SCIENCE NEWS

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LEAP YEAR

EVERY fourth year having an extra day is called Leap Year because during the twelve months following February 29 a date "leaps over" or skips a day of the week, causing dates to fall two days later in the week instead of just one. Whenever the number of the year is divisible by four, with the exception of century years not divisible by 400, an extra day at the end of February is introduced.

The ordinary year of 365 days contains 52 weeks and one day. This extra day causes a particular date to fall one day later in the week than during the previous year. But when there is a leap year, which contains 52 weeks and two days, any date in the twelve months after February 29 falls two days later in the week instead of just one. New Year's day, for example, was on Friday in 1943, and on Saturday in 1944, but in 1945 it will skip Sunday and fall on Monday.

Leap Year was introduced because the earth does not turn on its axis an exact number of times during one entire revolution around the sun. In the Julian calendar, inaugurated by Julius Caesar in 45 B.C., the year was assumed to contain $365\frac{1}{4}$ days, or 365 days and 6 hours.

The extra hours can not be included in the year until they have accumulated to a whole day. By the advice of the astronomer Sosigenes, Caesar decreed that the Roman year should consist normally of 365 days, but that every fourth year should contain 366 days.

The true period of the earth's revolution around the sun is 365 days, 6 hours, 9 minutes, 9.5 seconds. This sidereal year is the time taken by the sun to complete the circuit of the heavens from a given star back to the same star.

The year which is used in every-day life, however, is one which depends on the seasons. Because of a slow wobbling motion of the earth called precession, the equinox moves gradually westward and the tropical year, that is, the interval between two successive arrivals of the sun at the vernal equinox, is about 20 minutes shorter than the sidereal year. Its length is 365 days, 5 hours, 48 minutes, 46 seconds. Thus the average year in the Julian calendar was 11 minutes and 14 seconds or 0.0078 day, too long.

This error of 0.0078 day per year adds up to one day in about 128 years, or causes an error of about three days every 385 years.

In the course of a thousand years the Julian calendar loses nearly eight days. Pope Gregory XIII proposed a calendar reform which would make the date of the vernal eqinox the same as in the year 325 A.D., at which time the Council of Nicaea decided upon the method of reckoning the date of Easter. Between 325 and 1582, the date of the vernal equinox had moved, in the Julian calendar, from March 21 to March 11. The Pope directed that ten days be dropped from the calendar so that the vernal equinox would once again fall on March 21. For people living in Catholic countries the day after October 4, 1582, became October 15. Other countries gradually adopted this change.

Since an error of about three days was introduced every 385 years by the Julian calendar, Pope Gregory XIII decreed that the rule of adding an extra day every fourth year should be followed except in the case of those century years whose number is not divisible by 400. Thus the year 2000 remains a leap year, but 2100, 2200, and 2300 will have only 365 days.

AN ELECTRONIC TRAIN TELEPHONE SYSTEM

A TWO-WAY electronic train telephone system which permits freight conductors and engineers to talk with each other or with block operators is now in operation on the 67-mile Belvidere-Delaware branch of the Pennsylvania Railroad.

This unique system, the first to be established up to the present time, will be used on freight trains only until it is more thoroughly tested. Installation of the necessary equipment has been made on ten locomotives and in ten cabin cars. It has also been made in one block station, at Frenchtown, N. J., and is under way in another block station at Trenton, N. J.

High-frequency alternating currents are used in the new system. They are transmitted along the rails, and also along wires on poles parallel to the track. They are termed "carrier" currents. They have impressed upon them the impulses of the telephone currents produced by talking into the telephone instruments. These electrical impulses are transformed back into sound by the receiving sets in the locomotives, cabs or block station.

The system will be used at present for operation purposes only. Train crews will be able to report to block station operators and to get orders from them. Conductors and engineers will be able to talk to each other at will, and also to communicate with other trains within several miles' distance.

This new train communication system was produced in collaboration with the Union Switch and Signal Company, following several years of intensive experimentation and development. Further installations are planned after this first one has been given a thorough trial in practical operation.

PURE METALLIC MANGANESE

PURE metallic manganese is produced in the United States by an electrolytic process recently developed in this country. The process was put into operation commercially on a small scale in 1939, but in the past two years production has expanded until now some four tons a day are made. This probably meets important war needs.

Electrolytic manganese and its alloys were discussed by Dr. R. S. Dean at the New York meeting of the American Institute of Mining and Metallurgical Engineers.

The electrolytic process of obtaining pure manganese is an achievement of the Metal Division of the U. S. Bureau of Mines. The development work was carried out under his leadership.

