SCIENCE NEWS

APPROACH TO ABSOLUTE ZERO

Science Service

THE nearest approach to the absolute zero temperature which has yet been attained has been recently achieved by Professor H. Kamerlingh Onnes, of the University of Leyden, Holland, according to advices received by the Bureau of Standards. The record temperature of 272.18 below zero Centigrade, or, as the physicists express it, .82 degrees Absolute, was reached by the Dutch scientist in an unsuccessful attempt to solidify liquid helium. The temperature is equal to approximately 458 degrees below zero Fahrenheit.

At this temperature the liquid helium showed absolutely no tendency to solidify, according to the report of Dr. Onnes, who expresses the opinion that helium may remain a liquid even at the absolute zero.

This temperature, 273 degrees below zero Centigrade, denotes the entire absence of heat, or, expressed in more scientific language, the entire absence of atomic or molecular motion. Heat is due to the vibrations of the atoms. The less heat, the less vibration until, as has been found through mathematical study of the problem, the temperature of —273 Centigrade means the cessation of atomic motion and the entire absence of heat.

Physicists have been trying to attain to this temperature for years because of the bearing that a study of the properties of matter under those conditions would have on the problem of the ultimate constitution of matter. For example, it has been indicated that at the absolute zero the electrical resistance of many, if not all, metals is approximately zero, or, in other words, that although the atoms are entirely at rest the electrons of which they are composed are free to move without the slightest interference.

According to modern theories, an electrical current is a sort of procession of electrons or particles of negative electricity; and it is supposed that at the absolute zero the atoms settle to rest in some form which leaves absolutely free paths through which the electrons may travel without any interference or "resistance."

Every gas has been both liquefied and solidified except helium, which has never been reduced to the solid state in spite of years of effort. In Dr. Kamerlingh Onnes' most recent attempt, he evaporated the liquid helium in the most perfect vacuum attainable, the pressure at the surface of the liquid being only thirteen thousandths of a millimeter of mercury, or about one sixty-five thousandth of an atmosphere. A battery of twelve glass and six iron Langmuir vacuum pumps connected in parallel was used to obtain this result.

The previous attempts to solidify helium having produced a temperature of 1.15 degrees absolute, Dr. Kamerlingh Onnes undertook his latest attempt with the utmost refinement of technic. Although he was unsuccessful in getting any solid helium, he did succeed in getting the lowest temperature ever produced by man. It seems impossible, he states, to get temperatures lower by more than a few hundredths of a degree under those he has now obtained, but he adds: "We can not accept such a limit otherwise than as a provisional one." The pursuit of the absolute zero will continue.

"SLEEPING SICKNESS"

Science Service

ALTHOUGH encephalitis lethargica or "sleeping sickness" is more prevalent in North America than at any time within two years, the total number of cases reported bears but a small relation to the total population. The actual number of cases is not known, as the disease is reportable only in twelve states. Reports for the full year 1922 from thirty-one states and the District of Columbia to the United States Public Health Service give a total of 1,333 cases as against 1,822 for the preceding year.

No accurate figures for the whole country for 1923 are as yet available, according to Public Health Service officials. A severe local epidemic broke out in Winnipeg, Canada, early in January and 85 cases had been reported up to Febraury 26, with 17 deaths. There have been 345 cases and about 110 deaths in New York since the first of the year, or about three times as many as last year. Other cases have been reported in widely separated sections of the country.

An increase in the number of cases of "sleeping sickness" in several countries of northern Europe is announced by the Health Section of the League of Nations. Although the recrudescence was first noted in Sweden, the greatest number of cases has been reported from England and Wales.

The increase began in Sweden in November, when the number of cases jumped from a former monthly average of three to a total of 19 and showed a further increase in December to 45, and in January to 102. England and Wales re-

ported 66 cases in January and 107 for the first three weeks of February as against 52 cases for the corresponding period in 1922. A total of 99 cases has been reported in Switzerland since November, and a few cases have been noted in other countries. During February, encephalitis was present in Poland, and four cities, including Warsaw, registered 32 cases.

