yearly output of radiation," said Dr. Abbot, in presenting his conclusions jointly with F. D. Powle and L. D. Aldrich. "It can be compared a thousand or ten thousand years hence with the values which prevail then, if in the meantime our records are preserved as faithfully for posterity as the Babylonian clay tablets have preserved for us the records of the past. How unfortunate that the Babylonians did not observe the solar constant!"

When Dr. Abbot's work was begun in 1902, the best instruments for observing the solar heat at the surface of the earth differed by at least 50 per cent in their indications, and the values of the sun's heat as it is outside the atmosphere, published in the best text-books, ranged from 1.76 to 4.0 calories per square centimeter per minute. Nothing was known as to the limits of the solar variability. Now a large mass of data on the fickleness of the sun has been obtained.

"Our observations have shown that the sun does not vary so much as many of the other stars," Dr. Abbot said. "Its range of variation within the last 20 years has apparently not exceeded 12 per cent. On the other hand, fluctuations from 1 to 5 per cent appear to occur frequently at irregular intervals with irregular ranges of variation. For instance, at the time of the great sun-spot group of March 22, 1920, a fall of solar radiation of about 5 per cent occurred, corresponding to the passage of the sun-spots across the center of the sun. There is a long period solar variation attending the changes of solar activity revealed by sun-spots, prominences, and other visible solar phenomena, so that high values of solar variation occur at times of high solar activity. The range is about 3 per cent for 100 Wolf sun-spot numbers."

"Clearly, if the sun is thus variable, the planets which shine by reflected light must vary correspondingly but not necessarily at the same instant as the earth, since the earth and the other planets may lie in different directions in the heavens as seen from the sun. A few highly accurate observations of the brightness of the planet Saturn, made by Dr. Guthnick of the Berlin-Labelsberg

Observatory, have been compared with the solar observations of the Smithsonian Institution. It is found that 1 per cent change in the sun appears to produce 1 per cent change in Saturn, due allowance being made for the rate of rotation of the sun which carries the rays of variable intensity around at the rate of one revolution in about 27 days."

"A connection between the variation of the sun's heat and weather here on earth has been worked out by the Weather Bureau of Argentina", Dr. Abbot announced.

"Regular forecasts, a week in advance, are made there based upon the solar observations of the Smithsonian Institution at Montezuma, Chile, telegraphed in from day to day."

IMPORTED INSECT ATTACKS NATIVE CORN-BORER

Washington. April 24.- The foreign legions of insects that government entomologists are importing into this country to prey upon the insect enemies that have invaded our fields from other lands are not only efficiently attacking the foreign foe but in many cases do good work in destroying harmful native insects, Dr. L. O. Howard, chief of the U. S. Bureau of Entomology, declared here today in an address before the National Academy of Sciences.

The government insect fighters are beginning to launch an offensive on the European corn-borer, which is threatening our great fields of corn in the Middle West. Dr. Howard announced that they are raising armies of a new imported parasite, found only last summer in a region of South France, near Hyeres. Some thousands of these insects, known as *Habrobracon brevicornis*, have been raised in laboratories, liberated and sent to battle in the fields.

In addition to destroying the European corn-borer, Dr. Howard believes that this new insect fighter will attack the native cornstalk borer that is especially prevalent in the southeastern United States, and that it will also parasitize upon a Lepidopterous borer damaging sugar cane in Louisiana. Laboratory experiments show that the new parasite manages to lay its eggs in the larvae of the borer while in the cornstalk and thus destroys them.

"Since the extraordinary initial success of the Department of Agriculture in importing the Australian ladybird beetle into California to destroy the fluted

scale in the 80's, a great deal of successful work of the same sort has been done in different parts of the world," Dr. Howard said. "Parasite introduction has never been attempted in any part of the world on so large a scale as it has been in this country since 1905 in the effort to secure the European and Japanese parasites and natural enemies of the gipsy moth and the European enemies of the brown-tail moth."

Dr. Howard announced that for the first time since the world war, experts of the Bureau of Entomology are now in Europe and Japan studying the native parasites of the gipsy moth and endeavoring to send over new supplies of these that failed to successfully live here.

The Tachinid fly, a parasite of the brown-tail moth, has attacked a number of native injurious species and has not only spread all over the whole gipsy moth territory but has established itself in some cases twenty miles beyond.

STUDY ANIMALS TO LEARN ABOUT HUMAN DISEASE

Washington. April 24.- In order to secure knowledge which will tell more about how such epidemic diseases in man as meningitis, poliomyelitis, influenza and cholera are spread and caused, Drs. Simon Flexner and H. L. Ames of the Rockefeller Institute for Medical Research are making studies of the means of spreading typhoid among mice and septicemia among rabbits, they announced today to the National Academy of Sciences. Mouse typhoid is spread in a manner similar to human typhoid, and rabbit septicemia is typical of respiratory diseases.

HEAT OF HELIUM FORMATION
GREATER THAN ANY CHEMICAL REACTION

Washington. April 25.- That hydrogen gives off five million times as much heat when it is transmuted into helium as it does when it unites with oxygen to form water, was stated by Professor W. D. Harkins of the University of Chicago to the National Academy of Sciences meeting here today.

Hitherto the hottest chemical reaction known was the burning of hydrogen but this is insignificant compared with the energy evolved when four hydrogen atoms unite to form one helium atom. If four grams, only one seventh of an ounce, of hydrogen is transmuted into helium gas the amount of heat produced is 670,000,000,000 calories. This would be enough to supply a man with muscular energy for 600 years if the human body were capable of so using hydrogen in the place of food.

Fortunately this transformation of hydrogen gas into helium gas does not readily occur otherwise there would be danger that the earth would melt in fervent heat. Professor Harkins explained that the nucleus of the helium atom is composed of four positive electrical particles, called protons and two negative electrical particles, called electrons. This altogether constitutes the alpha particles such as are shot out from radium as it disintegrates into lead.