For the first time in the history of the institute an entire session was devoted to manganese because of its importance as a war metal. Electrolytic manganese, the speaker stated, is used in the production of magnesium bomb cases, high expansion alloys important in control instruments for warships and planes, stainless steel, many high-strength bronzes, and in the new five-cent piece which is no longer nickel but an alloy of pure manganese, copper and silver.

Manganese in an impure form has been used for years in steel-making. The pure manganese, used in nonferrous alloys, may be obtained from low-grade ores available in this country by this new process. The older methods of producing manganese alloys in the blast furnace and electrical furnace are adaptable only to high-grade ores not available here.

INSECT EGGS

THAT insect eggs are often highly dependent on the amount of moisture present in their surroundings, was pointed out by Professor Daniel Ludwig, of New York University, at a meeting of the New York Entomological Society.

Some species, like the Japanese beetle, lay eggs that soak up moisture as seeds do, and will not hatch unless they get this extra water. The eggs of the Japanese beetle increase three times their original weight by such imbibed water.

Professor Ludwig's principal studies recently have been on the water relations of eggs and pupae of the saturniid moths, such as the Luna, Promethea and Cecropia moths. Their eggs will take in water from very damp air, but do not need such moisture for their development; they will hatch even in dry air if it is is warm enough. However, if the air is either a little too warm or a little too cool the amount of moisture present will influence the hatchability of the eggs. As might be expected, there are differences in the behavior of the eggs of different species. Thus, Polyphemus moth eggs will hatch in hotter, drier air than the eggs of other species can endure.

Drying of the pupae during the winter had adverse effects on reproduction after the adult moth had emerged in spring. In some cases fewer eggs were laid, in others the eggs that were laid failed to hatch.

ITEMS

AMERICA'S known reserves of potash have received a substantial addition through the discovery of thick beds of potash-containing minerals underlying a large area in eastern Utah, according to B. W. Dyer, of the U. S. Geological Survey, in a report made to a joint meeting of the Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. The first hints of the presence of potash deposits in this region were given twenty years ago, when the minerals appeared in the logs of exploratory borings made by an oil company. There was a brief flurry of interest then, but presently it subsided and the whole matter was practically forgotten. After the United States was involved in the war, interest in the possible mineral beds was revived, partly because one of the minerals contained a high percentage of magnesium as well as potash. The Defense Plant Corporation put down some deep holes, and geologists studying the samples brought up found that there are three beds of potash minerals at depths between 3,300 and 4,200 feet. The thickest bed is more than 90 feet from top to bottom. The area is served by a railroad, the Denver and Rio Grande, so that transportation is readily available in case economic exploitation of the deposits is undertaken.

PENICILLIN in the large quantities demanded by wartime hospital service is being produced through adaptations of mass culture methods developed in the U. S. Department of Agriculture for the commercial production of citric, gluconic and other organic acids. The labor, and hence the cost, per unit of production is greatly reduced by this method, which was first developed 15 or 20 years ago, long before penicillin was even thought of. This is only one of the concrete benefits which research in the Department of Agriculture has brought to the national war effort, and can be expected to extend into the years of peace that will follow victory. Some of the others are described in the report of E. C. Auchter, Research Administrator. Among the new fruits of past research are the release for general use of 35 improved new strains and varieties of crop plants, reduction of the ripening time in Cheddar cheese by 50 per cent., more efficient ways to keep discomfort-producing and disease-bearing insect pests like lice and mosquitoes away from our soldiers, development of many new foods from soybeans, finding and growing new plant products to replace those cut off on account of the war.

A PIECE of newspaper and hydrochloric acid, familiar to every high school chemistry student, are the materials with which a new sulfa drug test has been developed by Captain Robert Hubata, S.C., A.U.S. The test is reported in *War Medicine*. The simple test will be valuable, Captain Hubata believes, in determining whether or not a person has taken a sulfa drug. It is made by moistening a small area on a blank strip of newspaper with a drop or two of a specimen of urine from the person being tested. A small drop of dilute hydrochloric acid, one part acid in four parts of water, is then placed on the center of the moistened area. The immediate appearance of a yellow to orange color shows the presence of a sulfonamide compound. The method is based on the color reaction in the presence of acids between crude cellulose, such as newspaper, match sticks or pine shavings, and the arylamine group. Paper from refined pulp, for example white bond, will not give the reaction. The color varies from orange yellow to orange, the yellow color, or one plus reaction, being obtained from persons who have recently stopped taking a sulfa drug.