When encephalitis first appeared at Glasgow, Scotland, in an aggravated form, public health authorities believed at first that a new malady had made its appearance, but a closer investigation showed that "sleeping sickness" with certain symptoms not present in the 1920 epidemic had recurred. Twenty-six cases have been reported so far.

The cause of the disease is unknown, nor is there at present any definite remedy. Although apparently due to an infection, the disease is not contagious in the usual sense. In 900 cases studied there were no secondary cases in the immediate families of the patients.

The disease is an inflammation of the brain substance with accompanying congestion and frequently with small hemorrhages. It is characterized by great prostration and sleepiness, the patient being literally unable to keep his eyes open and falling into a deep sleep or into a state of coma from which it is sometimes impossible to arouse him. Death occurs in about 29 per cent. of the cases, coming after a few days of profound coma.

It is not a direct sequel of influenza in individual cases, although with one exception every outbreak of it has followed a general influenza epidemic. The disease was first described by a German writer in 1712, and has been known ever since. The first case in the present outbreak in North America, which has continued with varying intensity and distribution, occurred in New York City on September 4, 1918. In 122 cases where definite histories could be secured, the patient had recently had influenza in 46 per cent. of them.

Since about 30 per cent. of the whole population had influenza during the great epidemic, soon after which occurred the cases studied, it may be that in some way an attack of influenza causes susceptibility to encephalitis, but it is not a direct sequel, as most of the victims have not had the "flu."

It has been suggested that influenza causes a lowering of resistance to the sleeping-sickness infection, or that it is due to a separate variety of the influenza germ, which has an affinity for the nerve cells of the brain.

Encephalitis occurs principally in men, and in persons in the latter part of middle age, the ages from 40 to 59 being particularly susceptible. Infants under one year are also susceptible. Old persons are relatively free from the disease, as are those from infancy to 40 years.

A SEAPORT FOR AN INLAND STATE

News Bulletin of the National Geographic Society

THE "Ararat" of a strictly American "Noah," real communist inhabitants, a huge lava flow and salt and sand sufficient to cure most of the world's fish and to keep all its builders and glass factories busy are some of the by-products, valuable and otherwise, that the United States would acquire if it successfully acted on a recently reported resolution of the Arizona House of Representatives. The resolution seeks to add to the state a small triangle of northern Mexico.

It is for quite a different reason, however, that Arizona desires what might be called this "second Gadsden Purchase" of one of the most desolate and least-known regions of North America. The map shows that while the southern boundary of the state extends due west for a space from the southwestern corner of New Mexico, it then strikes northwestward at a very slight angle. The resolution seeks an arrangement with Mexico by which this bend in the southern boundary of the state would be eliminated so that the line would continue as it started, in a due east and west direction. The triangular area that would be added to the state would be about 240 miles long by about fifty miles wide at the point of greatest breadth.

The important consideration is that this long narrow triangle is all that separates Arizona from the sea—the Gulf of California, huge arm of the Pacific. Add it to Arizona, and overnight the state would desert the twenty-seven inland commonwealths and join the twenty-one that border on salt water. With its hundreds of thousands of tons of minerals to ship, the state is now bottled up by a narrow region undeveloped and little likely to be developed by its present owner. It is felt that even the desolate, practically trailless desert, and the lack of natural harbors on the gulf would not deter Yankee enterprise and Yankee engineering ability from laying down a trail of steel and constructing quays or piers at which ocean steamers would soon be loading, furnishing the cheap transportation that bulky products demand.

The areas of most states are well-known, even the parts sparsely populated. It is hard for dwellers in many other portions of the United States to realize, therefore, that not only is this triangle

of Mexico a *terra incognita*, but that the portion of Arizona which adjoins it is almost equally so. Most of the region south of the Southern Pacific Railroad may be thought of as a desert on which small broken rocky ranges of mountains have been superimposed. In the valleys between the craggy mountains are numerous patches of fertile soil, but little rain falls, and there are practically no running-streams—only dry stream-beds which now and then carry water for a few hours until it is lost in the sand, and a very few water-holes.