Atoms are supposed to be built up of units of two protons and one electron with other protons and electrons more or less loosely attached. This makes it possible that atoms of the same chemical element may have different weights. Such cases are called isotopes. Professor Harkins has actually separated chlorine into two isotopes of different weight.

EAR MORE SENSITIVE
THAN ANY SOUND INSTRUMENT

Washington, April 25.-"The ear must differentiate between sounds so nearly alike that no existing physical apparatus is capable of separating them," said Dr. R. L. Wegel of the Western Electric Company when he demonstrated to the National Academy of Sciences new instruments for examining the hard-of-hearing and aiding them to hear better.

DO YOU KNOW THAT -

A plant to manufacture alcohol from molasses is being constructed at Anaheim, California. The distillery has a capacity of 25 tons of molasses in 24 hours.

South African grasses known as tambookie, papyrus, and dobo, yield about 6 tons per acre and vary from 5 to 16 feet in height. These grasses are used for paper manufacture.

According to Camille Flammarion, meteorologists are the luckiest people in the world. In the hottest weather of summer, when everybody else is complaining of the heat, they are eager to see the mercury mount yet higher in order that a "record" may be broken, and in the coldest weather of winter they are anxious to have it colder, for the same reason.

Charging the atmosphere with an excess amount of carbonic acid gas has been known to increase the yields of greenhouse cultivation.

DO YOU KNOW THAT -

Potatoes freeze more quickly when exposed to a rapidly diminishing temperature than when the temperature diminishes slowly.

An "aphis" is an insect that steals the juices from the stems and roots of apple trees.

It takes 62,000 clover blossoms to produce one pound of honey and it would take one bee 2,750,000 journeys to bring this one pound home.

Granite paving blocks are manufactured in a great variety of sizes. Eleven varieties were reported in 1917.

DO YOU KNOW THAT -

The second Manchurian plague epidemic spread from Manchouli to Vladivostock, a distance of 1072 miles.

Although \$250,000 is annually spent in the planting of oyster shells in Connecticut there has been continued failure to obtain a set of seed oysters. The hope of restoring the industry appears to lie in the development of artificial fertilization and propagation of young oysters.

In coal mines where blasting is dangerous the hydraulic cartridge is a safe and effective substitute. It works on the principle of the hydrostatic press, splitting the coal by the pressure of water. A cartridge containing quicklime, which expands under the action of water, has also been used as a substitute for explosives in coal mining.

Yellow corn is superior to white corn for the feeding of hogs not on pasture. Sufficient quantities of vitamins are present in yellow corn for rapid growth in pork production.

DO YOU KNOW THAT -

The standard kilogram weights from which all other weights in the United States derive their calibration have just been checked by the Bureau of Standards and found to be accurate to within two-one hundred millionth of their mass.

A tunnel driven through hard rock by Emperor Claudius was 19 feet high, 9 feet wide and over 3 miles long. Over 11 years elapsed during its construction.

Lower grades of graphite when purified are suitable for lubrication purposes.

Peary's first north polar expedition lasted four years, 1896-1902, during which period he failed to get nearer than 343 miles to the Pole.

DO YOU KNOW THAT -

One species of chinquapin, or wild chestnut, is found in the Yosemite National Park.

Gasoline is produced by "cracking" heavier oils. The Burton process for this production yielded in 1921 a daily average of some 2,000,000 gallons.

More than two-thirds of the people of India are Hindus.

Mistletoe has recently appeared on pine trees in Bavaria, having come from the south. The Alps had previously acted as a barrier, and it is believed that the present introduction is due to seeds carried by the thrush.

DO YOU KNOW THAT -

The public water supply of Seattle, Washington, is obtained from the carefully patrolled Cedar River Watershed, passed through a settling tank and screen chamber and chlorinated.

Among the resins which are most commonly used in varnish-making are various natural resins of fossil or semi-fossil origin.

Although the evolution of the horse has been traced almost wholly from fossil remains found in America, horses were unknown upon this continent in modern times until introduced by the Spanish explorers.

Mechanical stokers of various designs are used by industrial plants. The proper operation of these stokers results in smokeless combustion.

READING REFERENCES TO NEWS-LETTER ARTICLES

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FRAGMENTS OF SCIENCE

The fact that we can imagine nothing higher than ourselves, that we make even our gods in our own image, offers no warrant for supposing that nothing higher will ever be. What ape could have predicted man, what reptile the bird, what amoeba the bee? -- Caleb Williams Saleeby.

All Flesh Is Grass.

Do you know of any animal that does not depend for its very existence on vitality conserved by plant life? Is not the food of all animals derived from plants? Do we not depend on plant life as a mixture, not starch and sugar alone, for our existence? Are we not, therefore, in the life essence taken as a whole, a part of the vegetable kingdom, a transformed, perhaps transplanted part? Should we then, as one of nature's animals, define ourselves as moving plants, because our very life essence is transferred to ourselves from vegetation? -- John W. Lloyd.

The germ-cell is a sort of a blind artist; its sketches are submitted to the criticism of the fully formed organism, the seeing artist, who will put them in the proper light and bring out what there is in them of value. -- J. Arthur Thomson.

Everybody knows that every one of us individually became what we now are by a slow process of evolution from a microscopic spherule of protoplasm, and yet this did not interfere with the idea of God as our individual maker. Why, then, should the discovery that the species (or first individuals of each kind) originated by evolution destroy our belief in God as the creator of species? -- Joseph Le Conte.

It seems as if an individual is non-musical owing to the presence of an inhibitory factor preventing the expression of musical temperament which is potentially present in everyone. -- J. Arthur Thomson.