Both north and south of the border, this region is given over almost wholly to a handful of Papago Indians with communistic customs, who range as freely as did their remote ancestors, needing to give in their desolate homeland little or no thought to border-lines, or to the governmental machinery of states and nations. The region—both American and Mexican—is known roughly as "Papagueria," and is seldom traversed by white men.

Through it the international boundary extends the ultimate in arbitrary lines. Swerving neither to the right nor to the left, it extends a straight geometrical line running up sheer cliffs and over craggy peaks, hurdling great valleys and tiny arroyos, crossing deserts, lava flows and sand dunes, until it strikes the Colorado River some fifteen miles below Yuma. And it is imaginary as well as arbitrary. Little monuments from three to five miles apart mark its progress, but these are often obscured, and the Indians and the occasional white or Mexican travelers may, and do, cross and recross it frequently without knowing its location and with no guards or officials to question them.

The Mexican triangle of Papagueria, which it is proposed to add to Arizona, is even a more inhospitable country than the border region. In addition to the features of the latter, it embraces a district thirty by forty miles covered by extinct volcanic craters and an ancient lava flow, and hundreds of square miles of great towering sand dunes that create a landscape like that of parts of the Sahara. On the highest lava peaks of Pinacate, say the old Papago legends, their "Elder Brother" landed from his cask after the deluge and after floating around the world four times. While his solicitude for animals was not as extensive as that of the Hebraic Noah, he at least managed to save a coyote and a beetle. The Papagos formerly were "sand people" living in the sand dune region near the lava fields, with headquarters at the few small water-holes. This region is now practically deserted, the Papagos living by dry-farming and stock-raising farther east and north and making journeys coastward only at intervals for salt.

There is no general knowledge of good natural harbors along the portion of the Gulf of California that would be included in the proposed triangular addition to Arizona, but probably there would be little difficulty in constructing harbor facilities either along Bahia Adair, which would mark the southern boundary of the addition, or northward toward the head of the gulf. The larger sand dunes are twenty miles from the shore near the gulf head and an equal distance from the Colorado River. The most feasible railroad route probably would be from the neighborhood of Yuma, extending roughly parallel to the river.

A NEW HIGH EXPLOSIVE

Science Service

THE latest thing in blasting explosives, cartridges of lampblack soaked in liquid oxygen, was given a trial at a local quarry near Martinsburg, W. Va., recently. The tests were conducted by a representative of a German firm of manufacturers of liquid oxygen apparatus under an arrangement with the United States Bureau of Mines. The test was said to have been successful.

The liquid oxygen explosive has a number of advantages over the older sorts. It can be made on the spot, and the cartridge is perfectly safe until after the liquid oxygen has been poured into the hole into which it has been placed. The hole is then tamped and the cartridge exploded. No poisonous gases are set free by the explosion. If the cartridge fails to explode, it is not a continuing source of danger, but after about twenty minutes the oxygen evaporates from it and it again becomes harmless.

The explosive property is due to the property of finely divided carbon of absorbing large amounts of oxygen when soaked with it in the liquid state. The cartridge explodes owing to an instantaneous combustion of the carbon in intimate contact with pure oxygen. Each cartridge contains about two ounces of lampblack which absorbs about seven ounces of the liquid oxygen.

Owing to the expiration of earlier patents for the manufacture of liquid air, liquid oxygen can now be produced cheaply on the large scale. It is made from liquid air by permitting the nitrogen, which evaporates at a lower temperature, to boil away, leaving practically pure liquid oxygen. The chief expense of its commercial production is said by manufacturers to be the cost of the steel pressure cylinders, tested up to 3,000

pounds, which are necessary for long distance transportation; but this is overcome when used for blasting by making it at the mine.

The Germans are said to have made much use of liquid oxygen for blasting purposes during the war. It was unsuitable for a military explosive and was used therefore wherever possible in place of the expensive nitrogen-containing explosives which were essential at the front.

DECREASE OF TYPHOID FEVER

Science Service

THE death rate from typhoid fever continues to decline in the larger cities and for the year 1922 was at the lowest point of record, according to the eleventh annual summary of the deaths from the disease published by the American Medical Association on the basis of official reports from all cities of 100,000 population or more. The total population of these cities, 69 in number, somewhat exceeds 28,000,000, and the total number of typhoid deaths reported was 953, or at a rate of 3.3 per 100,000.

Compared with this were rates of 4.0 in 1921 and 8.1 in 1916.

Generally speaking, the larger the city the lower the typhoid death rate, although the three cities reporting no deaths have neither of them more than 300,000 residents. But every one of the 12 cities with a population of 500,000 or more showed a rate of 5 or less.

Eighteen cities reported rates of 2.0 or less, the three reporting zero being New Bedford, Providence and Yonkers. The three at the bottom of the list of the 69 are Birmingham, Trenton and Nashville, with respective rates of 12.5, 15.9 and 16.2.

According to the report, outside infection is coming to bear a more and more important relation to the total number of city cases. Baltimore, for example, reports cases of outside origin as numbering about 35 per cent. of the total. Philadelphia reports 29 per cent. of the cases due to infection outside the city.

The great decrease in the number of deaths from typhoid within recent years can be measured by comparing the current death rates from that cause with those of a few decades ago. The average for the years 1906 to 1910 inclusive for Pittsburgh was 65, as compared with 4.6 last year; New York, 13.5, as compared with 2.2; Chicago, 15.8, as compared with 1.0; Richmond, 34 and 4.4; Atlanta, 58.4 and 10.9; Los Angeles, 19 and 3.7, and Portland, Oregon, 23.2 and 3.3. These comparisons are typical.

Of the 69 cities reporting, 46 show a diminished and 23 an increased rate for 1922 as compared with 1921. The increases are generally slight, and the report declares that "it seems reasonable to suppose that the city typhoid fever rates will decline further. When a city like St. Paul, with a population of nearly 250,000, can report only 7 deaths from typhoid, three of which were in non-residents, it is plain that typhoid is at a low ebb."

ITEMS

Science Service

FLUELESS, radiant gas heaters of the type commonly used in heating rooms, may cause serious or fatal poisoning from carbon monoxide even where there is no leak in the pipe, according to the United States Bureau of Mines, which has been investigating a number of deaths due to faulty burning of gas heaters. The deadly carbon monoxide is given off as a product of the combustion of artificial or natural gas when the combustion is not complete, due to insufficient air being mixed with the gas. The Bureau of Mines recommends that all heaters have flues, or that a window be kept open in the room in which they are used, that the radiants should not be permitted to glow more than three fourths of the way from bottom to top, and, in general, that the gas flow be controlled by the needle valve rather than by the gas cock, as the greater the gas pressure at the burner the less the chance of the production of the poisonous gas.

A NEW miniature planet has been spotted in the heavens. George H. Peters, observer at the U. S. Naval Observatory, has just announced that he has photographed with the ten-inch refractor an asteroid that is thought to be new. It is now in the constellation of Orion, but it is so faint that it can not be seen with the naked eye. Its magnitude is about 10. The hitherto undiscovered minor planet was first sighted on December 22 at the government observatory as a by-product of the regular observation work, but no announcement was made until a series of positions had been obtained. Mr. Peters has also learned that the planet was independently discovered by observatories in Algeria and Spain about ten days previous to his first observation. There are now about one thousand of these planetoids known and most of them revolve around the sun in between the orbits of Mars and Jupiter. The largest of them is about four hundred and fifty miles in diameter, but the diameter of the new one has not yet been measured. Mr. Peters has discovered other planetoids before.

THE Brazilian Congress of Coal and Other National Fuels has recommended the use of alcohol-driven vehicles by the government and advises promoting the use of fuel alcohol.